

# The Future of the Dutch Environmental Testing Market

Master End Project Thesis

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# The Future of the Dutch Environmental Testing Market

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by

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This research was performed in collaboration with Eurofins Analytico B.V.

*This thesis is confidential and cannot be made public until December 21, 2024.*

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# Preface and Acknowledgements

*"Begin at the beginning", the King said gravely, "and go on till you come to the end; then stop"*  
— Lewis Carroll, *Alice in Wonderland*

This master thesis marks the end of my academic carrier: a lengthy process that spans the mandatory primary school, secondary school, high school, and optional two universities and three degrees. Three years ago I made a (rather impulsive) decision to extent my masters trajectory and master in both Life Science and Technology as well as Management of Technology. They say: "quality over quantity", I said: "why not both". The best of both worlds. The bridge between science and business. Not just one friend declared me insane to torture myself with two thesis projects. And now that I'm almost at the end of the road and can reflect back; maybe they were right.

This educational challenge started with great ambition, but like all life experiences was not without its ups and downs. The biggest up was the eye-opening educational method of the MOT master program. Many individual and group projects of which the choice of industry of the managerial aspect being taught, was completely up to the student. This resulted in insights and interests in industries that were not even close to what I had been taught in the Life Sciences. Topics could range from nuclear energy, to LiDAR technology, to the streaming service industry. However, the many projects and also both thesis studies, were complicated by the biggest down of all: the corona pandemic. As students, we can only learn how to adapt and move forward, and especially acknowledge that we don't have to do this alone.

The interests into many different industries generated through the MOT program, has ultimately guided me to the graduation internship at Eurofins Analytico B.V., a company that provides environmental testing to ensure and maintain the quality of our environment. When explaining the internship to friends and family, it was seldom that they had already heard of the company and the industry, but after the explanation, everyone recognized their importance. The projects they offered me was the exact combination between high-tech marketing, emerging break-through technologies, and technological strategy and entrepreneurship that I was looking for. The nature of the project out-weighted the traveling time to the firm in Barneveld (which was 4 hours a day in the best case scenario).

Before I wish you happy reading, I want to acknowledge numerous people that have supported and helped me during the long process, without whom it would not have been possible: First of all, a big thanks to my daily supervisors Erik Langerak Msc. and Dr. Tom Dolkens, respectively from Eurofins and TU Delft. Thank you Erik, for all your help, all the discussion, and making me feel so welcome at Eurofins. Thank you Tom, for being there whenever I got stuck and lost in the black hole that is strategic management research. Of course, my time at Eurofins would not be possible without Erik van Noort. Thank you for giving me the opportunity to perform my master thesis research at Eurofins. I'm grateful for all that I have learned during my time there and all the people that I have met. (And also a special thanks for the many times that you offered to drive me home, and spared me the headache and time that comes with public transport.) An additional shout-out to all the participants of the expert interviews, thank you for your time, insights, enthusiasm, and patience with the theoretical explanation of it all. Lastly, I want to thank all my friends and family for guiding and motivating me throughout my academic journey, and the infinite support during these times (even though you declared me insane).

I wish you lots of fun reading my final (for real this time) thesis!

*Simona Lu*  
*Delft, December 2022*

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# Executive Summary

The environment is an important part of the life for most organisms, including humans. Since its quality is integral for social welfare, ensuring and maintaining a high environmental quality is essential. The environmental testing market is dedicated to the testing of the three main components of environment: soil, water, and air. Since the origin of the environmental testing market in the Netherlands, a rapid growth in the market, especially its soil and water markets, has been witnessed. Multiple consolidation waves has reduced the market players to a few, and the markets have become saturated and growth is stagnating. Furthermore, the Dutch environmental market is facing a two-sided challenge that could potentially disrupts its current form. The first challenge is that the high pricing and cost reduction strategies, that have been adopted because of the high competitive nature of the market, have resulted in profit margins that are not longer feasible in the current economy. Secondly, the market is at the forefront of potential disruptive change from different factors like emerging technologies, regulation & policy, or the emergence of alarming substances that are potentially harmful to the environmental. These types of challenges in the Dutch environmental testing market point to a reevaluation of the business strategies of firms operating in this target market.

This study was dedicated to multiple sided analysis approach of the developments in the Dutch environmental testing market . The objectives were to determine the most suited business strategy for firms in the Dutch environmental testing market to remain competitively relevant in regards to the future developments in the market, and the internal circumstances needed to support this strategy. To analyze the multiple facets of the market, three theoretical perspectives are taken. Individual analysis using the external competitive forces approach, the internal resource-based perspective, and the economics of regulation created insights into different aspects of the market. These three theoretical perspectives were also combined in a conceptual framework that support identification of important links between the three different theories. For the identification of the different market aspects, a qualitative exploratory research design was constructed. In collaboration with Eurofins Analytico B.V., one of the main players in the Dutch environmental testing market, expert interviews were conducted to obtain a clear understanding of the strengths and weaknesses of environmental testing companies (the internal analysis), and the opportunities and threats in the external market environment (the external analysis). It was found that there is a difference in most of the theoretical resources that adhere to the VRIO criteria of the RBV framework, and empirical resources of sustained competitive advantage as found extracted from the interview data. This difference was explained by the regulatory perspective, due to the governmental desire to eliminate information asymmetry. One firm strength that was found to be valuable and unique in both theoretical and empirical study was the economics of scale. However, analysis of the firm's external environment showed that different types of business drivers affect the economics of scale, in particular regulation & policy. The threats were found to not be supported by the pricing positioning taken by Eurofins, indicating that another competitive positioning is desirable. After confrontation of the company's strengths and weaknesses with the opportunities and threat in the market, it was found that more innovation- and service-based positioning are suited. Because of the empirical lack of source of sustained competitive advantage, it was proposed that firms adopt a continuous innovation strategy on the basis of customer requirements. A continuous innovation cycle was proposed that is supported by five internal firm conditions: market insight, expert knowledge, internal communication systems, overcapacity in resources, and standard protocols. The continuous innovation strategy could gain firms in the Dutch environmental testing market a continuous temporary competitive advantage under these five circumstances.

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# Nomenclature

## Abbreviations

Abbreviation	Definition
BD	Business Development
BTB	Business-To-Business
BTC	Business-To-Consumer
CAQDAS	Computer-Aided Qualitative Data Analysis Software
CE	Competition Expert
CS	Customer Service
KBV	Knowledge-Based View
MNE	Multinational Enterprise
MT	Management Team
P5F	Porter's Five Forces
PD	Process Development
PFAS	Per- and polyfluoroalkyl substances
PLC	Product Life-Cycle
RBT	Resource-Based Theory
RBV	Resource Based View
RV	Relational View
SCP	Structure Conduct Performance
SVHC	Substances of Very High Concern
SWOT	Strengths, Weaknesses, Opportunities, Threats
TCA	Thematic Content Analysis
TICC	Testing, Inspecting, Certification, and Compliance
QCA	Qualitative Content Analysis

# 1

## Introduction

*"To make the changes we need to make and to reach a safer future, we will need the resources of everybody here — the scientists, the policy makers, and the industrialists — all working together towards a common goal. And that goal is a planet that can continue to support life."*

— Dr. Piers Sellers

## 1.1. General introduction

Once mainly operating from the shadows, but now coming to light: the Dutch environmental testing industry is gaining increasing interest from all parts of society. In the last 35 years since the industry's origin in the Netherlands, increasing emphasis has been put on environmental quality as a necessary condition to human life. When researching environmental quality, three main components are defined within the environment: soil, water and air (Gupta, 2007). Each of these components has received increased interest from government, industry and the population because of their role on the quality of life. The global Covid-19 pandemic, one of the most defining events of the past few decades, has increased awareness of the significance of air quality, the importance of monitoring this environmental component, and its impact on health worldwide (Addas & Maghrabi, 2021; Ropkins & Tate, 2021; Singh & Chauhan, 2020). Recent initial exploratory research into the dangerous human-made chemical group per- and polyfluoroalkyl substances (PFAS) and their impact on the environment by the Free University of Amsterdam (VU Amsterdam), has led to new regulation and policy being instated in 2019 that obliges measuring these substances in soil before manipulation of the medium (H. Hall et al., 2021). Lastly, awareness of the importance of water quality in the Netherlands has also increased because of the flood in Limburg in July 2021, the increasing temperatures and decreasing levels of groundwater during the summer months recent years, and their impact on different ecosystems. This impact have not yet been studied in the Netherlands, but in other parts of the world (Mishra & Alnahit, 2021; Qiu, 2019).

To track the quality of the environment, constant monitoring is needed. This essential task of monitoring the different components and preserving environmental quality in the Netherlands, is performed through a collaboration between the government, non-governmental organisations, and multiple industries. One of the main players in this collaboration is the environmental testing industry. Companies in this industry provide testing, inspection and certification (TIC) service of one or multiple of the environmental components. The environmental testing industry in the Netherlands has grown to a €70M industry over the years. The industry is mostly business-to-business (BTB), as their clients are often made up of technical consultancy firms or organisations (both governmental and non-governmental) related to environment management.

This thesis focuses on a competitive market analysis of the Dutch environmental testing market. It is expected that developments in this market are influenced by multiple aspects in both the external market environment as well as in the internal environment of testing companies, with both facets also being heavily influenced by regulation and policies. Because of these different aspects influencing a firm's ability to compete, different perspectives in strategic managerial theories should be considered for this research. This study includes perspectives from the competitive forces approach for the external analysis, the resource-based perspective for the internal focus, and also regulatory theories to highlight the influential role of regulation and policy. Insights obtained from multiple market perspectives could result in a better understanding in how firms, with their internal attributes, can position themselves with regard to the market forces and in the institutional context of the industry. This research is performed in collaboration with Eurofins Analytico B.V. (the environmental branch of Eurofins Scientific Groups), one of the main players within the environmental testing market in the Netherlands.

The rest of this chapter is dedicated to providing more background context of the development of the environmental testing market (section 1.2) to understand the current circumstances, problem statement and research objectives (section 1.3). After, the research questions and methodology are presented in section 1.4 and 1.5. The scientific and social relevance of this study will be elaborated in section 1.6. In the final section (1.7) of this chapter, the rest of the report structure is highlighted.

## 1.2. The history of the environmental testing market

The importance of environmental quality first arose after the Lekkerkerk incidence in 1980, when it was discovered that a new neighbourhood was built on soil that was highly contaminated with harmful chemicals (RIVM, n.d.). The discovery was made after a water pipe burst due to corrosion caused by the aggressive chemicals in the soil. The citizens of the neighbourhood were temporarily relocated

and the pollution was remediated by completely removing the polluted ground, costing roughly 188 million guilders (equivalent to €85.5M). The Lekkerkerk crisis was the first environmental scandal in the Netherlands of this scale and attracted much media and political attention. Because of this, new regulation and policies were called to life on soil quality, similar potential contamination sites, and the approach of remediation of these sites (Bodemrichtlijn, n.d.).

At first, it was suspected that the number of the contaminated sites was within a few thousand cases and remediation could be commissioned by the Dutch government through complete removal of the contaminated soil. However, in early 1990, the number of contaminated sites needing remediation had increased to more than hundred thousand cases and the in-house knowledge and resources of the government became insufficient. Especially the extensive associated financial costs caused the governmental-approach to become unrealistic, and a shift in regulation and policies occurred (Bodemrichtlijn, n.d.). At first, responsibility and financial costs of remediation of the contaminated sites shifted from government to third parties, either private or public companies. This decentralization of both estimation of the contamination extent and the approach of remediation responsibility, gave rise to the Dutch environmental testing market.

Many advisory companies with in-house laboratories dedicated to testing of soil and water quality were established to meet the increasing demand from industry. However, this shift of responsibility to multiple third parties also resulted in decentralization of analysis techniques and reporting methods, making it hard to compare contamination reports between different parties. To counteract this, stringent standardization of analysis methods, reporting and approach to remediation criteria were created in regulation and policies. The stringent analysis method regulations and quality assurance policies were hard to meet for smaller environmental testing companies without sufficient resources. This initiated a new phase for the environmental testing market: the consolidation waves of smaller companies into larger ones. The merger and acquisition of smaller laboratories was further motivated by the increased competitive market advantage of sharing resources and costs.

Recently, the consolidation waves in the environmental testing market in the Netherlands are decreasing and only few companies make up the majority of the market share. For example, in the Dutch soil testing market, three main players remain: Eurofins Scientific, SGS and Agrolab, controlling more than 90% of the soil testing market. The initial growth seen in demand from the market after the establishment of regulation and policies and the shift in responsibility, has stagnated. The stationary growth and lack of innovation in the market has created a matured and saturated market. The market saturation in the environmental testing market, in particular the soil and water testing market, has resulted in a highly competitive market nature, where pricing and cost reduction strategies are often adopted.

### 1.3. Problem statement and research objectives

The last few years, companies in the Dutch environmental testing market have adopted a combination of the price leader and loss leader pricing strategy. Eurofins Analytico B.V. (further addressed as Eurofins) has used the loss leader pricing strategy, where they use low pricing on the standard packages to increase their market share and use this increased client portfolio to also sell analysis package with higher profit margins. The three main players left, generally behave as an oligopolistic market using a price leader pricing strategy, where each time one competitor lowers their pricing, the others follow soon.

Currently, companies such as Eurofins are faced with a two-sided challenge regarding their future business model. On one hand, the pricing strategies in their core businesses (the soil and water testing market) have reached a limit where profit margins have become too small to be viable. On the other side, the market is at the forefront of potential disruption by either radical innovation or changes in regulation and policies, that could both cause the demand to not only stabilize as seen currently, but to even decrease in its current form, as well as result in a different operating model needed.

Potential disruptive developments can be classified into three categories. The first category is regulation and policy related. At the moment environment quality is preserved through multiple different

acts and decrees such as the Soil Protection Act, the Environmental Protection Act and the Soil Quality Decree. The Dutch government has proclaimed their desire to assemble all environment related acts and decrees under a single law the Environmental Act (Rijksoverheid, 2022). This law is planned to take effect starting from January 1st 2023. However, it is unclear how the new law will effect regulation and policy, and in turn effect environmental testing companies. The second category are emerging technologies that could potentially change the current approach to soil and water quality testing. Currently, samples are taken and send to a laboratory where the concentration of different components are determined. Innovation in monitoring technology, sensor technology or self-test kits, could eliminate the need of a laboratory once they are adopted into regulation. Other technologies such as DNA techniques or bioassays could change how soil quality is determined. At this moment soil quality is determined through measuring certain values of chemical compounds. However, a different approach could be to instead of identifying all chemical compounds, look at their impact on the ecosystems of the surrounding environment. Next to a new technology, another emerging danger is the use of old data from previous samples in the surrounding environment. Companies in the environmental testing market can use their historical data as provide clients with a new service, but simultaneously this also decreases the demand of analysis packages. The third category is defined as the emerging of substances of very high concern (SVHC). The rising concerns surrounding PFAS has also increased the interest into other SVHC. Since most of the SVHC are not part of standard analysis packages, environmental testing companies would have to create new analysis methods for these emerging SVHC once demand increases. The rising awareness of the impact of harmful chemical substances on human health has resulted in an increase into scientific research on this topic.

To summarize, growth of the core business of companies in the Dutch environmental testing market is limited and multiple factors are in play that could potentially disrupt the current operating process of these companies. The objective of this research is not to discover which of these categories is the most likely to take place first, but to explore what strategy companies in the environmental testing market should adopt to compete in the changing external environment, and how their internal resources should be allocated accordingly. Utilizing the right resources, companies in the Dutch environmental testing market could generate a competitive market advantage that could potentially be sustained for an extended period of time.

## 1.4. Research question

As mentioned previously, we wish to explore the different aspects of the internal and external environment of companies within the Dutch environmental testing market, to adopt a strategy for quick reaction to potential disruptive market developments. To achieve this, both internal conditions and external drivers should be taken into account. Therefore, the main research question is formulated as following:

“What business strategy should companies in the environmental testing companies in the Netherlands adopt and what circumstances are needed for this shift?”

Multiple sub-questions are formulated to answer the main research question. The first sub-question is dedicated to obtain a more in-depth understanding of the current circumstances in the environmental testing market. The second sub-questions aim to examine the internal resources of companies in the market, and identify potential factors that could be deployed to attain a competitive advantage and the external circumstances that hinder their development. In the third sub-question, the market environment assessment is used to formulate the most suited business strategy. Ultimately, the fourth sub-question is committed to determining what these environmental testing companies need to be able to accommodate this shift in strategy to changing market conditions.

1. What are the current circumstances in the Dutch environmental testing market?
2. Which theoretical perspectives provide insight into the developments of the environmental testing

market?

3. What is the most suited business strategy considering the current challenges?
4. What circumstances are needed to adapt the most suited business strategy?

## 1.5. Research methodology

To answer the multiple sub-questions a qualitative research approach is proposed. A detailed overview of the research methodology is provided in Chapter 4. The research will be constructed of both theoretical parts based on secondary sources and empirical parts based on primary sources. The theoretical parts is performed through a desk research. This literature review is executed using both grey literature as well as scientific articles for the study of the current environmental testing market and the state-of-the-art examination of strategic management theories (see Chapter 2 and 3). The desk research concludes the first and second sub-questions that are essential for the empirical research chosen to examine the other sub-questions. Chapter 3 introduces multiple useful theories in strategic management that provide different understanding into aspects of the Dutch environmental testing market. The chapter proposes a combination of multiple theoretical perspectives, and designs and sets up the framework for the remainder of this research.

For the second part of the research, interviews are proposed as the research method to obtain data. Through guidance of different theoretical perspectives, interviews with employees of Eurofins can be performed to map out the different aspects influencing the developments in the Dutch environmental testing market. Using the better understanding of both the external market environment as well as a firm's internal attributes, in an institutional context, a firm's ability to compete in the market can be explored.

Several limitations can be identified in the chosen research methodology and are discussed more in-depth in Chapter 4 and 7. Besides the usual known limitations of interviews (i.e. low statistics, interview bias, etc.) as a research methodology, there is another limitation that needs to be considered when designing the research method for this thesis. The research is conducted in collaboration with Eurofins. Both the grey literature for the desk research as well as the results from the interviews could potentially be influenced by a single company's tunnel vision. The danger from generalizing the data obtained from a single firm to the whole environmental testing market in the Netherlands, is that we could miss important factors that are not on Eurofins' radar and therefore will not come forward in the interviews. In chapter 4 this limitation is further discussed and the measures taken to decrease this weakness in the research are presented.

## 1.6. Relevance of study

The outcome of this thesis research has the potential to contribute to both scientific research as well as society. In this section the scientific and societal relevance are further highlighted to address the two sides of the significance of this research.

There are two main factors in which this research contributes to scientific research. Firstly, the Dutch environmental testing market has been studied little from a theoretical perspective. There is little scientific literature to be found on the circumstances of the market within the boundaries of the Netherlands. Most research into environmental testing markets globally are connected to agriculture purposes of the soil and not the challenges and opportunities of the market itself. By studying the Dutch environmental testing market through different theories and frameworks, focus can be created within the current circumstance in the market in regards to future developments. Secondly, this study contributes to strategic management research as it combines different theoretical perspectives to examine the different aspects of the Dutch environmental testing market. Combining the strengths of multiple theoretical frameworks, a better understanding of the market and firm attributes in this specific market can be generated. Through combining different theoretical perspectives and application on a different type of

industry, the environmental testing market in the Netherlands, this study contributes to theory.

Next to the scientific contribution, an even more important societal contribution can be created from the research outcome. By creating a better understanding of the environmental testing market environment and highlighting the opportunities and challenges in the market, this thesis could contribute by advancing the Dutch environmental testing market into a new phase. The market has been operating in a similar fashion since its origination by analysing the three main categories soil, water and air for harmful contaminations. However, this thesis could emphasize the importance of innovation within the market and initiate a different approach to how environmental quality is defined. Through improvements in the environmental testing market, ultimately the research could result in a contribution to the environmental quality and general living conditions.

## 1.7. Report structure

This chapter has been dedicated to introducing the research topic, through a brief history of the Dutch environmental testing market, the research objectives, relevance of study and a brief overview of the research methodology. To present the rest of this research in an organic method for the readers, the thesis report will be structured as followed: Chapter 2 is allotted to presenting a market overview, the main players, and define the operation and product in the market. The theoretical background will be presented in Chapter 3. This literature review contains a few commonly used frameworks in strategic management and proposes a combination of these theoretical perspectives. In Chapter 4, a detailed description of the research methodology will be provided alongside the considerations made. Chapter 5 will be dedicated to approaching the environmental testing market from multiple perspectives to focus on different important aspects of the market. These different perspectives are combined in Chapter 6, and the key insights will be used to answer the research questions. Chapter 7 is dedicated to a more in-depth discussion on the use of theory and some key assumptions or choices made during the research. The chapter will end with future recommendations. The conclusion of the thesis will be elaborated in Chapter 8 through a brief summary of the research performed. The outcome from this thesis can be used by companies within the Dutch environmental testing market in the decision making process, and support how they will prepare for upcoming developments in the market.



# 2

## The Dutch environmental testing market

*"A healthy ecology is the basis for a healthy economy."*

— Claudine Schneider

A brief overview of the origin and history of the Dutch environmental testing market was already presented in Chapter 1. This chapter presents a detailed overview of the current market for a better understanding of the market operation. Section 2.1 is dedicated to a general overview of the market through the main environmental testing companies and other important stakeholder. Introducing the market players, also results in the understanding of the market size and the core businesses of the companies operating in the environmental testing market. In next section, section 2.2, some important regulation and policy in the market are highlighted. This includes both regulation and policies that result in the demand of environmental testing, as well as regulation and policy to which testing companies must adhere for operation within the market. Lastly, section 2.3 describes the general process flow. This is needed for an in-dept understanding of the current operating model and sets some key concepts that will be used in the rest of the report.

Through these topics, an answer is formed for the first research sub-question: "What are the current circumstances in the environmental testing market in the Netherlands?". This in-depth understanding of the market is needed as background information for the rest of the research.

## 2.1. Market players

For a general overview of the current market circumstance, the main market players are first mapped out. By identifying the main players, an understanding is obtained into the total market size, market shares of each organization, and different business aspects of the market. The main players in the market are differentiated into Dutch environmental testing companies, the customers, the government and other main stakeholders of the market.

As mentioned in Chapter 1, consolidation waves of environmental testing companies in the Netherlands, have reduced the key testing companies to three main players: Eurofins, SGS and Agrolab. In the next sections, these players are briefly introduced. After, other organizations and stakeholders that play a large role in the functioning of the Dutch environmental testing market are addressed.

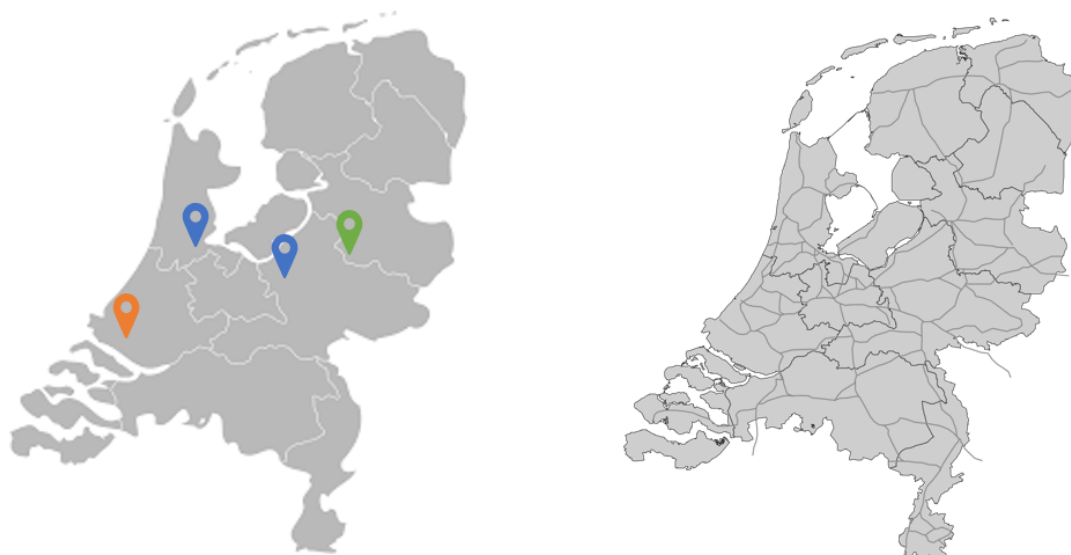
### 2.1.1. Key testing companies

#### Eurofins

Eurofins Scientific was founded in 1987 in France with the original purpose to use a new technology to test whether sugar was during the wine production process (Eurofins, 2021a). In the years that followed, the range of testing was expanded to other products in the beverage industry, and soon the environmental testing market was also penetrated. Eurofins Scientific eventually penetrated the Dutch environmental testing market in 1995, shortly after the shift of responsibility from the government to third parties. This makes Eurofins Analytico one of the first providers of environmental testing in the Dutch market. The following years Eurofins Scientific as a whole went public with the first listing in 1997 in Paris, and a second listing in Frankfurt 2000. The financial capital raised from these listings were used to geographically expand the company and to fund the Eurofins' strategy to consolidate with other testing companies (Eurofins, 2021a). The later strategy was to use the resources and capabilities of the other laboratories to build a unique portfolio in the (at that time) core markets: food and environmental testing. Today, Eurofins has grown to a network of 900 laboratories in 54 different countries on all continents, that is active in multiple industries like food, agriculture, environment, pharmaceutical, clinical diagnostics, and consumer product testing.

The environmental division of Eurofins Scientific in the Netherlands is called Eurofins Analytico. It has two laboratories dedicated to mainly soil and water testing. One is a smaller laboratory located in Amsterdam, while the main laboratory is located in Barneveld. For an understanding of these locations in the Netherlands and the comparison to the location of the other main companies in this market, a visualization can be found in Figure 2.1. The locations of the Eurofins settlements in the Netherlands are shown in blue.

The environmental testing market (the soil and water market excluding drinking water and waterboards) is estimated at a total market value of €70M (Eurofins, 2021b). It is approximated that Eurofins has a total market share of 57%. Most customers of Eurofins can be divided into two types: environmental consultants and monitoring organizations. When taking a more detailed look into these customers that Eurofins services, it was estimated that Eurofins is the market leader of environmental consultants (soil and groundwater testing) with approximately 60% of the Dutch market. While in the water market (waste water, surface water, and process water (excluding drinking water) testing), it is estimated that Eurofins contains 44% of this market segment. As part of the TIC sector, Eurofins mostly only provides the testing service, while clients like environmental consultants account for the inspection and certification services for the end customers. Additional services that Eurofins provides for its customers are the logistic service and the packaging of the analysis samples (Eurofins, 2021b). The deliver of the sample packaging and the transfer of samples to the laboratories is completely facilitated by the logistics division of Eurofins Scientific. This logistic service is used for sample pick-up through the Benelux (Belgium, the Netherlands and Luxembourg) across division (all division active in the Benelux). Next to these services, Eurofins has implemented an overnight process flow, which has allowed them to reduce their turnaround-time. In turn, this has paved the way for the urgent analysis order market segment, of which Eurofins has a market share of 80%.



**Figure 2.1:** Distribution of the laboratory location of the three main key companies in the Dutch environmental testing market. Eurofins, SGS and Agrolab are indicated with blue, orange and green pins respectively. The accessibility of the laboratories is indicated by the reference image of the main Dutch infrastructure.

### SGS

The second main player among the Dutch environmental testing companies, is SGS (an abbreviation of Société Générale de Surveillance). The history of the company goes all the way back to 1878 in Rouen France. Its initial purpose was the inspection and verification of the quantity and quality of imported grain (SGS, 2022). In the following years, the business was quickly expanded to multiple other trading cities like Dunkirk and Marseilles. The start of World War I resulted in the division of the customers and offices. Therefore, the company moved its headquarters from Paris to Geneva, Switzerland, where it remains until today. In 1919, the company also adopted the SGS company name that is known today. In the following years, the company grows and expands to different countries, industries, and even starts providing inspection services. In 1981 the company goes public. Like Eurofins, SGS also used financial advantages of the listing for the acquisition of new businesses and further diversification for their corporate strategy. Today, SGS is operational in different industries across 125 countries with over 2700 laboratories and offices globally (SGS, 2021).

SGS did not enter the Dutch environmental testing market until April 2021, when Synlab Analytics and Services is acquired by SGS (SGS, 2021). The acquisition added 37 laboratories in North-Western & Central Europe to the multinational enterprise, strengthening its presence, especially in Germany, Benelux, and the Nordics. In particular division in the industries environment, food, life sciences, and oil testing improved through this acquisition. While SGS is active in multiple industries in the Netherlands, it has one environmental testing laboratory stationed in Rotterdam (shown in orange in Figure 2.1). In the annual report from 2021, the firm indicated that their Industries & Environment division will play a larger role in their total portfolio, because of the acquisition of Synlab (SGS, 2021).

It is not entirely known what the share of SGS is in the total Dutch environmental testing market. However, an estimation was made that SGS contains 25% market share in the environment consultants market segment (Eurofins, 2021b). Because of this, Eurofins assumes that SGS is their most important competitor in the Dutch market. Compared to Eurofins, SGS also offers the inspection and certification service. However, SGS does have a higher turnaround time of their analysis, due to the lack of an overnight process and inflexible out-sourced transport service. Another difference is that SGS, in general, is more innovation-driven. The company was even ranked as one of the World's most innovative companies by Forbes in multiple years.

### Agrolab

The last major player in the Dutch environmental testing market is Agrolab. The company originates from Germany and was founded in 1986 to improve the lack of service provided by German governmental laboratories (Agrolab, n.d.). It originally operated in the agricultural testing industry, but acquisition of a water and pollution analysis laboratory in 1995 marked the beginning of corporate diversification of the company. In the following years, Agrolab continued to expand with multiple laboratories in Germany, and eventually into other countries within Europe. Today, Agrolab has 25 branches across multiple countries in Europe, that are active in food, agricultural, environmental and water testing.

The firm first entered the Dutch environmental testing market by becoming shareholder of the Dutch contaminated waste water laboratory, Tauw-Laboratory B.V. in 2004 (Agrolab, n.d.). A year later, Agrolab acquired Tauw-Laboratory and the name changed to AL-West. In 2012, Agrolab started construction of a new laboratory for AL-West (the Dutch environmental division of Agrolab) located in Deventer (indicated by the green mark in Figure 2.1). The laboratory was finished and put to use a year later. Although this location might not be in a central position in the Netherlands, it is positioned close to important infrastructure junctions that result in a good connection with Germany, the company's main country of operation.

Similar to SGS, it is not entirely known what the total Dutch market share is of Agrolab. AL-West is estimated to contain 11% of the market share in the environment consultants market segment, making it the second main competitor of Eurofins (Eurofins, 2021b). In the water testing market, AL-West is estimated to possess 15% of the market share. Compared to Eurofins and SGS, Agrolab is founded much more recently, and the size of the organization reflects this. The diversification of Agrolab is limited to mostly food and environmental (including agricultural) testing. Because of this smaller size, AL-West has taken a more service-oriented strategy, since it is able to form more intimate relationships with their clients (as often seen for smaller businesses) and to offer more flexible service (Eurofins employees, personal communication, September 1, 2022). Compared to Eurofins and SGS, AL-West does not possess a separated R&D department dedicated to innovation. Innovation is mostly performed by highly knowledgeable individuals in the laboratory.

Since the market is composed of more players than the environmental testing companies, the next section briefly introduces other important stakeholders that shape the market in its current form.

### 2.1.2. Other stakeholders

#### Dutch water boards

One of the main stakeholders in the Dutch environmental testing market are the water boards. These organizations are independent regional governing bodies charged with surface water management in the Dutch environment. Their responsibility includes management of rivers and canals, solving issues around water drainage and watercourse, keeping track of water collection, overseeing flood and erosion prevention, and providing potable water. Some water boards have chosen to consolidate to increase their knowledge and improve their functioning. Two examples are the organizations Aqualysis and Aquon. Aqualysis is the laboratory for five different water boards situated in the Eastern provinces of the Netherlands (Aqualysis, n.d.). While Aquon is the laboratory that support nine different water boards in the Middle and Southern provinces (Aquon, n.d.). It is estimated that all water boards together make up 15% of the water market share (Eurofins, 2021b).

The water boards are mostly monitoring organizations dedicated to surface water. They are interesting stakeholders since they currently still lack in-house knowledge to analyse all contaminations. Therefore, they out-source most deviating analyses to the environmental testing companies (Eurofins employee, personal communication, July 18, 2022). However, simultaneously they are developing these analyses and new technologies. The Dutch environmental testing companies could potentially lose important clients when the water board laboratories manage to develop the products in-house, which leads to a decline in analysis demand.

### Clients

In every market and industry, the buyers are important stakeholders. As mentioned previously, the main clients of environmental testing companies are environment consultants and monitoring organizations (Eurofins, 2022). However, these clients, in particular the environment consultants, receive these analysis orders from their clients. These clients can be private individuals, that, for example, wish to buy a house or land. In these cases, the individual is responsible by law to show that the soil does not contain harmful substances. Other clients can be other firms that wish to premises, or that operate in industries where soil is moved (like construction) or water is used in some part of the process flow. These companies are also obligated by regulation to demonstrate that the new environment is not harmed by the displacement of the soil or water. Another type of clients that request environmental analyses, are the monitoring organizations, which are often governmental bodies like municipalities, provinces, and water boards. They are responsible to periodically check the soil and water quality to ensure the health and safety for society. Most of the clients order environmental analyses because of regulation and policies. Section 2.2 presents an overview of the most relevant ones.

### Government

Next to the client-oriented role of the government in the Dutch environmental testing market, the most influential aspect is its authority in the formulation of regulation and policies on the operation of testing. Although the market demand is largely driven through regulation and policy, the Dutch environmental testing companies also experience numerous regulation and policies that largely impact their operation. This governmental influence stems from the origin of the market. As briefly explained in section 1.2, the shift of responsibility needed standardization for comparison power. Section 2.2 also elaborates on certain important regulations that impact the operational process of the companies.

### Non-governmental organizations

The last notable stakeholders in the Dutch environmental testing market are non-governmental organizations (NGOs). Examples of NGOs are BodemBreed Forum, which is an non-profit organization made up of multiple stakeholders in the soil and groundwater testing market. The organizations objectives is the exchange of knowledge and information to stimulated that development of new knowledge and problem-solving solutions (Forum, n.d.). Other NGOs could be trade associations like Fenelab. This association is active in multiple sector including environment, and brings together experts within each industry to deliberate the problems that companies face (Fenelab, n.d.).

## 2.2. Regulation & policy

The demand for environmental testing originates mostly from regulation and policies. Therefore, this section is dedicated to a brief overview of the current regulation and policies. First, an overview is presented of the multiple different regulations that dictate soil testing. After, regulations regarding water testing are introduced. The section concludes with the regulation and policies that prescribe the operational model of environmental testing companies.

### Soil related regulation

- **Wet bodembescherming** (Act of Soil Protection): This act prescribes conditions that might be associated with performing activities that includes the displacement of soil (Rijkswaterstaat, n.d.). In particular protection and remediation of locations are addressed in this law. In the former case, the law highlights the importance of prevention, limitation, and reversing of certain changes to soil, that are potentially reduction or threat to the environmental quality.
- **Besluit bodemkwaliteit** (Decretal Soil Quality): This decree indicates the conditions in which soil can be reused. It states background, intermediate, and intervention values for harmful substances. The objective of this policy is the balance between conservation of soil quality and the reuse of soil for societal developments like housing and construction of infrastructure (Rijkswaterstaat, n.d.). The inspection of the possible reuse of the soil is set in AP04 reports.
- **Arbowet** (Working Conditions Act): This law is dedicate to the health and safety of employees. Its objective is to prevent harm and illness during labor (Rijkswaterstaat, n.d.). This law is also applicable to ground-, road-, and water-associated projects. The employer must demonstrate that the working environment is safe for their employees.

#### Water related regulation

- **Wet Milieubeheer** (Environmental Management Act): This act is dedicated to a general description of legal instruments to protect the environment and which principles apply for each instrument. It dictates that companies, like industrial firms that process water and drain their waste water directly into the sewage or surface water, need to ensure the highest possible protection of the environment in their operation (Rijkswaterstaat, n.d.).
- **Waterwet** (Water Act): This act forms the basis for standards that can be set for the quality of different bodies of water. It also states that water quality managing organizations should adhere to a number of quality requirements. For example, for surface waters, chemical and ecological standards apply, while for groundwater only chemical standards apply (Rijksoverheid, 2008). For the definition of water quality standards, this act refers to the Environmental Management Act.

#### Important regulations for environmental testing companies

- **KWALIBO** (Quality assurance in soil management): This regulation aims to increase the reliability and comparability of quality measuring instruments that are required for activities in soil and water management (SIKB, n.d.). It ensures the integrity of the environmental testing companies. Part of this decree is the accreditation requirements, AS3000, to which Dutch environmental testing companies must adhere to. It describes the laboratory analyses of soil, groundwater, surface water, and waste water testing. Other accreditations that the companies should meet, are AS1000 and AS2000 (both dedicated to the sampling process for quality analysis).
- **NEN-EN-ISO/IEC 17025**: These standards specify certain general requirements for the operation of laboratories on the bases of competencies, impartiality, and consistency. Laboratories are tested by independent experts to verify that their process is qualified (RvA, 2022).

The multiple different regulation acts and policies in the Netherlands makes it hard to remain a clear overview, introducing the possibility of confusion and uncertainty. The Dutch government wishes to bundle the many different acts and policies, into a single Environmental Act. However, because of delays in the legislation process and governmental decision making, the contents of the act are yet to be made known. This creates an uncertainty in the future of the Dutch environmental testing market, since regulation and policy are an essential aspect of the market.

## 2.3. Product process flow

This following section is dedicated to the clear definition of the product within the Dutch environmental testing market and an overview of the process flow from analysis order to analysis report.

For the understanding of the rest of this thesis, it is important that the product is clearly defined. Even among employees of Eurofins, there is not only a clear description of the product. Some describe the product of Eurofins as the final analysis report. Others mention the information provided to the client. Again others indicate the different analyses packages as the product. While some think that Eurofins does not offer products, but a service. In this research, the definition of the product is chosen to be the analysis packages. The information provided to the clients and analysis reports are results of the analysis package order, while the service is an additional part of the order.

Clients are obligated to test the soil and water associated to their activities. Therefore, they order certain analysis (packages) at an environmental testing company through the designated portal. When a company receives an analysis order, the first step taken is the pre-processing (Eurofins, 2022). During this process, they examine the risks associated to the sampling location. They can use the location's history (its previous function) or historical data from nearby previous measures, to determine the risks of certain substances. Through this, companies can estimate the presence of certain substances and advise the corresponding analyses. After the pre-processing step has resulted in specific analysis packages, the sampling process can start. Either in-sourced or out-sourced sampling teams take the samples in the designated packaging according to the methods described in regulation and policy. These packaged samples are transported in cooled vehicles (also either in-sourced or out-sourced) to the laboratory, where they are sorted and registered. The next step, the analysis process, depends on the analysis package ordered. Most analyses are standardized in regulation and policy and the methods of analysis are set. An analyst will look over the initial analysis results, and conjure an analysis

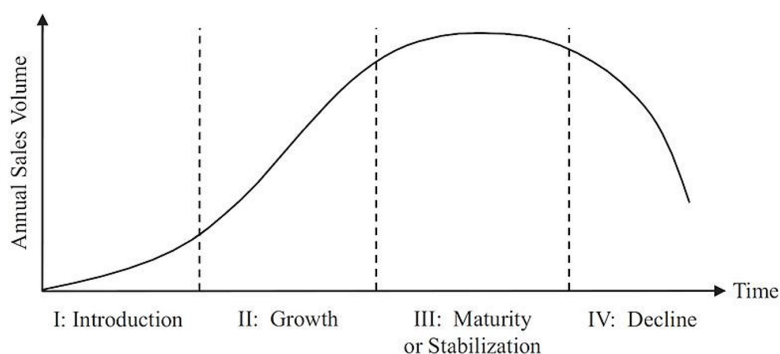
report of the requested substances, their measured values, and the reference concentration of said substance in "clean soil". This analysis report is checked and send back to the client, who can use it to validate their operations. The time of the product process flow from start to finish is also called the turnaround time. This process flow is schematically visualized in Figure 2.2.



**Figure 2.2:** The process flow of an analysis order for environmental testing companies.

### 2.3.1. Product Life Cycle

Most products follow the Product Life-Cycle (PLC). Understanding the most likely pathway that a product might take, creates insights for decision making in marketing and strategy formulation (Rink & Swan, 1979). This PLC is divided into four phases: introduction, growth, maturity, and decline (Figure 2.3). After defining the product in the previous section, a more detailed look can be taken into the current stage of the product in its PLC. It was determined that the environmental testing market is becoming saturated and growth is stagnating. The phase of the product can be identified as mature. It is not unreasonable to future market developments result in the initiation of the decline stage of the PLC. The potential decline of demand to the product indicates to companies that they should revisit the current operational model and use strategic management to determine what is next.



**Figure 2.3:** The Product Life-Cycle diagram defining the four stages of products.

## 2.4. Summary of chapter

This chapter answers the first sub-question through an in-depth desk research of the current Dutch environmental testing market. Environmental tests in the Netherlands are mainly provided by the three largest testing companies: Eurofins Analytics (the Dutch environmental division of Eurofins Scientifics), SGS, and AL-West (the Dutch environmental division of Agrolab). However, other stakeholders, like clients, Dutch waterboards, the Dutch government, and multiple NGOs, are also largely influential to the market. It was also seen that the market is highly regulated, which regulation and policy driving both the demand of analysis, as well as the analysis format. Because of the necessity of analysis from regulation, most companies offer the same analysis packages in the most demanded soil and water market segments. The products of the Dutch environmental testing market, the analysis packages, show signs of the classic PLC. The soil and water markets have matured and demand in these segments might even decline in the future. Therefore, a theoretical perspective is taken on the market to

determine how companies can prepare for the future.



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# 3

## Strategic management in literature

*“Strategy management is not a box of tricks or a bundle of techniques. It is analytical thinking and commitment of resources to action.”*

*- Peter Drucker*

In this chapter, a state-of-the art literature review on strategic management is performed. The objective of this chapter is to take different theoretical perspectives for the observation of the Dutch environmental testing market and to assess which are the most suited to obtaining an understanding of the market developments. First, a general overview on strategic management and its basic concepts is presented in section 3.1. The following section 3.2 introduces three different theoretical perspectives to strategic market research. The section elaborates the external and internal approach to strategy formulation, and also suggests a role for economics of regulation theories. These different theoretical perspectives are combined in a conceptual framework in section 3.3.

Through these topics, an answer is formed for the second research sub-question: “Which theoretical perspectives provide insight into the developments of the environmental testing market?”. The theoretical background is used as the back-bone of the rest of the research.

### 3.1. Strategic management

Two main branches make up management theory: strategic management and operational management. Operational management is mostly focused on how the operation can improve efficiency and control costs within the strategy set by the organization. Strategic management, on the other hand, is dedicated to providing the overall direction of the organization. This includes setting organizational objectives, developing policies, and allocating resources to achieve the objectives set (Ayitey, 2010). Strategic management has been extensively researched, as it is a crucial part in the field of management (Alkhafaji & Nelson, 2013; Courtney, 2002; Nag et al., 2007; Pfeffer & Salancik, 2003). Multiple different researchers, have different interpretations of what strategy is exactly. Chiavenato (2009) identified four fundamental parts that together make up an organization's strategy:

- The mission: this defines the organization's purpose
- The business: this includes what needs the firm covers through its product and service, the market in which the firm operates, and also the public image of the firm
- The vision: this defines the long-term prospects of the organization. The purpose is to guide, control, and encourage all parts of the organization to achieve the necessary states to create this vision.
- The objectives: these define the results that are desired in a set period of time

Organization's managers can use strategic management to formulate and implement goals on behalf of stakeholders, while considering the internal and external market environment, and different attributes and aspects available. Therefore, to understand what the organization needs to compete, one of the first steps to undertake is an environmental analysis. This analysis touches upon two main areas (Mintzberg et al., 2003):

- **External environment:** two different types of external environment are identified:
  - Market environment: this analysis includes the identification of behavior of competitors, the bargaining power of the rest of the corporate chain (buyers and suppliers), threat of new entrants to the market, and the possibility of substitution products available to the buyers. This basic concept of market environment is also known as the Porter's five forces (Porter, 1989).
  - Remote external environment: organizations also experience influence from forces outside of the market. This includes political, social, technological, legal, and environmental aspects. All companies in an industry endure impact from these factors, but potentially in different degrees.
- **Internal environment:** this analysis entails a detailed look into the organization's attributes, and their strengths and weaknesses.

The understanding of an organization's environments creates insights into how internal attributes should be aligned, mobilized, and utilized towards the organization's objectives. In the follow-up step of the environmental analysis, organizations should decide what their objectives should be based on the external opportunities and threats, while considering their internal strengths and weaknesses (Mintzberg et al., 2003). These decisions are often corporate strategy or business strategy based. Corporate strategy involves the organization's objectives from a portfolio perspective, while business strategy focuses on how to compete in a certain business (Chaffee, 1985). Hajli et al. (2017) state that the objectives formulated and implemented, should contain five attributes to be a business strategy:

- The objective should be measurable
- The objective should be clear
- The resources involved need to be identified
- There should be clear assignment of responsibility
- The performance can be checked

The strategy of a company defines the efficiency by which the organization achieves its objectives. Fuertes et al. (2020) described that business success demands a continuous adaptation of the organization to its environment, and therefore depends heavily on the business strategy adopted by the firm.

## 3.2. Managerial frameworks on business strategy

Researchers and practicing managers have developed several models and frameworks over the years to assist in strategic decision making in market environments of varying complexity and competitive dynamics (Ghemawat, 2002). During the 1980s and 1990s, the field of strategic management mostly focused on understanding how a firm could obtain a competitive advantage. During this time, two different approaches to analyzing an industry were taken:

1. The **outside-in approach** focuses on the external market environment of firms. The theories following this approach state that understanding the external market aspects can result in the identification of opportunities and threats, which in turn can help in the competitive positioning of the firm. One of the most dominant theories in this external analysis approach are the competitive forces theories. The competitive forces approach (Porter, 1989) focuses on how firms can take action to earn economic rents through creating privileged market or industry positions against competitive forces.
2. The **inside-out approach** focuses on the internal market environment of firms. The theories following this approach state that firms should look inside to their strengths and weaknesses and base their strategies on their strong attributes. One of the most dominant theories in this internal analysis view are the resource-based theories (RBT). The resource-based perspective (Barney, 1991; Penrose, 1959; Wernerfelt, 1984) focuses on how firms can create competitive advantage by capturing the economic rents from internal resource efficiency.

In the next subsections, these two principals are further examined. First, the external analysis approach is introduced through the Structure-Conduct-Performance diagram and its influence on the competitive forces approach. After, the internal analysis approach is explored through its main trend, the Resource-Based Theories (RBT) and the three main disciplines within this perspective on strategic management. Lastly, a third theory and approach in economic management is introduced. This theory, economics of regulation theory is also considered because of the large role of regulation and policy that was determined from Chapter 2.

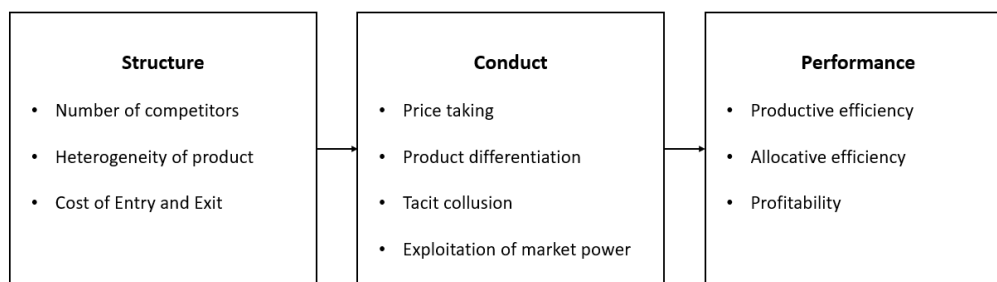
### 3.2.1. External analysis approach to strategy formulation

The goal of the external market environment analysis is to map the different aspects in the industry. It provides insights into the attractiveness of the market in which the organization is active, and identifies the opportunities and threats from the industry. The different aspects of an industry is often divided into three parts: the macro-environment factors, the general market factors, and the competition in the market. Since Chapter 1 and 2 were mostly used to identify the macro-environment factors and general market factors, this section is dedicated to the competition analysis part of the industry analysis. One popular approach is the Structure-Conduct-Performance (SCP) paradigm

The SCP paradigm was first introduced in 1933, and developed into a model by Bain (1951). It extends the theory of firm with realistic complexity to the previous view of a perfect competition model in industrial organization economics (Lelissa & Kuhil, 2018). The SCP model offers causal explanation from theory for an organization's performance by examining three major components of an organization: structure, conduct, and performance:

- **Structure:** includes the construction, formation, and the main setup of the organization, including the external environment in which both the organization and market operate. This market structure could be measured by factors like the competitors, heterogeneity of the product, and cost of entry and exit.
- **Conduct:** refers to the behavior and interactions of buyers and sellers in the structure of the market. This includes factors such as price taking, product differentiation, tacit collusion, and exploitation of market power.
- **Performance:** describes the achievements of results of the market or industry. Variables that are considered in this component, are product quantity and quality, productive and allocative efficiency, and profitability.

The structure-conduct-performance paradigm assumes that the observable characteristics of the market structure determines the behavior of the organizations in that particular market. In turn, the behavior of firms affects measurable market performance (Bain, 1951). This relation between the three



**Figure 3.1:** The relationship between economic or market structure, market conduct and its performance adopted from Tan (2016)

major components of an organization is also visualized in Figure 3.1. The outside-in model proposes a line of causality that start from structure, and runs through conduct to performance. The stable relation is assumed to be a one-way relationship between the three components. Furthermore, the SCP paradigm assumes that the market structure that is observed by multiple (similar sized) firms operating in said market, is a structure equal to a competitive market generating greater performance (Lelissa & Kuhil, 2018). Because it is also assumed that markets with a higher degree of concentration of firms' output are more likely to produce effective tacit collusion. In other words, the market concentrations affects the cost of collusion between firms. When the market concentration is high, the cost of collusion decreases and this in turn lowers the profit for all market participants (Bain, 1951). Lastly, the SCP model assumes that the market adheres to an equilibrium state and to the existence of perfect information. The model is based on assumptions that demand is known, constant, and that the effect on demand by competition is a stable state.

Over the years, the model has been updated by scholars who argue that firms can influence entry into the industry by carefully considering their strategies. One scholar that revisited the structure-conduct-performance paradigm was Neuberger (1997). In that study, he discusses the influence of government policy on all three components of the SCP paradigm. According to the SCP model, when the degree of concentration is low in the market, the abuse of market power can lead to restriction of the output and, in turn, to an increase of prices above equilibrium level (Lipczynski & Wilson, 2005). This effect from low market competition is likely to have negative implication for consumer welfare. However, this cascade of effects is less observed in economics than the occurrence of market or industries with a low degree of concentration. Therefore, Neuberger (1997) suggests the fourth component regulation and policy, which intervenes and promotes competition, thus preventing market power abuse.

Another external market analysis approach building from the SCP paradigm is the Porter's Five Forces framework. The development of the framework by Porter (1989) has reshaped the thinking of scholars and managers on the approach to competitive strategy (Dobbs, 2014). In this framework, the structure and conduct of the market are derived from five components that determine the competitive intensity of a market and, in turn, the appeal (or lack thereof) of an market based on its profitability. A market that posses a lack of appeal, is a market where the five component of the market effect each other negatively, and the overall profitability is reduced. In other words, the framework analyzes the collective strength of the forces and determines the profit potential in the industry (Porter, 1989). This competitive forces approach focuses on how firms can take action to earn economic rents through creating privileged market or industry positions against the competitive forces. This allows organization to not only obtain an overview of the industry at a particular point in time, but also an overview of the dynamics of the industry and potential developments in the future.

The Porter's Five Forces framework focuses on a better understanding through observation of the market, and identifying the industry's strengths and weaknesses. Through this, a competitive strategy can be formulated based on the insights obtained from opportunities and threats in an organization's external environment. The framework mainly highlights how profit is divided between the five forces of a specific industry. The five forces within an industry, as identified by Porter (1989) are (also visualized in Figure 3.2:

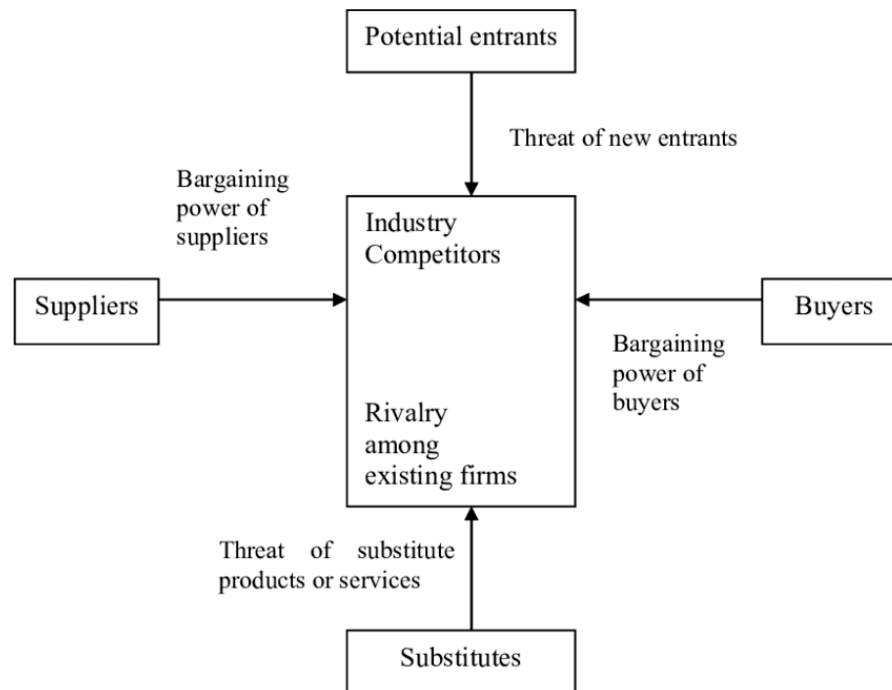


Figure 3.2: Schematic diagram of Porter's five forces as adopted from Vrontis and Thrassou (2006)

- **Rivalry among existing firms:** the degree of concentration, or in other words the intensity of competition, influences the degree of profitability, and in turn introduce measures such as price discounting, product development, advertising campaigns or service improvements.
- **Threat of new entrants:** new entrants have the potential to disrupt the established market environment, and directly affect the competitive advantages of players within the market. However, entry is dependent on the number of players in the market and entry barriers. As Porter (1989) states: " new entrants to an industry bring new capacity, and the desire to gain market share that puts pressure on prices, costs and the rate of investment necessary to compete". This can results in shift in demand equilibrium. If not, the additional supply by the new entrant will decrease profit margins of existing market participants.
- **Bargaining power of suppliers:** suppliers can threaten organizations with increasing prices of products and services that are crucial to the organizations' operating model. Most powerful suppliers do not rely on one industry for its' revenue. Most serve a number of industries and are most likely to maximize their performance in each of these industries.
- **Bargaining power of buyers:** with multiple market players, buyers have greater bargaining power, since they are able to switch comfortably to alternative suppliers. When buyers are powerful, sellers may be forced to accept the imbalance of power and the reduction in profitability.
- **Threat of substitute products and/or services:** substitute products or services need to be considered, since they reduce demand of the products or services of the organizations. From an industry's perspective, it is desired to have a low threat of substitutes, while for the consumers, or buyers, the opposite is desired.

The Porter's Five Forces framework is considered one of the most well-known strategic models for competition analysis, because of its origin from industrial organization economics and the shift in observing the market structure (Bruil & Gerard, 2018). However, over the years, many scholar have also discussed the pitfalls of the framework and its usefulness in modern industries. The main weakness of the framework discussed by scholars, is the composition of the framework. The model, like the structure-conduct-performance paradigm, is static and provides a snapshot overview of the industry at a particular point in time. Therefore, its application is mostly useful for formulation of short-term objectives and strategies (Beattie, 2022). Furthermore, the window of useful application in strategy formulation, is narrowing due to rapidly changing market trends. These include trends like globalization

and rapid technological advances, that were not seen at current levels when Porter devised his competitive forces approach. Globalization has resulted in less clear industry boundaries, which impacts the assumption that there exist perfect information in defining the five forces. Another major drawback of the framework stems from the often wrongful application of the framework (Beattie, 2022). The most common mistake is the application of the framework to a specific company and not the industry as a whole. The Five Forces framework is meant to determine the attractiveness of taking a certain position within the market. Additionally, the information obtained from application of the framework is easily compromised by honest mistakes (Beattie, 2022), like failing to consider all alternatives or not paying equal attention to all five forces. When examining industries that have witnessed a large shift in their Porter's Five Forces analysis, it is mostly due to external factors (such as deregulation or changing cost of transaction that suddenly allow new entrants) not explicitly returned by the analysis. Therefore, other strategic models have been proposed by scholars and practitioners that may be comparable to the competitive forces approach, but are more useful as a sole tool to formulate a business strategy.

### 3.2.2. Internal analysis approach to strategy formulation

An overview of the external market is needed to understand opportunities and threats in the market. However, an internal analysis is just as important to understand which opportunities and threats are applicable to the firm with its current attributes. A dominant internal analysis trend in the field of strategic management is the resource-based perspective. These theories emphasize the inside-out approach, and state that building competitive advantage starts from fundamental efficiency advantages of the internal environment of the organization, instead of the outside-in approach of the competitive forces approach. The basis of the RBT originates from the theoretical perspective introduced by Penrose (1959), that stated that it was the firm's resources that limit the potential growth of a firm instead of external market factors. The RBT challenge the competitive forces approaches' assumptions of homogeneity and mobility of strategic resources (Barney, 1991). Since the RBT link the organization's internal characteristics with its performance, it builds on two alternative assumptions:

1. Firms within an industry may be heterogeneous in terms of the strategic resources they control.
2. The strategic resources of a firm may not be perfectly mobile across firms, and therefore, the heterogeneity of resources may be persistent.

Under these assumptions, resource-based theories put emphasis on understanding how some firms in certain industries are able to consistently outperform others in the same industry. All RBT share these assumptions and focus on explaining differences across firms in terms of firm performance and sustained competitive advantage (Barney, 2001). However, there are also some differences within different among these theories, for example how they define performance. The study by Acedo and Barroso (2006) was dedicated to exploring the dissemination of the RBT and to identifying the main trends within these theories. Through an extensive literature review, the study shows the presence of three main trends within the RBT: the resource-based view (RBV), the knowledge-based view (KBV), and relational view (RV). Other theories are either extensions of these three main trends, or appear as a link between them. In the following part, the three main trends of RBT are examined in more detail.

#### Resource-Based View

The resource-based view emphasizes the existence of difference in firm resource endowment, that is persistent over time due to resources and capabilities being heterogeneous and imperfectly mobile. In other words, firms are able to adopt different strategies because of difference in resource mixes and their capabilities to exploit these resources in their operational model. The RBV is formulated due to efforts of many scholars. However, Barney (1991) is generally acknowledged as the first to formulate the resource-based perspective into an applicable theoretical framework. In his work, Barney (1991) states that not all resources of a firm possess the potential to become a source of sustained competitive advantage. This potential is attributed to four criteria the resource must adhere to:

- **Valuable:** Resources are considered valuable when they exploit opportunities and/or neutralizes threats in the firm's external environment. This characteristic of sources of competitive advantage point to the relationship between the competitive forces approach and the resource-based view.
- **Rare:** Valuable resources can only become sources of sustained competitive advantage when it is rare. When a particular resource is possessed by several firms in the industry, it increases

the possibility that multiple firms are able to exploit the resource in a similar way and thereby implement a similar strategy that results in no competitive advantage for any of them. Therefore, a firm can only enjoy a value-creating strategy not simultaneously adopted by others when the resource is rare. Barney (1991) debated on how rare a valuable resource needs to be to potentially generate a competitive advantage. The study by Newbert (2008) showed that the more valuable and rare a firm's resource or capability, the more likely it is to attain a competitive advantage.

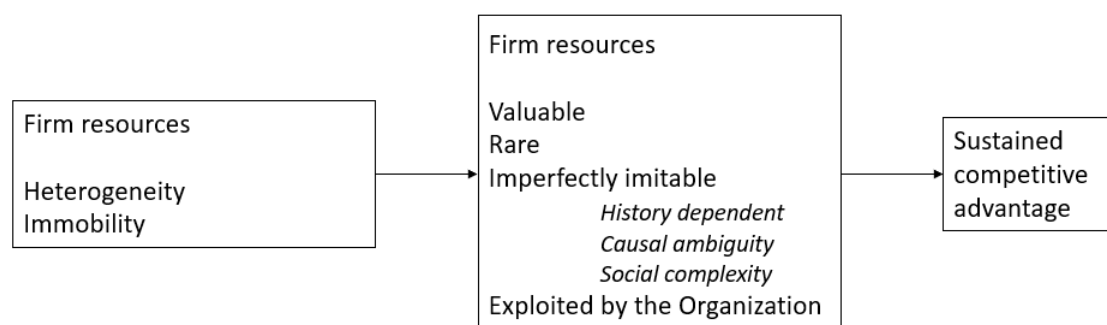
- **Imperfectly imitable:** Valuable and rare resources can only become sources of sustained competitive advantage when firms that do not possess them, are also not able to obtain them easily. In other words, the resource must be imperfectly imitable. Barney (1991) present three reasons why resources could be costly to imitate:
  - Unique historical conditions: A firm is able to obtain a resource due to a particular moment in space and time. When this unique historical condition passes, firms cannot obtain the same space- and time-dependent resources, making the resource imperfectly imitable
  - Causally ambiguous: Resources could be imperfectly imitable, because the link between the resources and the sustained competitive advantage is not understood. This is due to resources often being complex, interdependent, and implicit (Winter & Nelson, 1982).
  - Socially complexity: When resources are based on complex social phenomena, firms without these resources are not always able to create them, even though it is understood how these socially complex resources add value to the firm. These resources are often associated with relationship in- and outside of the firm, such as interpersonal relations between employees, culture and a firm's reputation.
- **Non-substitutable:** Resources should not only be valuable, rare and imperfectly imitable, but also should not be replaceable with a strategically equivalent resource. Using these resources, other firms are able to adopt the same strategies, neutralizing the competitive advantage. Barney (1991) identified two forms of substitutable resources, similar resources and different resources, but in both cases they are able to achieve the same implications on the firm's strategies.

When firm attributes adhere to being valuable, rare, imperfectly imitable and non-substitutable (also called VRIN resources), competitive advantage and the corresponding improvement in performance can be enjoyed. However, Mahoney and Pandian (1992) argue that organizations are able to outperform competitors, not because they possess more valuable and rare resources, but because their competences and capabilities allow them to make better use of these resources. This led to the additional theoretical approach within the RBV, the VRIO framework (Barney, 1997). In addition to possessing valuable, rare, inimitable (including non-substitutable) resources, the organizational structure of a firm should support the exploitation of the full potential of those resources. Only through full exploitation of VRIN resources by the organization, a competitive advantage can be attained. To combine this with the two assumptions of a firm's resources heterogeneity and immobility, scholars using the RBV have formulated three hypotheses (Newbert, 2008):

- If an organization possesses resources and capabilities that are valuable and rare, and is able to exploit these resources, it will obtain a competitive advantage.
- When the resources and capabilities are also both costly to imitate and non-substitutable, the firm can sustain this advantage for an extended period of time.
- Gaining the sustained competitive advantage from these resources and capabilities will enable the firm to improve both its short-term and long-term performance

The relationship between the heterogeneity and immobility of firm resources, that are not only valuable and rare, but also costly to imitate and non-substitutable, and sustained competitive advantage when properly exploited by the firm, is shown in Figure 3.3.





**Figure 3.3:** Resource-Based View Framework by Barney (1991)

The RBV framework has defined resources broadly. According to the RBV, resources include firm attributes, assets, organizational processes, information, and knowledge controlled by the firm, which could be used to conceive and implement a strategy (Madhani, 2009). Because of this broad definition, it is necessary to distinguish between the wide spectrum of resources and capabilities, to obtain a better understanding. Therefore, scholars have formulated multiple methods to classify and categorize different resources. Barney (1991) originally categorized three types of resources: physical capital, human capital, and organizational capital. However, Brumagim (1994) proposes a hierarchy classification based on different levels of corporate. Other researchers classify the resources as tangible and intangible (R. Hall, 2009; Itami & Roehl, 1991). Tangible resources include financial, physical, technological, and organizational capital, while intangible resources include human, innovation, social, and reputational capital (Madhani, 2009).

Like the Porter's Five Forces framework, the Resource-Based View framework has become one of the most substantial theories in strategic management research. However, critics still debate on the limitations of the RBV. One of the main limitations are the definitional concerns raised. Critics point out the lack of commonality of terms used in RBV research (Foss, 1998; Priem & Butler, 2001a; Wade & Hulland, 2004). The different terminology make it hard to compare the results of various studies, and could limit the framework's usefulness in strategic decision making (Nanda, 1996). The crucial term resources have multiple varying definitions by different RBV scholars: Wernerfelt (1984) defines resources as anything that can be a strength or weakness of a firm. Amit and Schoemaker (1993) describes them as firm attributes that are controlled by the firm. Grant (1991) interprets resources as inputs to the production process. While Barney (1991) uses the term as a bundle of assets, firm attributes, organizational processes, capabilities, information and knowledge. On the other hand, another scholar indicated that the explanatory power of resources decrease drastically because everything in the firm can be seen as a resource (Conner, 1991). Another main concern of the RBV is the tautological nature of the assumptions (Priem & Butler, 2001b). the circular reasoning due to this nature, is said to lack clarity about core concepts and impede the development of the theory (Madhani, 2009). The last major concern area of the RBV are the methodological issues. The vast number of studies performed on resources and firm performances vary substantially in methodology used and the way the RBV research is designed. An analysis by Rouse and Daellenbach (1999) discusses the quantitative research using RBV generating a strong bias in the research design. It is suggested that the complexity of the nature of advantageous resources can only be understood through qualitative methodology.

#### Knowledge-Based View

The second main trend within the Resource-Based Theories, is the Knowledge-Based View. Even though this branch within RBT is often seen as an extension of the Resource-Based View, the main concept of the KBV was already observed in 1972, when a study discussed that the improvement in performance did not result from better resources, but in knowing how to utilize these resources (Alchian & Demsetz, 1972). Although the RBV acknowledges the importance within a firm and the role it play in achieving a competitive advantage, proponents of the KBV argue that the RBV mainly treats knowledge as a generic resource, rather than having special properties, and because of this, does not distinguishes between different types of knowledge-based capabilities. The Knowledge-Based View

considers knowledge as the most significant resource of a firm when determining the strategy. The theory assumes that firms are structures that generate, integrate and distribute knowledge. In turn, competitive advantage is governed by the firm's ability to develop new knowledge-based attributes that generate core competencies (Pemberton & Stonehouse, 2000).

Within the KBV, two main sub-groups can be identified (Acedo & Barroso, 2006):

- **Collective knowledge:** From the collective perspective, knowledge is seen as a social phenomena. In this approach, the collective knowledge is seen as more than the aggregation of all individuals of the organization (Nahapiet & Ghoshal, 1998). The firm is seen as a community that is specialized in the speed and transfer of knowledge, and the collective knowledge a firm possesses is assumed as the most important strategic resource.
- **Individual knowledge:** The study by Grant (1996) introduced the individual-oriented perspective. It places the individual as the primary source of knowledge creation. Therefore, they suggest that understanding new value creation and organizational application of knowledge should be approached from an individual level. This theory indicates that the firm learns through two methods: by individual learning of its members, or by employing new members who possess knowledge that the firm did not possess yet.

In other words, while the collective knowledge perspective analyzes the dual role of firms in knowledge creating and application, the individual knowledge perspective puts emphasis on the firm as an institution for knowledge application systems to support the integration of individual's specialized knowledge.

Knowledge is not an attribute of the firm that is directly observable or measurable. Therefore, the resource knowledge becomes a conceptual factor whose existence and characteristics can only be inferred through the capabilities of the firm that are established in observable actions (Stehr, 1992). This differentiates knowledge from other firm resources in the KBV, since other firm resources can be identified without observable actions. Since different actions are attributed to different capabilities, a group of actions indicate the existence of specific knowledge that is needed to perform these capabilities (Theriou et al., 2009). The KBV recognizes two forms of knowledge: tacit and explicit knowledge. Tacit knowledge is implicit in nature and is generated in the subconscious of individuals, making it hard to articulate and disseminate throughout the organization. In contrast, explicit knowledge can be articulated and, therefore, be documented, formalized and shared. Most organizational knowledge starts as tacit knowledge, and since this form of knowledge is most inimitable and immobile, the Knowledge-Based View states that tacit knowledge is the primary strategic resource of the firm (Kaplan et al., 2001).

Opponents of the KBV point out that people and their corresponding knowledge are restricted by two-sided bounded rationality (Nickerson & Zenger, 2004). On one hand, people are limited in their ability to receive, store, and process information without committing errors. On the other hand, individuals cannot overcome the language limits that is inseparable to human nature. The language barrier results in the inability to articulate their knowledge and experiences. Other scholars indicate that knowledge and the individual's ability to learn are impacted by their sense of self as well as their organizational context (Eisenhardt & Santos, 2002). Another limitation to the KBV often mentioned by critics is the unclear boundaries of the firm when knowledge is perceived as the primary strategic resource. The boundaries of the firm are defined by the assets over which the firm has residual control rights. Since it is not always clear how human capital, and especially knowledge, is bought, sold, and controlled, the boundaries of the firm become obscured in the knowledge-based perspective of the firm (Moore, 1992). Also, scholars argue that knowledge cannot truly be a firm's most strategic resource without considering whether the knowledge is actually utilized or just present within the individuals of the firm. They propose that the current highly dynamic environment of most industries, point to the organization's ability to manage change as an even more important resource than knowledge.

#### Relational View

The third main trend within the Resource-Based Theories is the Relational View. This branch was first proposed in the study by Dyer and Singh (1998). It builds on the Resource-Based View and its emphasis on resources and capabilities that are controlled by the single firm, as sources of competitive advantage.

However, the researchers point out that the RBV overlooks important factors that advantages and disadvantages of a single firm are often linked to the advantages or disadvantages of the network of relationships of which the firm is a part of. Therefore, as an extension of the RBV, it was suggested that a firm's critical resources could potentially span firm boundaries, and routines and processes stemming from interfirm network relationships are important sources of competitive advantage (Dyer & Singh, 1998). In the same study, they define relational rents as profits enjoyed from an exchange relationship that cannot be enjoyed by either firm separately, but only through the joint contribution of the specific partnership. Four sources of relational rents, each with their unique ability to generate value, are proposed:

- **Interfirm relational specific assets:** A firm can differentiate itself by creating assets through specialized utilization of the assets from the alliance relationship. The development and application of such assets can create a complex interfirm structure that is costly to imitate by competitors. These relation-specific investments can result in a lower total value chain cost, greater product differentiation, and faster product development cycles. In other words, these investments have the potential to increase the relational rents. Another advantage from the investment into relational specific assets is the creation of a high entry barrier in the market, as new entrants that do not have the network and corresponding relational assets yet, need high investments to compete effectively.
- **Interfirm knowledge sharing routines:** The interfirm learning resulting from knowledge sharing routines between alliances can support performance-enhancing technology and innovation within the firm. Trading of knowledge in an open market fashion is difficult because of difficulties in measuring and valuing knowledge cross-organization without a certain degree of familiarity and empathy supporting the trade. Firms that are capable of recognizing, transferring, and assimilating valuable knowledge from their networks, can exploit this knowledge to their advantage. This advantage could be a sustained competitive advantage because of the incapability of competitors to imitate the knowledge sharing routines.
- **Complementary resource endowments:** Another method for firm to increase the relational rents from strategic alliances is through combining complementary resources and capabilities. Firms are able to obtain certain resources, competencies or capabilities from partnerships that cannot be found through other methods. Partnerships with different but complementary firms can provide opportunities in synergy and value creation. When taking a resource-based perspective, combining the complementary resources with the firm's internal resources, a group of resources is created that is not only highly unique but also difficult to imitate (Harrison et al., 2001).
- **Effective governance:** Relational rents can also be generated through enhanced efficiency due to an effective governance structure. The process of writing, monitoring, and enforcing contracts can result in an efficient collaboration and, thereby, minimize transaction costs of the partnership (Barney & Hansen, 1994). These governance structures are often costly to imitate because of the social complexity of the resource and the idiosyncratic nature of the relationship. However, the relational rent from this type of source is highly dependent on the trust between alliances, and that opportunistic behavior will not lead to abuse of that trust.

Like other theories, the Relation View also contains a number of assumptions in its key concepts. Similar to the Knowledge-Based View, the Relational View assumes that the learning effects is a given. In the RV, it is assumed that individuals are eager to learn from the alliances formed by the firm, and that they develop competences and increase their capabilities. However, in practice, this may not hold true, since individuals behave differently regarding their interest to learn and grow. In these cases, the learning effects are not optimally utilized, and the alliance will experience difficult knowledge-sharing routines. Another assumption of the RV is that relationships are indefinite, as they are not subject to time. In a study by Dollinger and Li (2010), the change in assumptions of the RV was explored in case of mega-events, like the Olympics, the FIFA World Cup, etc. They showed that, in reality, firms are more inclined to form relationships for fixed amount of time, and renegotiate the conditions of this relationship when this period expires. Especially firms that have bad experiences with partnerships are less likely to engage in long-term relationships. As mentioned previously, the relational rents from the alliance are best enjoyed over an extended period of time as a certain degree of trust and transparency are needed. When firms are reluctant to commit to long-term alliance, the potential benefits of the RV

might be mitigated. Another potential shortcoming of the RV is the assumption that the relationships formed are voluntary and under shared authority, power, and non-governmental conditions (Dollinger & Li, 2010). In other words, the RV assumes that alliance partners have equal power in the control and sharing of resources, which is not dominantly influenced by a central authority. However, in reality, this voluntary governance structure is not always witnessed in relationships. Lastly, the RV mainly describes private, profit-seeking firms, that are aware of the potential to create relational rents, and therefore engage in alliance seeking activities (Dollinger & Li, 2010). However, non-profit organizations or non-governmental organizations are more interested in relational values that contribute to opportunities for the quality of human life. The RV might be less useful when examining these types of organizations.

### 3.2.3. Economics of regulation theory

As seen in Chapter 2, the Dutch environmental testing market is largely influenced by regulation and policy. Since it was expected that the competitive forces approach and the resource-based perspectives might not highlight the influences of institution sufficiently, the regulatory theories were also considered for this study. This section is dedicated to introduction of economics of regulation theory. These theories derive from governmental intervention to counter the potential conflict between public service and commercial operation, and the interests of those directly involved as users or indirectly through transactions (Den Hertog et al., 2010). It is assumed that the actors, or companies, are inherently self-regarding and desire to maximize their own interest. Other assumptions are that all parties are as well informed as possible, learn from experience and that regulation is costless.

The regulation, the form of control the government exerts, can have several elements like public statutes and standards, registration or licensing processes, inspection processes or setting of price controls (Stigler, 2021). The setting of price controls, for example in price-cap regulation or rate-of-return regulation, are more applied in markets that behave as natural monopolies. This is not the case in the Dutch environmental testing market (as seen from the market overview in Chapter 2, and no price-controls are witnessed). Public statutes and standards can be seen in the standardization of the analysis methods in policies. The accreditation system, that ensures analysis quality and reliability, is a form of registration or licensing process, since companies that desire to offer the testing service, are required to be accredited. The minimal contamination parameters and reporting methods are elements of inspection process regulation.

Within academic research into economics of regulation theories, two main branches are identified: positive theories of regulation and normative theories of regulation (Den Hertog et al., 2010). In the former theories, the focus is to explain why regulations occur and provide an effect-analysis of regulation. On the other hand, normative theories of regulation assume that efficient regulation is desirable and investigate which type of regulation is the most efficient or optimal. In other words, positive theories of regulation focus on existing regulation, while normative theories mostly conclude what should exist. Therefore, it was chosen to use positive theories of regulation to examine the Dutch environmental testing market.

Positive theories of regulation include theories of market power, interest group theories and theories of government opportunism (Jamison & Berg, 2008). These theories argue that regulations occur because of four reasons (Stigler, 2021). First, the government desires to eliminate the information asymmetries with the companies and align the companies' interests with their own interests. Secondly, customers seek protection from market power in cases where competition is ineffective or non-existing. Regulation can eliminate the impact of the natural monopoly on the customers. The third reason why regulation occurs, is driven from the companies' preference of a high entry barrier to protection them from potential rivals. And lastly, companies desire protection from government opportunism, and as such, restrict government discretion to provide efficient services to customers (Armstrong & Green, 2013).

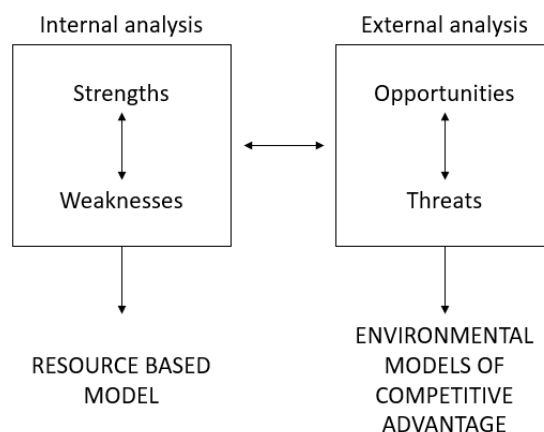
One of the criticisms of regulation theories states that all governmental regulation theories eventually lead to a net loss in social welfare. Some argue that companies possess an intrinsic motivation to behave socially responsible. This would eliminate the need for external regulation because of their commitment to the different stakeholders, their objectives for long term growth and their interest to maintain reputability. Therefore, the governmental role in this economic market can be reduced. However,

in the Dutch environmental market, we witness a commercial drive as seen in the loss leader pricing strategy adopted in the past. Clients do not always show duty of care but have the tendency to consider the testing service as a necessity for their own core business. This partial lack of incentive to behave socially responsible indicate that the market is not ready to become self-regulated. The governmental role in the Dutch environmental testing market will remain an important factor for the up-coming period.

### 3.3. Conceptual framework

Markets and industries are made up of multiple different aspects. The different theories and frameworks presented in the previous section are used to describe the different aspects involved; the competitive forces approach focuses on an industry's macro-environment, the research-based perspectives highlight the micro-environment of firms, while regulation theories emphasize the specific aspect of governmental influence in both micro- and macro-environment. It is recognized that choosing one theoretical perspective is not sufficient to observe the Dutch environmental testing market and to study the corresponding firms' competitive advantages and business strategies. Therefore, in this section, elements from the three theoretical perspectives are combined into a conceptual framework for this study.

The external analysis competitive forces approach is mainly dominated by the Porter's Five Forces framework, and focuses on the actions firms can take to create economic rents by generating market privilege and identifying industry positioning. The internal analysis perspectives of Resource-Based Theories, made up of dissemination of the three main trends (RBV, KBV, and RV), focus on how firms can utilize their internal resource efficiency to create competitive advantage. In other words, the competitive forces approach is an outside-in approach where an external analysis of the different environmental factors explores the opportunities and threats within an industry. While the RBT are inside-out approaches in which an internal analysis of the firm's controlled resources and capabilities identifies the strengths and weaknesses of said firm. For the conceptual framework, the combined efforts of the external market analysis and the internal firm analysis, are proposed as the integral inputs for the strategic analysis. Understanding the external environment can help in identifying competitive positions that are potentially opportunistic for the testing companies. However, recognizing that different firms have access to different resources and capabilities, firms also differ in which competitive position they can occupy. This relationship between the internal and external analysis theories is visualized in Figure 3.4.



**Figure 3.4:** The relationship between traditional "strengths-weaknesses-opportunities-threats" analysis, the resource based model, and models of industry attractiveness adopted from Barney (1991)

From literature it is known that the competitive forces approach and the RBV framework do not highlight the governmental influence on regulation of an industry sufficiently. Therefore, the conceptual framework includes the observation of the external and internal analysis insights through the lens of regulatory theories. The different aspects of the conceptual framework are elaborated next.

### 3.3.1. Different perspectives of market analysis

#### Perspective 1: External analysis

The Porter's Five Forces framework is mostly useful in estimating the competition in the industry through the five forces defined: rivalry of existing industry competitors, potential entrants, buyers, suppliers and the threat of substitutes. The framework highlights the entities among the forces buyers, suppliers and competitors, that hold the most power within the industry. Through the insight obtained from these five forces, a firm can determine the most valuable market position and also identify the corporate risks associated. However, the importance of regulation and policy are not explicitly highlighted in this framework. For the external analysis it is important to take regulation and policy as a force into account as seen from its role in the market (section 2.2). Therefore, a different competitive forces approach is proposed with other analysis units than Porter's Five Forces framework.

The external analysis is performed through examination of external business drivers. The main drivers identified were: market, competition, customer needs, technology and regulation. Similar to Porter's approach, the external business drivers market, customer needs and technology identify the bargaining power of suppliers, the bargaining power of buyers, and threats of new entrants and substitutes. While the external business driver competition is used for the description of rivalry among existing firms. The additional external business driver regulation is dedicated to highlight the governmental role in the Dutch environmental testing market. Using these five external business drivers as units of analysis, opportunities and threats from these five market forces are determined.

#### Perspective 2: Internal analysis

After identification of the different external business drivers, it is imperative that an internal analysis is performed for the strategic analysis. As mentioned before, the Resource-Based Theories are inside-out approaches that identify the strengths and weaknesses of a firm. The firm can use this information to play into their strengths and improve and reduce the effects of their weaknesses. The dissemination within the theories were categorized into three main trends: the Resource-Based View, the Knowledge-Based View, and the Relational View. Both KBV and RV are extension of the RBV. Supporters of the KBV argue that the RBV does not highlight the importance of knowledge as a primary source of competitive advantage, while supporters of the RV state that the firm boundaries of the RBV does not take into account economic rents from relationships across alliances. However using the KBV or the RV assumes the importance of these two types of firm attributes, while maybe overseeing other valuable resources that can be found in Dutch environmental testing companies. Therefore, for the internal analysis, the Resource-Based View framework is used.

The unit of analysis of the RBV are the resources and capabilities of the firm. However, the theory recognizes that not all resources or capabilities can be used in the business strategy to obtain an advantageous competitive position. These strategic resources can be sources of competitive advantage when they adhere to most or all aspects of the VRIO criteria as elaborated in section 3.2.2. When a resource is both valuable, rare and inimitable, and is also being exploited by the organization, the competitive advantage obtained through it, can be sustained over an extended period of time. For the strategic analysis, the identification of resources of potential sustained competitive advantage is important, but also identification of sources of unexploited competitive advantage, temporary competitive advantage, and source of competitive disadvantage can be used by the company in the decision to grow, defend, improve or withdraw from certain businesses.

The main limitation of the RBT, the literal comparison power because of definition of concepts, can be minimized by clearing defining the concepts of this study. In the case of the term resources, the definition by Barney (1991) is adopted (see section 3.2.2). The concept sustained competitive advantage is defined as a competitive advantage that lasts a minimal of 5 years.

The RBV has been tested empirically in many academic studies over the years since its development. A study by Newbert (2007) was dedicated to assessing the level of empirical support of RBV in literature. It was found that although the RBV has received tremendous attention in empirical literature, it has only received marginal support. Of the 55 empirical studies using RBV assessed, 53% was found to support the RBV. While this seems low, the level of support is similar to the levels supporting other theories in strategic management (Newbert, 2007). An example is a study into the empirical support of the Transaction Cost Economics theory, where support of 47% was found in the studies assessed (David & Han, 2004). This shows that despite this relatively low support of the RBV, it is as suited for application in strategic management as the other theories.

#### Perspective 3: Regulatory theories

The market overview in Chapter 2 showed that the Dutch environmental testing market is largely influenced by regulation and policy from both demand and supply side. In other words, regulation effects both the opportunities and threats in the external market environment, as well as the strengths and weaknesses obtained from the internal analysis. Using the regulatory theory perspective, it is possible to create focus within the multiple opportunities and threats in the market, through understanding why and when regulation and policy occur in the Dutch environmental testing market. The use of regulatory theories can be extended into the internal aspects of environmental testing companies, and show how firms can use the governmental reasoning of regulation to their advantage according to their strengths and weaknesses.

### 3.3.2. Combining the different perspectives

After obtaining insights on the Dutch environmental testing market through different theoretical perspectives, the conceptual framework integrates the different theories to derive the most suited business strategy. The strengths and weaknesses obtained from the internal analysis, and the opportunities and threats derived from the external analysis, make up the SWOT (strengths, weaknesses, opportunities, threats)-analysis tool. This overview can be used in a confrontation matrix. This matrix identifies the positive and negative key issues. It visualizes how the organization can utilize its strengths to capitalize on certain opportunities or mitigate certain threats, or which weaknesses are in the way of this.

It is expected that from the external and internal analysis, multiple different strengths, weaknesses, opportunities, and threats are identified. For the confrontation matrix, the four most important elements are taken from each of the four factors of the SWOT-analysis. The next four questions are asked to distinguish between the different elements for the strategic analysis:

- Are the **Strengths** used to respond to the **Opportunities**?
- Are the **Strengths** used to ward off the **Threats**?
- Are the **Weaknesses** being improved to respond to the **Opportunities**?
- Are the **Weaknesses** being improved to resist the **Threats**?

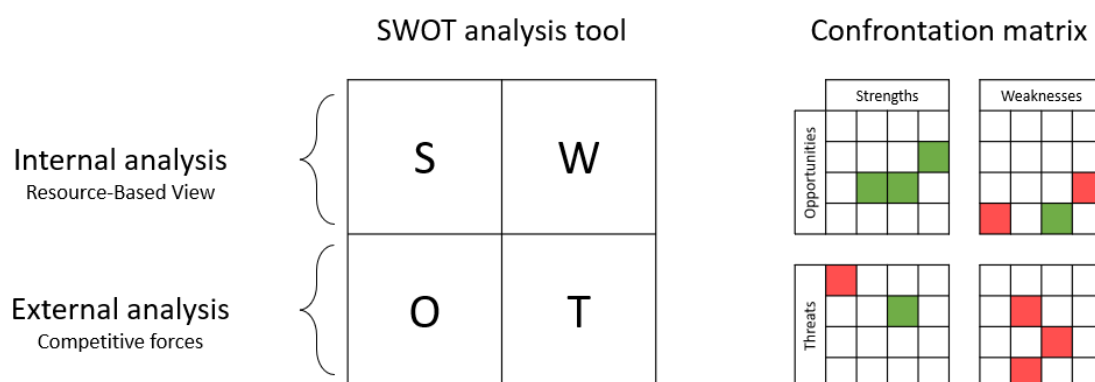
The answers to these questions can be approached systematically through simplified symbols. These symbols are shown in Table 3.1. The symbols also contain a score. Using this score, the total impact score of a strength, weakness, opportunity, or threat can be determined. This score helps in identifying the most suited strategy.

With the insights obtained from the confrontation matrix, the strategic analysis can be performed. The confrontation between the strengths, weaknesses, opportunities, and threats of the firm, especially when that confrontation is clearly positive or negative, point to key issues of the company. A visualization of the three theoretical perspectives combining in the SWOT analysis tool and the confrontation matrix that can be derived from it, is shown in Figure 3.5. The confrontation between a strength and an opportunities, presents a growth strategy for the firm. On the other hand, when a correlation exists between a strength and a threat, it points to the need of a defense strategy. When an opportunity correlates with a weakness, a company should invest in the improvement of said weakness, to be able to exploit the opportunity. Lastly, when a threat confronts a company's weakness, the company should adopt a withdrawal strategy of that particular resource or activity. To extract the key issues of the strategic analysis clearly, it is important to select the most important elements from the SWOT analysis for the confrontation matrix. For this study, the number of elements per SWOT category is set at four.

**Table 3.1:** Symbols of the confrontation matrix

Response	Confrontation correlation	
Positive	++	+2
Slightly positive	+	+1
Neutral	o	0
Slightly negative	-	-1
Negative	—	-2
Empty	No relation	0

Before a business strategy is formulated, the insights obtained from the SWOT analysis and its confrontation matrix, should be regarded through the third theoretical perspective, economics of regulation theories. These theories can highlight certain aspects from the confrontation matrix that will aid in a more realistic and suited business strategy by taking into account the regulatory restrictions of the industry.



**Figure 3.5:** Strategic analysis through combination of the external and internal analysis using the SWOT analysis tool and the confrontation matrix.

### 3.3.3. Strategy formulation through combined perspectives

After identification of the positive and negative key issues within the company, the firm can perform the strategic analysis. Using both the competitive forces approach and the resource-based perspectives, usually two contradictory theories in strategic management literature, is not entirely new. G. Hooley and Broderick (1998) combines the two different concepts by introducing competitive positioning. In this study, the researchers developed a hierarchy in marketing resources and capabilities and explored how the firm can utilize these to achieve different competitive positions in the market. The competitive positioning perspective requires identification of the target market(s) and the competitive advantage that is pursued in serving those targets (G. J. Hooley & Saunders, 1993). In other words, they looked into the fit between market requirements and a firm's ability to meet them.

Before the different competitive positions in a market can be identified, the different approaches to competitive advantage need to be identified. The paper by G. Hooley and Broderick (1998) takes two fundamental approaches in account:

- **Cost leadership:** This strategy is based on appealing to the market through relatively lower internal costs to ensure sales. It is focused on the internal efficiency to pursue margins that are superior to competitors (Porter, 1980). This strategy is not well effective to changes in market requirements, as it is internally focused. Therefore, it is mostly useful for short-term financial advantage and not the security of long-term market advantage.



- **Differentiation:** This strategy aims to make the offerings of the firm distinct from the competitors and create unique value to the customers (S. D. Hunt & Morgan, 1995). The value focus of this strategy has the potential to improve customer incentive to buy and, therefore, can create a sustained (long-term) competitive advantage through market creation.

In the study by Porter et al. (1996), three main competitive positions were proposed. Variety positioning is product centred where firms select their type of offering based on their assets and competencies rather than customer needs. In contrast, needs-based positioning is where firms design their offerings to meet as many of their and the target market's needs. And lastly, firm can position themselves competitively through access-based positioning. In this strategy, they try to identify potential market segments based accessibility. G. Hooley and Broderick (1998) states that firms do not need to choose between the two fundamental approaches to strategy formulation. When firms manage to treat market demands and internal capabilities equally, they can ensure a strategy that warrants a match between their offerings and their target market(s). Although there are many methods for firms to position themselves, six different main competitive positions were defined:

- **Price positioning:** Firms can attempt to obtain a financial advantage through a cost or quality advantage. In the former, effective cost control systems, such as for the the acquisition of raw materials, are needed to keep costs lower than the competition. For pricing strategies to become successful, two main requirements should be in place. First, firms should constantly pursue other cost reduction processes that result in a cost advantage. And secondly, the target market should have viable, price-sensitive customer segment. Firms can also choose to adopt a high price positioning. The products and services are priced higher than the competitors to create an exclusivity for their offerings. This is often accompanied by higher quality, brand recognition or superior images.
- **Quality positioning:** Firms can attempt to obtain a competitive advantage through offering products or services of higher quality than the competitor. A business strategy focusing on quality as the competitive tool, requires effective internal control systems, in particular in quality assessment and assurance. However, these control systems can only be effective when there is a clear view of what customers perceive as valuable and quality. The quality positioning is only viable when customers are prepared to pay for the superior quality, since in most cases the higher quality is accompanied by higher costs.
- **Innovation positioning:** In rapidly changing markets, mostly driven by technological developments, firms can attempt to position themselves on the basis of innovativeness. The requirements to adopt such positioning strategy, are superior development competencies in combination with both technical and creative abilities. In innovation positioning it is important to test the innovations on the customers first before launch to avoid further investments and the launch of unwanted products.
- **Service positioning:** Firms can choose to offer superior service, in particular service that is fitted to the needs of the target market, to obtain a competitive advantage. Using these types of strategies, it is important that firms recognize the variation in the nature and level of the service according to the different requirements across customer groups. To adopt a service positioning, it is critical that the firm possesses attributes such as market sensing to determine the level and type of service required, strong customer relationships with key customers, systems that support in delivering and monitoring the service, and in particular human resources that provide the service. To establish the competitive edge through service offering, the human resources require supporting systems in selection, training, motivation and rewarding. Also, firms should understand how customers judge service and what aspects of service are important.
- **Benefit positioning:** Firms can attempt to obtain an advantage by identifying alternative benefit market segments and focusing on meeting those needs. By segmenting markets based on the benefits through the customer perspective, firms can identify new market opportunities and position themselves in a way to target customers more effectively. Benefit positioning requires high outside-in competencies for the identification of the benefits and the segmentation of the market. To capitalize on the benefits, firms should also have effective capabilities for the development new products and services to offer to the customers. Firms adopting a positioning based on the benefits sought by customers, can be successful in both consumer markets as well as business-to-business markets.

- **Tailored positioning:** The difference in tailored positioning compared to service or benefit positioning, is to offer products tailored to the requirements of the individual customer instead of a group/segment of customers. To adopt a tailored positioning, it is essential that firms combine outside-in competencies, to identify what customers prefer and to establish strong relationships, with inside-out competencies, to be able to produce flexibly. While some opponents argue that tailoring to the individual client is hard in a large clientele, Pine et al. (1993) shows that mass customization can result in cost and efficiency advantages, while simultaneously enjoying the advantages of tailoring to individual customer requirements.

Firms are not required to choose a single positioning approach for their business strategy, as they are not necessarily exclusive of each other (G. Hooley & Broderick, 1998). Combinations between the different positioning approaches creates a large variety in which firms might generate competitive advantage. It is important to look at the firms competencies and capabilities before selecting between the alternatives. For the strategic analysis of this study, the six dimensions of competitive positioning as proposed by G. Hooley and Broderick (1998) are taken into account.

3.4. Summary of Chapter

In this chapter, different theoretical approaches were considered for the study into the developments of the Dutch environmental testing market. Each theory was shown to analyze and describe a different aspect of the market or industry. However, since markets and industries are made up of multiple different aspects, understanding developments in the market, should be approached using multiple theoretical perspectives. Therefore, a conceptual framework was proposed for the study into the Dutch environmental testing market. This framework combines the external analysis approach with the internal firm analysis approach to obtain key insights. Due to the large role of regulation in this particular market, a third perspective, economics of regulation is taken for added insights. An overview of the theoretical frameworks introduced in this chapter and the theories chosen for the conceptual framework is visualized in Figure 3.6

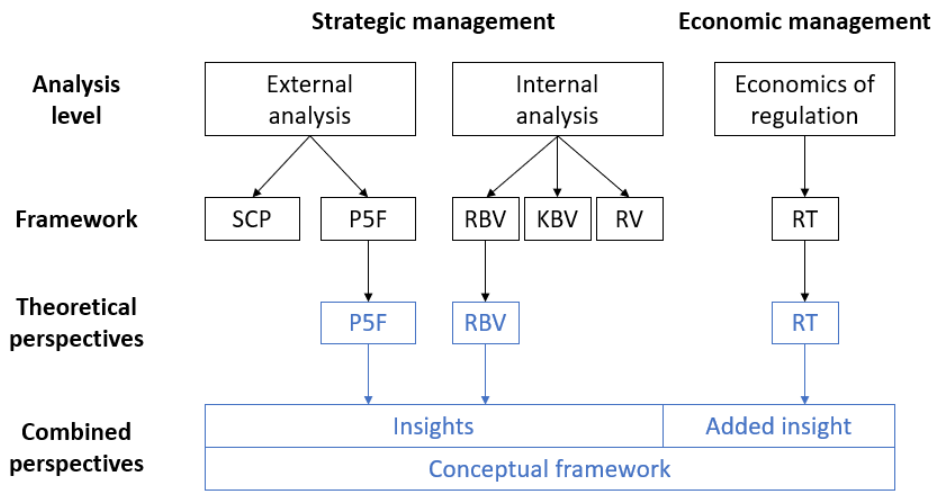


Figure 3.6: Visualization of the different theoretical perspectives introduced and the combined perspective in the conceptual framework

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# 4

## Research methodology

*"It is important to get results from experiment, but the most important is the process in getting that result."*

*- Dr. Nik Ahmad Nizam*

This chapter is dedicated to the detailed recount of the choices made in the research approach, and the data collection selection methods. Section 4.1 elaborates on the reasoning for an exploratory research approach. In section 4.2 the data collection method is described. This section will present semi-structured interviews as the main data collection method, discuss the interview structure, and the measures taken against interview bias. Section 4.3 includes a detailed description of the data analysis process.

## 4.1. Research Approach

In all types of academic research, stretching from health and social sciences to education to management practices to engineering problems, evidence-based practices have become a steppingstone in the origin and evolution of many professions over the years. A researcher must navigate the research entry barriers like understanding concepts such as validity, process planning and selecting research instruments. The study from Mike Lambert in 2012 is described as a suited support in the initial decision-making process for the selection of a suited research methodology (Ploettner, 2012). In his study, several research approaches are distinguished from each other for the conduction of academic research (Lambert, 2012). The selection of the research approach depends on the research objectives. The eleven different research approaches and their corresponding research objectives, as differentiated by Lambert, are shown in Table 4.1 These approaches were assessed next to our research objective as defined in section 1.3: to advance the strategic positioning of environmental testing companies and to contribute to fundamental knowledge by testing the RBV framework in the context of a new industry.

**Table 4.1:** Different research approaches with the corresponding research aim as defined by Lambert (2012)

Research approach	Research aim	Suitable
Action-practitioner research	Solve problems and enhance practice excluding theoretical scope	No
Case study research	Research a detailed in-depth examination of a particular case in a real-life context	Potential yes
Causal research	Investigate cause-relationships between multiple actors	No
Comparative research	Make comparison across different environments	Potential yes
Ethnography research	Research cultures or groups in their natural environment	No
Evaluative research	Research the performance of an organization, person, or action	No
Experimental research	Determine the efficacy or likelihood of a scenario through structured experiment set-up	No
Exploratory research	Explore the research topic in-depth or from an unfamiliar perspective previously untried	Potential yes
Grounded theory research	Create hypotheses through collection and analysis of data	Potential yes
Systematic review	Assess research data and/or literature in-depth	No
Theoretical research	Research theoretical side of ideas and concepts excluding practical use	No

In Table 4.1 it can be seen that four research approach as defined by Lambert, are potentially suited for the research objective of this thesis research: case study research, comparative research, exploratory research, and grounded theory research. In the next part, a closer look is taken into the four approaches.

The case study research approach is used to generate an in-depth and multi-faceted understanding of a complex issue in its real-life context in which they occur. This can help to understand and explain causal links and changes resulting from new policy or service development (Crowe et al., 2011). In the context of this research, the case study environment is the Dutch environmental testing market.

However, limitation and pitfall of the case study research approach, like conceptualization of the wrong cases for theoretical generalization and the large volumes of data that might be hard to analyse in the project time frame, indicate that this research approach might not be the most suited for this research methodology.

Secondly, the comparative research approach act to compare two or more phenomena to discover something about one or multiple things that are compared (Greckhamer et al., 2008). In the context of this research the conceptual framework would be applied to multiple actors in the Dutch environmental testing market and the findings could be compared to obtain certain insight into differentiating resources and business strategy management. However, due to the nature of this study and the time frame of the project, it was not possible to perform cases in different actor environments. With sufficient time and without limitations of non-disclosure agreements, a comparative research approach could potentially result in a true overview of the Dutch environmental testing market.

The third research approach was exploratory research. This approach is used to clarify the exact nature of a problem in the preliminary research phase, through a systematic design to maximize the discovery of generalization which in turn lead to description and understanding (Swedberg, 2020). Exploratory research approaches are in-depth analysis of a topic from a previously untried perspective, this suits our objective to observe in the environmental testing market using different theoretical perspectives.

Lastly, the grounded theory research approach was also identified as potentially suited for our research objectives. In the grounded theory research approach, researchers follow an open and flexible process, without previous search of literature, where theory emerges from the data collected (Makri & Neely, 2021). This approach could be suitable for the research objectives. However, in the study by Makri, they address the challenges of using grounded theory in management research, due to the various changes over the years. Although, a guide was proposed to integrate grounded theory in exploratory research, not much can be found on the application of this proposed guide. In the end, the exploratory research approach was regarded as the most suitable research approach, due to its wide application in strategic management research (Delery & Shaw, 2001; Molina-Azorin, 2012; Snow & Thomas, 1994).

## 4.2. Data collection method

Exploratory research approach and the grounded theory research approach are both qualitative research approaches that rely on inductive research methods. Lambert (2012) distinguishes between four types of data collection methods for exploratory research. For a clear overview of the different types and their advantages and disadvantages are shown in Table 4.2.

For this research, data collection methods interviews and desk research were chosen. Interviews were preferred over questionnaires and surveys, because the later often return superficial response, compared to the in-depth knowledge that can be obtained from interviews. Also, questionnaires and surveys do not allow flexibility of the structure design or clarification from both interviewer as well as interviewee side. Since the grounded theory research approach was chosen, extensive data collection was desired, due to lack of building on previous research and theory.

One of the main known limitations of interviews, as a data collection method, is the subjective nature of the interviews. The subjective nature of the interviewer, also called interview bias, will be addressed in the next section. The subjective nature of interviewees can be counter through two methods in this research. First, interviewees' subjectivity can be reduced by making them previously aware of the interview topic, certain definition of concepts and even asking them to prepare for the interview questions that could be hard to answers on the spot (also described in detail in the next section). However, the subjective nature resulting from interviewee personal experience and perspective cannot be eliminated, even though it is not always factual. The additional desk research as a data collection method, provides a solution to the factuality of the interview questions through validation and verification of the interview

data.

**Table 4.2:** Overview of research methods for data collection and their advantages and disadvantages

Method	Disadvantage	Advantage
Questionnaires/Survey	<ul style="list-style-type: none"> <li>• Superficial response</li> <li>• Not flexible for adaptation after structure design is send out</li> </ul>	<ul style="list-style-type: none"> <li>• Large number of respondents</li> <li>• Easy comparison of structured answers on the same questions</li> </ul>
Interviews	<ul style="list-style-type: none"> <li>• Taking notes can be difficult</li> <li>• Deviating from research topic introducing interview bias</li> </ul>	<ul style="list-style-type: none"> <li>• Extract more information from unwritten knowledge</li> <li>• Discussing topic in-depth</li> </ul>
Observation	<ul style="list-style-type: none"> <li>• Participation barrier high</li> <li>• Hard to remain objective</li> </ul>	<ul style="list-style-type: none"> <li>• Collection of variety of data</li> <li>• Can be used flexible and direct</li> </ul>
Desk research	<ul style="list-style-type: none"> <li>• Restriction on access to data</li> <li>• Difficult to obtain data specific to research purpose</li> </ul>	<ul style="list-style-type: none"> <li>• Factual information</li> <li>• Data is easy to compare</li> </ul>

#### 4.2.1. Determination of interview form

The interview method focuses on discussing the topic of interest between the interviewer and the interviewee (Hennink & Kaiser, 2017). The data collected is an accumulate a detailed account of their experiences and beliefs within the context they occur in (Rowley, 2012). When performing an interview, the researcher can adhere to three different interview design structures: structured, unstructured, or semi-structured interviews (Lambert, 2012).

Structured interviews are conducted through a set of predetermined direct questions that mostly require immediate responses that are either confirming or denying (Alshenqeeti, 2014). This organization of the interview structure leaves little flexibility and therefore, is similar in organization to questionnaires and surveys. In contrast, unstructured interviews, also called open-ended interviews, offers greater flexibility and freedom to both participating sides (Gubrium & Holstein, 2001). This allows the interviewer to ask follow-up questions for explanation or clarification of the interviewee's answers. However, in this unstructured design, the interview direction is determined by different variables in each interview, making them harder to compare in the data analysis. The semi-structured interview is a combination of the structured and unstructured interview design. As predetermined list of interview topics (which can take the form of research questions) guide the interview direction but allows the interview room for probing and expansion of the interviewee's responses (Whiting, 2008). The advantage of this semi-structure is the in-depth information collection within the parameters set by the aim of the study. Because of this, the semi-structured interview design was determined to be the most suited to the purpose of this research.

Next to the interview structure design, there are also multiple interview techniques to be considered. When comparing these different techniques, a distinction is made, based on their (a)synchronous communication in time and/or space (Opdenakker et al., 2006). Table 4.3 presents the four interview techniques related to these dimensions.

**Table 4.3:** Four types of interview techniques based on the dimensions time and space

	Time	Space
Synchronous communication	Face-to-face (online) interviews	
	Web interviews	Face-to-face (online) interviews
	Telephone interview	
Asynchronous communication		Email interviews
	Email interviews	Web interviews
		Telephone interviews

Face-to-face interviews are characterized by both synchronous communication in time as well as space. Due to this two-sided synchronous communication, the interviewer can optimize unwritten knowledge through social cues, such as emotion, intonation, body language, etc. (Opdenakker et al., 2006). Disadvantages of face-to-face interviews are the low flexibility in scheduling an interview time. Since both interview participants must be physically in the same place and time, not only the duration of the interview can become a bottleneck, but also health concerns play a role. Especially, the Covid-19 pandemic has popularized hybrid forms of working and makes synchronous communication in time and space more difficult. However, because of the advantages of social cues, it was chosen to use the face-to-face interview technique, since they can contain hidden information on interviewee experience. To introduce more flexibility to the space dimension, online face-to-face interviews through use of webcams, was presented as an option to interviewees.

#### 4.2.2. Designing of interview protocol

In the last section, a semi-structured interview was suggested. Before we can determine interview topics to guide the interview, the purpose of the interview must be revisited and highlighted in the interview focus. From the interviews, we aim to explore the Dutch environmental testing market, its resources, and the competitive advantage of these resources to determine the most suited business strategy in the face of external business drivers.

To emphasize the competitive potential of resources in the Dutch environmental testing market, it was chosen to base the interview questions on the initial scales of sustained competitive advantage as proposed by R. Moenaert and Robben (1999). The ten statements of this scale can be found in Table 4.4.

These ten statements were used in an adapted form to reduce interview length and complexity. This was done to decrease the participation barrier (related to demanding time from the interviewee) and increase enjoyment of participant (related to physical and mental comfort). It is assumed that not all interview participants have similar academic background on the topic of business strategies and competitive advantages. Therefore, the interview questions based on the initial scales by R. Moenaert and Robben (1999), were simplified and introductory questions provide additional support to the interviewee during the interview. Overall, the interview questions were structured in three main topic phases: product, resource, and strategy. Appendix A shows the interview protocol. In the interviews, a competitive advantage was categorized as sustained when the advantage lasts 5 years. The question numbers that are shown in bold, are questions that were based on the scale from Table 4.4. Furthermore, a maximal interview duration was set to one hour, including opening and closing statements of the interviewer.



**Table 4.4:** Initial scales of sustained competitive advantage as proposed by R. Moenaert and Robben (1999)

Code	Item
S1	At present, there are no substitute products or resources that pose a serious threat for our product line strategy.
S2	It is impossible to offer the same value to our customers using other technologies, resources, or competences.
S3	Our skills and expertise will offer us a competitive advantage for at least another five years.
S4	Our competitive strategy is based on resources that are strongly linked to the company
S5	Our product line is the result of distinctive competences that enable us to outperform competing firms.
S6	Our resources create a lot of profits for the company.
S7	We have been successful in realizing a sustainable competitive advantage: competitors find it difficult to copy our strategy.
S8	Compared to competing firms that are aiming for the same customers, our firm possesses several important competences that are clearly superior.
S9	Our competitive advantage will not erode quickly.
S10	Our competitive advantage is based on assets and processes that are extremely difficult to imitate by rival firms.

In a later study, R. K. Moenaert and Robben (2008) created categories of competitive advantage potential that are defined by indicating factors in the above listed initial scale of competitive advantage.

**Table 4.5:** The categories of competitive advantage potential and the corresponding scale indicators from R. K. Moenaert and Robben (2008)

Competitive advantage potential	Codes
Non-substitutability	S1, S2
Imitability	S7, S10
Durable demand	S3, S9
Appropriability	S4, S6
Superior resources	S5, S8

It was recognized that even after simplifying the interview questions, the complexity of the research topic could not only lead to difficulties to come up with an answer on the spot, but could also discourage interviewees for the remainder of the interview. To further prepare interviewees, two interview questions were shared beforehand to give them an impression of the interview direction and to encourage them to think of answers to the questions in their own time.

- Can you offer the same value to the customer using different resources?
- Does the organization enjoy a sustained competitive advantage (of minimal 5 years) based on current resources that are hard to duplicate?

These questions were chosen because of the extensive response range possible. By presenting these questions before the interview, it was attempted to generate more extensive answers than the most obvious answers only. Next to this, two concept definitions, resources and sustained competitive

advantage, are elaborated on before the interview. This is done to ensure participants using the terms in similar fashion, which in turn ensures better comparison of the interview answers in the data analysis. It was expected that some interview participants might still not be familiar with (parts of) the research topics, even with the measures taken. Participants were encouraged to share a feeling when they were uncertain of their answer to one or more of the questions. It is assumed that the feeling shared, is based on personal experiences and possess some forms of truths that add to the overview of the market.

#### 4.2.3. Limitations of the interview design

In previous sections, some weaknesses or limitations of semi-structured face-to-face interviews were already addressed and what measures were taken to mitigate their effect. This section will focus on other limitations of the chosen research method identified, and a detailed description of how their impact is lessened, is presented.

##### Interview bias

One of the most known limitations of interviews is the subjective influence from the interviewer, also called interview bias. There is a risk in interviews that the interviewer's expectations or opinions interfere with their objectivity. Another introduction of interview bias could be interviewees reacting differently to the interviewer's personality, social style/background, or their method to present particular questions (Pannucci & Wilkins, 2010). Both mistrust and over-rapport can affect outcomes and cause a distortion of responses from the interview participants.

The use of a semi-structured design can help reduce introduction of interview bias. Further prevention of this bias was attempted through restriction of interviewer freedom. Follow-up questions were reduced to request of explanation, clarification or supplementary information of the exact wording used in their interview answers.

##### Low significance

Another limit of the interview method is the time-consuming nature of the interviews. In consequent, a limited number of interviews is possible within the period of the research. The limited number of data collection points simultaneously reduce the significance of findings and raise concerns on generalization of the research conclusions.

Again, the semi-structured interviews can reduce preparation time of the interviews as the predetermined set of questions can be used multiple times (Qu & Dumay, 2011). In the next section, the interviewee selection process is described. The different expertise groups are defined. The significance of the data collection is increased by interviewing 4-6 individuals in each expertise group.

##### Attention intensive

The semi-structured interview design mitigates multiple weaknesses of interview methods. However, the face-to-face semi-structured interview also raises a new concern that need to be kept in mind when performing the research. During face-to-face interviews, there is no significant time delay between question and answer. Both interviewer and interviewee react directly on what is being said. Especially in unstructured and semi-structured interviews, this requires the complete attention of the interviewer. Wengraf (2001) calls this the double attention, where interviewers must focus on the interviewee response to obtain a clear understanding of their experiences and opinions, while also bearing in mind that all research topics are addressed properly within the fixed time at the level of depth and detail desired.

This risk of face-to-face semi-structured interviews is mitigated through two types of measures: First, the complete interview is voice recorded (after permission of the interviewee). The technological back-up ensures that losing focus momentarily does not result in a loss of information. The second measure type relates to interview planning. The number of interviews performed were limited to three on a single day. Next to that, it was attempted to schedule a buffer of 30 minutes between each interview.

To increase the reliability of the research design, multiple steps can be taken. One of the methods proposed in the study by Alshenqeeti (2014), was conducting a pilot interview. Therefore, a mock interview

was conducted in which the semi-structured interview design were tested. During this pilot interview, the three limitations of the interview research method were taken into account, and pitfalls during the interview that could lead to introduction of bias were noted.

#### 4.2.4. Interview participant selection process

The interview participants were selected from the employees of Eurofins. However, not all employees were considered knowledgeable enough to participate in the interviews, due to the complexity of the research topics. Therefore, five different expertise groups were identified based on their role relating to one or multiple of the five external business drivers and the innovation process. Interviewees were selected based on these groups:

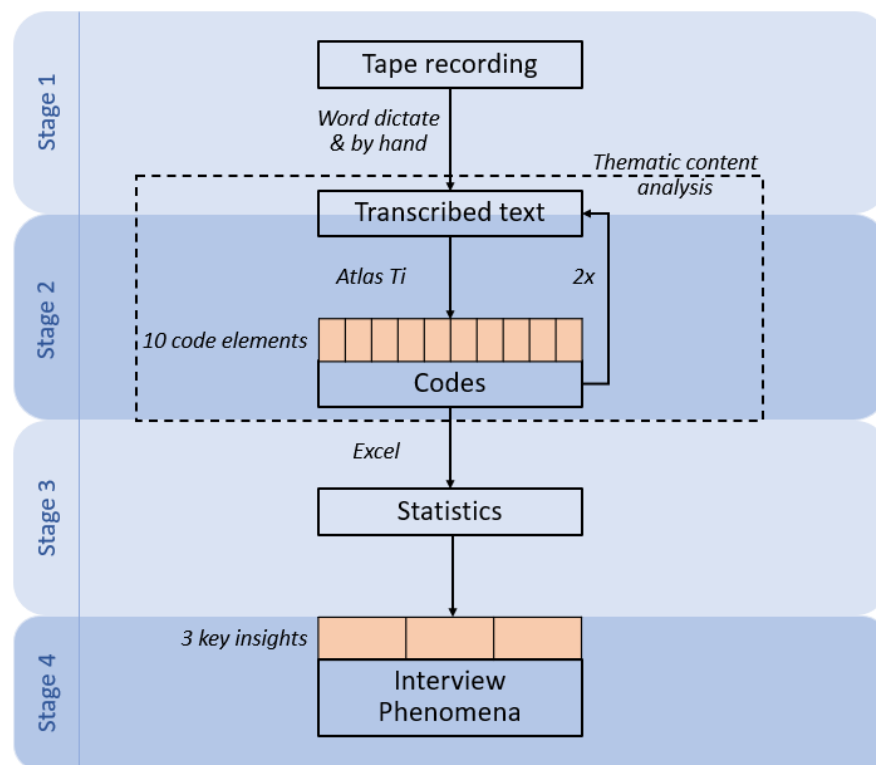
- **Management team** (MT) consists of individuals involved in decision making and creating vision within the company.
- **Customer service** (CS) are made up of individuals that work closed to the customer and have the most knowledge on customer needs and certain market changes.
- **Business development** (BD) consists of employees related to research and development of new technological improvements. These individuals are actively involved in regulation and policy, market, and technology, as business drivers.
- **Process development** (PD) includes individuals involved in different parts of the process flow. They are experts from pre-processing, the laboratory and post-processing phases of the analysis process. Also, individuals involved with supporting systems or optimization of the process flow are included.
- **Competition Expert** (CE) is established because the research objective is to examine the entire Dutch environmental testing market. Expert interviews with only Eurofins employees might not cover the market completely. However, interviews with other players in the market were hard because of non-disclosure agreement and time constraints of the research. Therefore, the group was made up of two types of competition experts. The first type is employees at Eurofins Analytico that have experience working at another Dutch environmental testing company. The second type are selected from another Eurofins division, Eurofins Agro, that operate in the Dutch agriculture testing market. Since agriculture testing also involves soil and water testing, expert employees from Eurofins Agro were deemed suited.

For each group four to six participants were selected and asked to participate in the research process. In total, twenty-seven interview participants were invited to participate, of which twenty-six participants were available for the interview. All interviewees were required to sign the informed consent form before the start of the interview. The outcomes of the research method are tape recordings of the semi-structured interviews. The treatment of the (pseudo-) anonymous data is described in the data management plan. The informed consent form and the data management plan are added in Appendix B.

### 4.3. Data analysis method

To gain insight into the research phenomenon, the interview data must be analyzed and assessed in a systematic approach. A systematic approach to the data analysis is important as it safeguards the comparability of the results, improves external validity and the corresponding generalization (Kuckartz, 2019). This section describes the step-by-step approach to the analysis of the different elements in the semi-structured interview design.

The design of the systematic analysis approach was initially based on the Qualitative Content Analysis (QCA) from Kuckartz, *et al.* This qualitative data analysis methods focuses on categorization of the data, through the creation of coding frames and the related codes. The research describes multiple categorization methods for the QCA. For this research, it was chosen to categorize the different elements in the data based on thematic categories, referring to certain topics in the interviews. Figure 4.1 visualizes the systematic analysis process flow and distinction is made for the different stages of the analysis process.



**Figure 4.1:** Systematic approach to qualitative data analysis

In the first step, also called stage 1, the interview tape recordings are transcribed to text, as a necessity for qualitative text analysis. The audio data is transcribed automatically using word dictate and manually revised and adjusted by hand. Each text document obtained through this process, contained the complete interview of a single participant.

To extract the desired information from the interview transcripts, the computer-assisted qualitative data analysis software Atlas Ti was chosen. In a review study, the software was deemed suitable for any point along the qualitative research spectrum (Hwang, 2008). Another previous study performed by Friese et al. (2018) showed how thematic content analysis can be executed in Atlas Ti in seven different phases (Table TCA shown in Appendix C, not visualized in Figure 4.1). Through this method, ten distinctive elements, or themes, were identified. Key points of the QCA are that the categories and coding frames are described as precisely as possible (to increase reliability of the data analysis), and that the data is coded completely (only excluding parts that fall outside of the research scope). The different elements were defined as code groups in Atlas Ti and were:

- **Important resources:** contains all resources that are mentioned as most important resources within the coding frame of Q6 in the interview design.
- **Competitive advantage:** contains all resources that are indicated to result in a competitive advantage. The coding frame of this element is limited to Q2 and Q11.
- **Sustained competitive advantage:** contains mentioned of whether a sustained competitive advantage is possible in the Dutch environmental testing market and the respective reason why. Coding of this group is restricted to Q12.
- **Client value perception:** contains all mentions of interview participants on their perception of what customers value most. The coding frame for this group is defined from Q2-Q16.
- **Strategy:** contains all opinions on the strategy of Eurofins within the Dutch environmental testing market. The coding is limited to Q11.
- **Strengths:** contains all resources that are indicated as strengths of Eurofins by the interview participants. The coding frame ranges from Q2-Q16.

- **Weaknesses:** contains all resources that are indicated as weaknesses of Eurofins by the interview participants. The coding frame ranges from Q2-Q16.
- **Opportunities:** contains all resources that are indicated as opportunities for Eurofins by the interview participants. The coding frame ranges from Q2-Q16.
- **Threats:** contains all resources that are indicated as threats against Eurofins by the interview participants. The coding frame ranges from Q2-Q16.
- **Resources necessary:** contains all resources that are indicated by the interview participants as necessities for quick adaptation to sudden market developments. The coding frame is limited to Q16.

Although the use of a computer-aided analysis software can save time, the data analysis process is still lengthy. Because of the time difference between the start of the analysis and the end, there is a possibility of inconsistency in the coding process. To minimize this effect on the coding process, phase 3-6 (Appendix C) were iterated in stage 2. In the next stage, stage 3, all codes with their total grounded density and the grounded density per expertise group, were exported to Excel for a clear overview. Both grounded densities (both total and per expert category) were normalized to the number of participants to give a true representation of the frequency of the code.

The code are used for both the particular perspectives of the three theories used, as well as the combined perspective of these theories in the conceptual framework. The insights obtained from the conceptual framework will ultimately result in an answers to the main research question:

*"What business strategy should companies in the environmental testing companies in the Netherlands adopt and what circumstances are needed for this shift?"*

# 5

## Particular analysis of market aspects

*“Every new change forces all the companies in an industry to adapt their strategies to that change.”*

— Bill Gates

This chapter is dedicated to the analysis of the interview data through the three different theoretical perspectives that were introduced in Chapter 3. First, an external analysis of the market environment is performed in section 5.1. The competitive forces within the industry are examined through identification of the external business drivers. After, the second perspective takes an inside-out approach and an internal analysis of the firm environment is dedicated to understanding the strengths and weaknesses of Dutch environmental testing companies. This second perspective is taken through use of the Resource-Based View framework. Firm resources and capabilities, and their role in reaching (sustained) competitive advantage is highlighted. Finally, the third perspective uses economics of regulation theories to put further focus on the role of regulation on a firm's ability to obtain competitive advantage in the environmental testing industry. This perspective is shown in section 5.3. This chapter takes individual theoretical perspectives to competitive advantage. The different perspectives are combined in Chapter 6 through the conceptual framework.

## 5.1. External market analysis

First, the data is approached using the competitive forces perspective for the external market analysis. As stated in section 3.3, a competitive forces approach is taken to examine the external market environment. This outside-in approach to competitive advantage, is taken to identify the different opportunities and threats in the environmental testing industry. In this study, the competitive forces were examined through analysis of the external business drivers. From the expert interviews performed (see Chapter 4 for the description of the interview design), all codes related to the external market environment were extracted. To eliminate difference of interview bias at the start and end of the analysis, the encoding process of the interviews was iterated twice. These external business drivers were divided into the five different categories stated: customer needs, market, competition, regulation & policy and technology. The results of the external analysis can be seen in Table 5.1.

**Table 5.1:** External business drivers of the Dutch environmental testing market and their effect on internal company conditions

External driver	Derived From	Effect on internal company conditions
Market demand	Customer needs	Demand pulled innovation
Everything mapped out		Decline in sample volume
Client company commitment		Inhibition of reputation improvement, decline in sample volume
Air market		Demand pulled innovation
Client preference		Distinguished client treatment
Client practice		Limited access new market segment
Pricing pressure corporate chain	Market	Implementation cost effective operation
Maturity core business		Inhibition of company growth, decline in sample volume
Pressure on labor market		Inhibition of company growth
Current competition	Competition	Decline in sample volume
Competitor's knowledge		Decline in sample volume
Price erosion		Implementation cost effective operation
Stagnation low pricing strategies		Decline in cost effective operation
Terra Index		Decline in sample volume
Exchangeable resources		Limited distinctive resources
Analysis method fixed in regulation	Regulation	Limited innovation opportunity
Delayed shifting by government		Limited innovation opportunity
Necessity of analysis		Increase of sample volume
Change in regulation and policy		Disruption operation
Duty of care		Increase of sample volume
Bioassay analysis	Technology	Technology pushed innovation, decline in sample volume
DNA techniques		Technology pushed innovation, decline in sample volume
Sensing/in situ technology		Decline in sample volume
Self-test kits		Decline in sample volume
Quickness of developments	All	Demand for continuous innovation

The different effects of the external business drivers are described in the following summation:

- **Inhibition of reputation improvement:** one of the external drivers related to customer needs is the commitment of a client to the corporation. There are clients that adhere to a multiple laboratory strategy, where they associate with multiple laboratories simultaneously and choose the cheapest or fastest laboratory at that time. When a company has multiple clients that use this strategy, the perception and appreciation of the added value can become lost. This affects the shift of a company's reputation from a necessity to a partner in the perspective of the clients.
- **Distinguished client treatment:** as mentioned some clients prefer the fastest and cheapest analysis packages, but others prefer to pay more for the added value of the surrounding service. A company should recognize this difference and treat the client according to their preference to not wrongfully invest resources.
- **Implementation/decline cost effective operating model:** Another effect on the company's internal circumstances is the implementation of the cost-effective operating model. The loss leader pricing strategy has forced the company to increase efficiency and productivity to lower the costs. This had also resulted in relatively low wages for employees, which in turn decreases the employee satisfaction and increases the turnover rate.
- **Demand pulled innovation:** changing customer needs require innovation of the company to meet the new demand and not fall behind. When a company neglects to recognize this change in customer need, they risk losing clients or losing profits, because of out-sourcing the analysis request. This customer demand pulled innovation not only directly affect all resources related to the R&D department, but also indirectly affect resources related to, for example, business models, sales strategy, and management policies.
- **Technology pushed innovation:** next to demand pulled innovation, innovation can also be pushed through development of new technology. This is also an external driver that can have a large impact on the internal company conditions. Technologies like bioassays and DNA techniques could change the current process of how contaminations in soil and water are determined. Currently, contaminations are determined by the presence of certain harmful compounds. But another method, could be to look at the health of the ecosystem in which the contamination is found. The emergence of these technologies has the potential of influencing the internal company conditions through this changing view.
- **Inhibition of company growth:** other external drivers originating from the market can limit the company growth. The maturity in the main market segments soil and water has decreased growing opportunities through traditional means, while the current pressure on the Dutch labor market also makes it difficult to obtain the resources needed to pursue other growing opportunities. These drivers are important to keep in mind especially for public companies in the environmental testing market that have stakeholder to satisfy, and growth of the company is needed.
- **Limited distinctive resources:** the exchangeable resources among the competitors in the Dutch environmental testing market result in little distinctive resources in the market. This high mobility of resources affects internal company conditions when a company has invested resources in innovation but is potentially unable to enjoy the return of this innovation for an extended period of time, because of adoption by competition.
- **Limited innovation opportunity:** another external driver that has a large impact on companies in the Dutch environmental testing market is regulation and policy. Most analysis methods are determined through regulation and policy and new developments in technology are slowly picked up by the government because of limited knowledge. This affects companies by limiting their innovation opportunities when researching methods for improvement in current processes.
- **Limited access new market segment:** an opportunity for growth could be forward or backward integration of the corporate chain by companies in the Dutch environmental testing market. Eurofins, for example, does not provide advise on analysis results, while they possess the knowledge for this. By providing that type of service, the company would step in the operation of their clients, which is not appreciated.
- **Increase/decline in sample volume:** a large influence on company internal circumstances are the external factors that impact sample volume. These drivers originate from all aspects of external factors. Especially drivers that result in the decline of sample volume are negative impacts



on the company internally. Companies need a minimal operating volume on standard analyses to remain profitable. When the sample volume decline below this minimal volume, the operating process will run at a loss.

- **Disruption operating model:** one of the biggest influences in the operating of the Dutch environmental testing market is regulation and policy. Large changes in regulation and policy could result in disruption of the operating model and in turn affect all internal conditions of a company in this market.
- **Demand for continuous innovation:** all five different categories of external business drivers result in the demand for change. However, this demand is never ending and companies in the Dutch environmental testing market need to continuously innovate to adapt to this ever-changing demand.

As can be seen from Table 5.1 Dutch environmental testing companies face threats from all different kinds of external business drivers. The categories market and competition contain external business drivers that should be managed, but that are neither large opportunities or threats. Most threats to the firm derive from the external business drivers technology and regulation. The former driver can potentially result in substitutes to the current product. The emergence of new technology to measure the environmental quality also points to the threat of new entrants to the Dutch environmental testing market. This threat could also pose an opportunity to develop new technologies that could potentially disrupt companies' operational model. However, these innovation opportunities (both demand pulled or technology pushed) might be hindered by regulation. The last external driver, customer needs, is largely intertwined with the driver regulation, since demand of analysis mostly originates from necessity. However, increasing awareness from both customer and government could expand the current environmental media, soil and water, and generate opportunities in niche market segment related to environmental quality (for example 'air market').

In the Dutch environmental testing market, the competitive forces deriving from rivalry among existing firms (external business drivers from categories market and competition) and bargaining power of suppliers are not above average. These forces should be monitored but do not lead to a significant (dis)advantageous competitive position for the firm. However, the external business drivers from technological developments can result in an increase of threat of new entrants and substitute products. The business drivers stemming from technology could also point to opportunities in the market to invest and innovate in niche market segments. This opportunity can also be seen in the category customer needs. The bargaining power of the buyers, the customers, is reduced by the necessity of analysis due to regulation. The number of environmental testing companies and their testing capacity are limited, which in turn also limits the bargaining power of buyers.

To summarize external drivers are important factors or conditions that should be considered by the company. Using the competitive forces approach to advantageous competitive positioning, companies can identify positions in the market that are not yet being provided by competitors in the market. From the market overview in Chapter 2, it was seen that the environmental testing companies are similar overall, and offer many of the same products. However, external business drivers like customer needs and sudden changes in regulation could result in demand into other analysis methods needed. An opportunity for environmental testing companies could be to become a first mover in providing these 'special' analyses.

## 5.2. Internal firm analysis

Next, an internal analysis is performed to map the internal environment of the firm using the Resource-Based View framework. Through analysis of the firm's assets, resource, capacities and capabilities, the strengths and weaknesses of a firm can be determined. Through both desk research as well as semi-structured interviews, all resources available in the environmental testing market are examined. In the analysis, the assumption was made that the three main companies that make up more than 90% of the total market share in the Netherlands, together are aware of all resources available in the market. Existing resources that might pose a potential threat to the market that are not yet on the radar of these companies, are assumed to not become a threat to the market in the nearby future. Another assumption made in the analysis is that weaknesses mentioned by interviews participants of Eurofins,

are resources that competitors in the market have access to and, therefore, are available in the market. The systematic approach to the analysis (see Chapter 4) ensures that the assessment of the interviews contain the same level of detail. To eliminate difference of interview bias at the start and end of the analysis, the encoding process of the interviews was iterated twice.

### 5.2.1. Application of the VRIO criteria

All resources that are related to the internal circumstances of environmental testing companies, were extracted from the total number of codes. After, the VRIO framework (section 3.2.2) was applied to determine the competitive potential of these resources. All resources were examined based on their value, rarity, cost of imitation and if they are being exploited by the organization. Since the VRIO framework is a business internal analysis framework, the fourth criteria of the VRIO framework are answered through the Eurofins lens. In other words, the fourth criterion is assessed based on if the resource is being exploited by the Eurofins organization.

Key concept of the RBV is that not all resources are of equal importance, nor do they have the potential to become sources of sustained competitive advantage. According to the VRIO criteria, the competitive implications of the resources can be categorized into five different types: competitive disadvantage, competitive parity, temporary competitive advantage, unexploited competitive advantage, and finally sustained competitive advantage. Therefore, the most interesting resources are those categorized in sources of sustained competitive advantage, unexploited competitive advantage or resources that are currently even resulting in a competitive disadvantage. These three types of competitive implications are shown in Table 5.2. The resources associated with competitive parity and a temporary competitive advantage, are assumed to not possess the potential to become sources of sustained competitive advantage since they are either not rare or can be easily imitated by competitors. In other words, they are either homogeneous or/and mobile. The resources categorized in these two classes, are shown in Appendix D.

#### Theoretical sources of sustained competitive advantage

Through application of theory, seven different resources are found that have the potential to yield a sustained competitive advantage:

- **Economics of scale:** This resource is also described as the high-volume laboratory, including all physical, human, and organizational resources. The sample turnover from Eurofins is higher than all other companies in the environmental testing market in the Netherlands, to the point that some large-order clients are only able to order from Eurofins. The cost of imitation is high because of historical conditions and causal ambiguity.
- **Overnight process:** Firms possessing a process that could perform analyses overnight are likely to have a smaller turnover time. Eurofins currently owns most of the urgent analysis orders because of this shorter turnover time (...% market share?).
- **Optimization:** Eurofins has formed a lean team that is dedicated to continuously improving the process flow, resulting in a highly efficient and productive workflow. From information provided by competition experts we can deduct that one of the close competitors AL-WEST does not have employees that focus on optimization as their core function. The formation of a lean team could be costly to imitate because of causal ambiguity and social complexity of fitting such team in their current process.
- **In-sourced logistics service:** The transport service at Eurofins is in-sourced compared to those of SGS and AL-WEST that out-source this part of the process flow. This in-sourcing of the transport service is supported by the size of Eurofins Scientific and the multiple divisions that uses this transport service, which results in lower costs and a certain level of flexibility. Imitation of this resource is costly due to both historical conditions as well as causal ambiguity.

**Table 5.2:** List of resources based on their competitive implication

Competitive implication	Resource	V	R	I	O
Sustained competitive advantage	<ul style="list-style-type: none"> <li>• Economics of scale</li> <li>• Overnight process</li> <li>• Optimization</li> <li>• In-sourced logistics service</li> <li>• One stop shop</li> <li>• Organization structure</li> <li>• Readiness to invest</li> </ul>	Yes	Yes	Yes	Yes
Unexploited competitive advantage	<ul style="list-style-type: none"> <li>• Well-educated personnel</li> <li>• Culture</li> <li>• Large clientele</li> <li>• Client relation</li> <li>• Reputation</li> <li>• Sales strategy</li> <li>• Network</li> <li>• Supply &amp; Demand forecast</li> </ul>	Yes	Yes	Yes	No
Temporary competitive advantage	See Appendix D	Yes	Yes	No	
Competitive parity	See Appendix D	Yes	No		
Competitive disadvantage	<ul style="list-style-type: none"> <li>• Pricing structure</li> <li>• Tacit Knowledge sharing</li> <li>• Locations distance</li> <li>• Cross-division competition</li> <li>• Internal communication</li> <li>• Knowledge retention</li> <li>• Client perception of service</li> <li>• Low frequency analyses</li> </ul>	No			

- **Organization structure:** The decentralization of the Eurofins network presents an efficient operating model as there is immediate feedback on the performance of the environmental division. Most companies in the Dutch environmental testing market do not possess a similar level of back-up network like Eurofins does.
- **One stop shop:** This resource is closely related to Organization structure. Whenever Eurofins Analytico is unable to perform a certain analysis, the out-sourcing procedure to another Eurofins Scientific division is well regulated and performed without unnecessary additional steps. This principal of having all possible analysis methods within a single firm (with in-house out-sourcing procedures) is marketed as the one stop shop. SGS is in possession of this back-up network, but according to information obtained from clients through customer service experts, they leave this network unexploited. When SGS receives an analysis order that they are unable to process, the clients are the ones responsible for the search from a laboratory that can perform the analysis,

while the one stop shop principal unburdens the clients from this. It is possible that this difference stems from the cost of imitation of either causal ambiguity or the social complexity of making use of their cross-division network.

- **Readiness to invest:** When PFAS became an environmental crisis in 2019, Eurofins capitalized quickly and scaled-up their PFAS operation from a single machine to 12 within a few months, while competitors scaled-up from one to two. This preparedness to free up financial capital quickly is part of company organization structure and culture, and both are hard to imitate due to historical conditions that established this nature within an organization.

When taking a high overview of these seven resources with a sustained competitive potential, it is noticeable that they are related to two types of resources. The economics of scale, overnight process, optimization, and transport service are related to the scale of sample volume that Eurofins is capable of handling. Both the scale and the efficiency due to optimization of the process result in relatively low costs of an in-house transport service and raw materials of the analysis process. Optimization and the transport service have made overnight processing of samples possible, resulting in the low turnaround time of the samples. While organization structure, one stop shop, readiness to invest and the in-sourced transport service can be derived to the Eurofins network. The decentralization and the cross-division collaboration have created a unique operating model for Eurofins, that is distinctive from competitors like SGS and AL-WEST.

To summarize, the VRIO criteria point to seven sources of potential sustained competitive advantage. These sources can be derived to two main strengths of the company: the economics of scale and the Eurofins network.

Theoretical sources of unexploited competitive advantage

Next to resources of sustained competitive advantage, the VRIO framework has also identified resources that are not (or not well enough) utilized by the organization and remain resources of unexploited competitive advantage.

- **Extensive network:** Over the years, Eurofins has compiled a large network of partners (other laboratories, universities, NGOs, etc.). However, Eurofins is not matured yet in making use of their extensive network. The creation of this network is costly to imitate due to historical conditions and social complexity. If Eurofins becomes able to capitalize on this large network, it could potentially turn into a source of sustained competitive advantage.
- **Culture:** The organizational culture at Eurofins is described as both an advantage as well as a disadvantage. At Eurofins it is stimulated to innovate and to grow, however, the culture is also largely fragmented due to the decentralized system of Eurofins Scientific. This inhibits certain developments or holds up integration of certain innovations within the operating model. The current innovative mindset is not supported enough, resulting in an unexploited competitive advantage.
- **Large clientele:** Due to their long history in the market and the loss leader pricing strategy, Eurofins has created a large clientele. However, this extensive network is not exploited enough by the organization. An example could be to use the network to gain market insight, or as a launch-pad for sales strategy of new developments.
- **Client relation:** This resource relates to customer service, and is not exploited sufficiently, as Eurofins' reputation in the market is seen as the high-volume laboratory and the commodity product. Eurofins can use client relations to start innovating according to customer needs. Another way this resource is not exploited properly by the organization, is that all clients are treated similarly, while some clients might prefer more or less service surrounding the product. Eurofins can take a closer look in the client relation and invest accordingly.
- **Reputation:** Overall Eurofins' reputation is viewed positively by clients, as a reliable partner. On the other hand, Eurofins is also known as the high-volume laboratory against low pricing. The additional value of the surrounding service, that the organization invests in, are not always specified enough by the organization.
- **Sales strategy:** Eurofins maintains the largest sales force within the Dutch environmental testing market, but the marketing strategy does not always support the full potential of this commercial advantage.

- **Well-educated personnel:** The economics of scale of Eurofins result in challenging logistics in both in the operation process as well as transport service cross-division. This could be used to attract well-educated individuals that are looking for challenging tasks in their work. Currently, this is used little when recruiting new employees, while attracting high-educated personal could help the company grow.
- **Supply and demand forecast model:** The supply and demand forecast model is also an unexploited resource. The communication of supply and demand between sales, laboratory and transport is not completely effortless, resulting in the creation of bottlenecks at certain points in the operating model and reducing efficiency loss. By using the data available, a supply and demand forecast model could result in a competitive potential. While Eurofins is not unique in using their data for supply and demand forecasting, in combination with their economics of scale, they could turn it in a sustained competitive advantage that is costly to imitate by competitors.

Multiple resources are identified that are not exploited fully by the organization. Most of these unexploited resources are associated to social capital like using different networks and relations, in particular the use of their clientele to create market insight and improve the Eurofins' reputation. By recognizing this gap in resource utilization, the company can adopt strategies to exploit these resource. This exploitation could lead to these resources becoming sources of sustained competitive advantage.

#### Theoretical sources of competitive disadvantage

In contrast, this section is dedicated to resources that are currently categorized as competitive disadvantages by the VRIO framework, since they do not participate in either exploitation of an opportunity or the mitigation of a threat. Determination of these resources is important to identify resources that are being invested in unnecessary, and should either be changed or let go completely. From the list of total resources available, the framework has identified 10 resources that are sources of competitive disadvantage:

- **Pricing structure:** the current pricing structure of Eurofins Analytico is adopted from Eurofins Scientific. However, the prices for standard packages are listed in excess. In combination with the loss leader pricing strategy, high discounts are presented to clients in price negotiations. The high discounts create a weak negotiation position for sales. This weakness could potentially lead to lesser profit and thus a competitive disadvantage
- **Confidential knowledge sharing:** competitors in the Dutch environmental testing market have little methods to look into each other's operating process. However, there are certain tasks outsourced to other companies (such as maintenance of electronics). These individuals that visit multiple laboratories could share what they have seen with competitors, potentially nullifying a potential competitive advantage. In-sourcing of these tasks requires knowledge not available to a company, such as Eurofins, or is costly to in-source. A better method would be to have protocols that limit or prevent tacit knowledge sharing.
- **Company location distance:** Eurofins contains two separate locations that processes analysis orders for the environmental division. These locations are roughly 50km away from each other. At the moment the synergy of these two locations is lacking and the competitive potential of having the resources from these two locations is not utilized correctly. This lack of synergy and correct resource distribution results in potential higher cost of collaboration. This in turn becomes a competitive disadvantage when left unaddressed.
- **Eurofins internal competition:** the decentralized organization structure of the different Eurofins Scientific divisions was returned as a potential source of sustained competitive advantage by the framework. However, this fragmentation within the organization also presents a downside that could turn into a competitive disadvantage when left unattended. Because of the decentralization, there is the possibility of two divisions competing in certain areas where their industries overlap. While this could motivate divisions to innovate, it also limits innovations that could arise from collaboration.
- **Interdisciplinary communication:** as mentioned before, the competitive advantage is often a result of synergy between multiple teams. The interdisciplinary communication should be guaranteed to prevent unnecessary bottlenecks from forming in the operating model of the organization. When the interdisciplinary communication is not warranted, this neglect could turn into a competitive disadvantage.

- **Knowledge retention system:** Eurofins deals with a high turnover rate in employees. Especially with the current pressure in the labor market, the turnover rate has increased, and the company struggles with the question: how do you ensure knowledge retention and lessen the impact of multiple golden workers leaving in a short period of time? Without a proper knowledge retention system, companies in the environmental testing market are vulnerable and period that know higher turnover create uncertainty in the firm.
- **Client perception of service:** a large element of the product of Eurofins is the surrounding service. Currently, the client's perception of the Eurofins product (from Eurofins' perspective) is high volume and low pricing. The added value of service surrounding the product is not always appreciated and this shows in price negotiations and customer satisfaction surveys. This difference in client's perception of service could become a source of competitive disadvantage now that loss leader pricing strategies are becoming not feasible, and companies start focusing on client relation.
- **Low frequency analyses:** most cases of special analysis requests are low frequency requests, that remain low frequency. Analyzing, developing, and testing an analysis methodology for these special request, cost time and resources, often obstructing the standard analysis process flow. Currently, there is no protocol for focused decision making to determine which lower frequency special request could potentially become more demanded in the future. Without this prospect from management policy to the research and development departments, the high investment and low return will turn into a competitive disadvantage.

Using the RBV framework and the corresponding VRIO criteria, sources of competitive disadvantage were found. These sources can also be seen as the weaknesses of the firm. Identification of the firm's weaknesses is just as important as the identification of the strengths, since sources of competitive disadvantage should be improved or let go. These resources should be assessed if they could become valuable to the firm when developed in a strategy. If not, the resource does not return its investment, and should be let go. As described in section 3.2.2 resources can be classified into three main categories: physical, human, and organizational. From the total list of resources available in the market, it was seen that most resources obtained, cannot be solely classified into one category, but are often a result from collaboration of multiple classifications. This emphasizes the importance of the synergy between the three types of resources.

To summarize, most of Eurofins' competitive advantage stems from the ability to handle large sample volumes, which in turn enables them to drive prices down, and the back-up of the Eurofins network, as long as the fragmentation of the divisions does not interfere with proper collaboration. There are some unexploited sources of competitive advantage identified through the VRIO framework. It was seen that these resources are often related to social capital. The resources that do not adhere to any of the VRIO criteria, do not contribute to exploiting an opportunity or mitigating a threat, and can be labelled as sources of competitive disadvantage. When left unattended, these resources have the potential to oppose a potential competitive advantage for the firm.

The scholars within the resource-based perspectives point out that understanding the causal relation between sources of advantage can be difficult in practice. Therefore, in the next section, the sources of sustained competitive advantage are compared to competitive advantage witnessed in practice by the expert interview participants.

### 5.2.2. Competitive advantage in practice

In section 5.2.1, an overview of the resources available and their competitive potential was made. In this section, a different view on competitive advantage in the Dutch environmental testing market by the interview participants is shown, and how this view relates to the results obtained from the VRIO framework.

#### Participants view on competitive advantage

In the interviews resources were coded as a source of competitive advantage only when explicitly remarked by the interviewee. Most codes were coded in the questions on (sustained) competitive advantage (Q11 and Q12 in Appendix A), although mentions by interviewees of competitive advantage

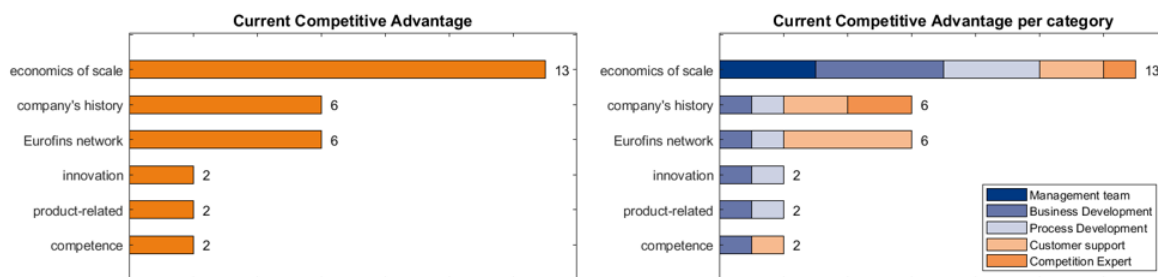
in other questions were included too. The different sources of competitive advantage identified in the interviews can be seen in Table 5.3. The table also indicated the number of appearance (the number of times the sources is grounded in the analysis software) and source groups, since some sources of competitive advantage were retraceable to a single source.

From the analysis, 14 different sources of competitive advantages were determined, which can be grouped into six different source groups. The source groups are economics of scale, company's history, Eurofins network, competence, product-related and innovation.

**Table 5.3:** Sources of competitive advantage as obtained from the data analysis

Source of competitive advantage	Source grounded	Sources grouped	Source group grounded
Economics of scale	6	Economics of scale	13
Low cost - pricing advantage	6		
Ability to scale-up	1		
Long history	4	Company's history	6
Long client relations	1		
Reputation	1		
Large portfolio	3	Eurofins network	6
Eurofins network	2		
Water market	1		
Knowledge	2	Competence	2
Added value of report	1	Product-related	2
Turnaround time	1		
Front runner innovation	1	Innovation	2

In Figure 5.1, Table 5.3 is visualized, and it indicates the composition of the sources based on the five expertise areas defined. An extended overview of all sources of competitive advantage can be found in Figure E.1. Three of the source groups were grounded two times. These were sources of competitive advantage mentioned related to competence, product, and innovation. Especially in the case of product and innovation related sources, the groups were made up of two different sources, each mentioned by one interview participant. These sources can be viewed as sources resulting in a small competitive advantage. Two source groups that are grounded more frequently are company's history and Eurofins network. The company's history is grounded six times. The source group is related to the long history of the company in the Dutch environmental testing market, which has resulted in a known reputation and long client relations. The second source group, Eurofins network, is also grounded six times and it made up of the extensive Eurofins network and the related one stop shop service. Especially the large portfolio that Eurofins can offer, is mentioned as a source of competitive advantage. By far the largest source group determined is economics of scale. The source group is made up of three different sources of competitive advantage. The source of competitive advantage, economics of scale itself, is grounded six times, while the low costs due to the high volumes processed that result in a pricing advantage, is also grounded six times. Because of the high frequency of mentions as source of competitive advantage, it can be concluded from the interviews that the economics of scale is the main source of competitive advantage currently in the environmental testing market.



**Figure 5.1:** Resources related to competitive advantage in the Dutch environmental testing market. From 26 expert interviews, the top 6 most frequently mentioned resources are shown. The code distribution over the five different expertise groups, management team, customer service, business development, process development and competitive experts, are visualized.

Next, a closer look is taken of the source groups of competitive advantage related to the expertise areas. From Figure 5.1B, all source groups are made up of participants from multiple expertise areas. Especially for the main source group, economics of scale, this is mentioned as a source of competitive advantage by all expertise areas, further emphasizing the importance of this source. From the figure it can also be seen that of all participants from the expertise area management team, there's only two grounded sources within the group economics of scale. Next, a closer look is taken into the detailed division of sources grounded.

Remarkable is that the total number of sources grounded exceeds the number of interviews taken, however, when taking a closer the sources of competitive advantage are coded from 14 different interviews. The remaining 12 interviews do not explicitly mention resources as sources that return a competitive advantage in the current environmental testing market. After having a closer look at the interview participants that do not mention sources of competitive advantage, it was found that these participants can be found in all five areas of expertise defined, but significantly more in the areas management team and customer service. As possible explanation could have been that these areas contained slightly more participants. However, after determining the percentage of these expertise areas that do not mention sources of competitive advantage, 67% was found that in both areas compared to 20-50% in the other areas (product development, process development and competition expert). The interview bias is expected to be decreased because the coding process was performed twice by one individual and remaining bias should be equal across all interviews. It remains unclear what has caused this difference.

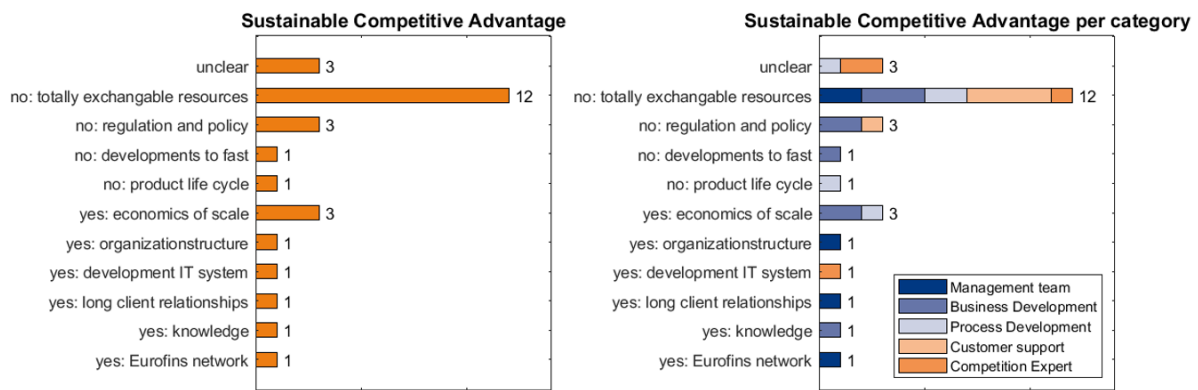
To summarize, from the interviews one main source of competitive advantage was identified, the economics of scale that is related to the high-volume ability of the operating process and the cost effectiveness related to it. Other important sources of competitive advantage are the company's history, mainly the long client relations and reputation build because of it, and the Eurofins network, through which a large portfolio and well out-sourcing process can be offered to the clients. Smaller sources of competitive advantage are the knowledge within the company, the speed and added value of the analysis report and innovation within the operating model. The next step is to analyze these sources of competitive advantage further through the lens of sustained competitive advantage.

#### Participants view on sustained competitive advantage

To extract the information from the interview on whether sources of competitive advantage are temporary or sustained advantages, the answers from interview question 12 were coded with yes or no and the respective reason presented by the interviewee. As described in the research methodology (Chapter 4), a competitive advantage is considered sustained when it results in an advantage that lasts at least 5 years. An overview of the answered provided can be seen in Figure 5.2.2.

From the total number of interview participants, eight people claim there is a sustained competitive advantage by Eurofins in the Dutch environmental testing market substantiated by six different reasons. Of these six reasons, only the economics of scale is grounded in multiple different interviews:





**Figure 5.2:** Analysis results of interview question 12: could the organization obtain a sustained competitive advantage for a time period of 5 years?. The answer distribution over the five different expertise groups, management team, customer service, business development, process development and competitive experts, is also visualized.

- **Economics of scale:** this resource is appointed as a source of sustained competitive advantage by three participants. Interview participants describe the cost of imitability within the defined period as reason for why this competitive advantage is sustained, because of supporting resources needed to handle these high sample volumes. Investing financial capital in the physical capital resources is insufficient as these need to be supported by human and organizational resources for an adequate process flow. Most of these supporting resources were grown organically with the growth of the company. This development of supporting resources cannot be bought and used within 5 years. Therefore, economics of scale can be seen as a source of sustained competitive advantage.
- **Organizational structure:** Eurofins is a frontrunner in optimization of their process due to their organizational structure. This structure contains both a R&D and a lean department, that together researches methods that can increase productivity and efficiency in the process flow. This has evolved the operating method by, for example, implementing processing over night in the process flow. This organizational structure would require a change in the business model and the recruitment of the correct employees, which is not easily implemented in 5 years. Therefore, organizational structure is mentioned as a source of sustained competitive advantage.
- **IT system:** Eurofins is developing an in-house IT system that will support both internal and external processes when launched. The new IT system will improve client communication and the out-sourcing procedure, among others. This new IT system is already being developed for 15 years. After launch and the initial testing phases, the IT system could become a source of sustained competitive advantage, because the long in-house development process, the causal ambiguity of development and the amount of data needed to develop a similar system. Eurofins serves the largest market share and possess the most data.
- **Long client relations:** the clientele network is also mentioned as a source of sustained competitive advantage. Most clients have been associates of Eurofins for a long period of time, and have developed a relation with both account managers, the operating process, and the reporting structure. This familiarization and built of trust are not easily established and can therefore be seen as sources of sustained competitive advantage.
- **Knowledge:** certain knowledge within the company is important for innovation and growth. The knowledge of regulation and policy, and technologies is not easily developed. When a company possesses human capital with the right knowledge, those can become sources of sustained competitive advantage.
- **Eurofins network:** The extensive Eurofins network presents a back-up of resources and competences. Through the network, Eurofins can offer a large portfolio of analyses and a well-established out-sourcing procedure that unburdens the clients. This infrastructure between the Eurofins divisions is hard to replicate within 5 years and can therefore be regarded as a source of competitive advantage.

Although, eight interviewees consider the competitive advantage within the Dutch environmental testing market as sustainable for 5 years, 17 participants argue that there is no sustained competitive advantage possible in this market because of four different reasons. Two of these reasons, exchangeable resources and regulation and policy are grounded in multiple interviews:

- **Exchangeable resources:** 12 interview participants mention the highly exchangeable resources as reasons why a competitive advantage cannot be maintained for 5 years. There are little distinctive resources, and all resources could be obtained through extensive investing. Because of the high replication opportunities, competitive advantages in this industry are often only temporary.
- **Regulation and policy:** in three interviews, regulation and policy is grounded as the reason of sustained competitive advantage improbability. Most analysis are strictly regulated in law and policy. This is an open source that all companies of the Dutch environmental testing market have access to and must adhere to. New developments within a company will become standardized in regulation and policy, resulting in access for all competitors and neutralizing the competitive advantage.
- **Rapid developments pace:** in the current Dutch environmental testing market, the developments in both knowledge of harmful compounds, analysis technologies and regulation are rapid. This rapid development pace limits the period of competitive advantage, and the 5-year advantage cannot be sustained.
- **Product life cycle:** whenever a new contamination group emerges and itself importance had resulted in new regulation and policy that obliges its analysis, a grid of analysis location is designed to map the contamination in the Netherlands. After the contamination is mapped out, the demand will decline. Because of this, a sustained competitive advantage of 5 years cannot be maintained.

Next to the interviewees that argue for or against the existence of a sustained competitive advantage, there are three participants whose answers were coded with unclear. These individuals stated that they did not possess enough knowledge of the company's and competitors' resources to present to distinguish resources that would lead to a competitive advantage that can be sustained for 5 years. A closer look into these individuals showed that they were employed at Eurofins for a relatively short time. This should not influence the rest of their interviews as the time of employment is sufficient to obtain the knowledge of their respective expertise on which they were selected.

#### Comparison framework and interview results

Next to the arguments made by participants in support of sustained competitive advantage and against it, three interview participants mentioned that it was unclear whether sustained competitive advantage could be realized in the market. The reason was that they considered their knowledge of the market and the process of exploiting competitive advantages in the market, insufficient. The number of grounded yes (8), no (17) and unclear (3) codes does not add up to the total number of interview participants (26), because in some cases participants have answered the question with both yes and no. To prevent interview bias, both yes and no were coded for these cases.

For a clear overview, all sources of sustained competitive advantage identified by both the VRIO framework, and the interview participants are listed in Table 5.4. When comparing the resources that were identified as sources of sustained competitive advantage by the VRIO framework (section 5.2.1) and the analysis of the interviews that argue in support of the sustained competitive advantage, similarities were found. Economics of scale is identified as both a theoretical and practical source of sustained competitive advantage. In the interviews, organizational structure is a source of sustained competitive advantage, the reasons presented can be linked to the resources overnight process and optimization from the VRIO framework. Similarly, the advantages of the Eurofins network are described by interview participants as linked to the organization structure and the one stop shop service.

**Table 5.4:** Comparison analysis results from framework and interview data

Framework	Interviews
Identical sources of sustained competitive advantage	
Economics of scale	Economics of scale
Overnight process Optimization	Organizational structure
Organization structure One stop shop	Eurofins network
Difference sources of sustained competitive advantage	
<ul style="list-style-type: none"> <li>• In-sourced transport service</li> <li>• Readiness to invest</li> </ul>	<ul style="list-style-type: none"> <li>• Long client relations</li> <li>• Knowledge</li> <li>• IT system</li> </ul>

From the interviews also resources long client relations, knowledge and IT system were identified as sources of sustained competitive advantage. The resource, long client relations, was classified as a source of unexploited competitive advantage using the VRIO framework. This difference stems from the fact that Eurofins does realize this advantage but does not fully exploit the client relations at this moment. Knowledge and IT systems were labelled as sources of competitive parity while interview participants view these as sources of sustained advantage. However, the significance of these answers is low due to the low frequency. The development of the IT system is not finished, and this is not yet a source of sustained competitive advantage. Knowledge is a resource closely related to innovation and development. Of all participants, 10 interviewees mention knowledge as a strength of the company. However, most do not view the resource as a source of sustained competitive advantage of 5 years, since the innovations performed with the knowledge is imitable within 5 years.

The majority of the interviewees oppose any resource in the environmental testing market being a potential source of sustained competitive advantage for the time constrain we set. Of these participants, 70% argue that the resources are totally exchangeable since the access to resources is similar to all companies in the environmental testing market and that there are little to no distinctive resources. This contradicts the assumption of the RBV that resources are immobile. Analysis of the Dutch environmental testing market might be limited when only looking through the single theoretical perspective of the RBV framework. Chapter 7 discusses this further.

### 5.3. Regulation theories analysis

Finally, the Dutch environmental testing market is observed through the third theoretical perspective of economics of regulation theories. These theories acknowledge that the government intentionally uses its authority to affect behavior of different parties in markets and industries. This is done by setting standards, involving instruments of information gathering and behavior modification. This governmental intervention is taken to counter potential conflict between public service and commercial operation. Taking a regulatory view on market developments, certain connections between market aspects can be clarified. This, in turn, can lead to better decision making in strategy formulation by the firm.

As mentioned in Chapter 3, positive theories of regulation are used to observe the Dutch environmental testing market. These theories focus on why and how influence from governmental institution occur. Four reasons from the occurrence of regulation are presented. Taking these four reasons into account, the interview data is analyzed, and the Dutch environmental testing markets and its developments are

observed from the regulatory perspective:

- Government desires to eliminate information asymmetries
- Customers seek protection from market power
- Companies profit from a high entry barrier as protection from potential rivals
- Companies desire protection from government opportunism

In the interviews, 23 participants mention regulation and policy as a part of the Dutch environmental testing market. All codes related to regulation are analyzed with the four reasons in mind.

Most participants answer that long-lasting competitive advantage is unlikely in the Dutch environmental testing market. They argue that standardization in regulation and policy either hindered innovation in existing analysis methods or neutralize distinctive methods through open-sourcing. This relates to the first reason for regulation development. These standards derive from the governmental desire to eliminate information asymmetry and ensure equalization in information comparison. The government does not possess the necessary in-house knowledge to compare different analysis methods for the same contamination to determine contamination levels in different environmental conditions and take the corresponding action. When a company develops a new analysis method that is not yet standardized in regulation and policy, they often experience first mover advantage and are able to enjoy high profit margins because of it. Competitors are encouraged to follow this development to also enjoy early mover advantages. However, the cost of imitation, mostly causal ambiguity when the competition does not possess all information on the development of such analysis, could result in a difference in analysis method. This is undesirable for the government as it makes comparison unclear, to counter this, the analysis method is standardized, which in turn neutralized the cost of imitation. After imitation by the competitors, the first mover advantage and corresponding high profit margin, are reduced again. This is also relates to the period of competitive advantage. The delay in governmental response to a newly developed analysis method is not instantly but is unlikely to take 5 years. Therefore, innovation can result in temporary competitive advantages for 1-3 years (the time indicated by interview participants), but not the 5 years set to define sustained competitive advantage.

The second reason for regulation development stems from the protection of customers against abuse of market power by companies. The customers in the corporate chain of the environmental testing market, in other words the end consumer, are required by regulation to perform environmental analysis in the operation of their core business. Because of this requirement, customers have less bargaining power when testing companies choose to abuse their market power. This phenomenon can be seen in market that behave monopolistic. However, Chapter 2 has shown that the Dutch environmental testing market has multiple main key players, that compete against each other. This competition has resulted in relatively low product prices. In the current market, customers are not in need of protection from market power. This type of institutional intervention are not witnessed.

Another reason for regulation to occur, is the companies' desire to enjoy protection from threat of entrants and potential rivalry. The high requirements of analysis methods and quality make it hard for new entrants to penetrate the market. Most new entrant also have little knowledge of the market to penetrate properly because of the regulations set by government. This protection from potential rivals is not the main purpose of the institutional intervention, but a side effect of the government's desire for the market to possess highly comparability. Most interview participants view emerging technologies as threats to the current operational model. Just three participants mention that the emerging technologies are no threat in the nearby future, because of delayed governmental approval of these technologies.

Finally, regulation can also stem from companies' desire to be protected against governmental opportunism. Theories of opportunism state that some actors could take advantage of other parties to advance their own interests by making false promises, misrepresenting intentions, reneging on agreements, or changing the terms of a deal for their own benefit. Interview participants do not mention large conflict with institution in which becomes clear that the government might have other intentions to certain regulations and policies. On the other hand, five different interview participants mention the advantage for companies, when they are able to control regulation or look ahead of policy formulation. Currently, the government is leading in determining which substances should be measured and

how the analyses should be performed. However, because of the lower in-house knowledge with the government, the decision-making and policy formation is often slow. When companies can use their technical and market knowledge, and governmental ties, they can become leading in certain aspects of regulation creation.

# 6

## Combined analysis of market aspects

*"If you're competitor-focused, you have to wait until there is a competitor doing something. Being customer-focused allows you to be more pioneering."*

— Jeff Bezos

In the previous chapter, the interview data was analyzed through different theoretical perspectives. This chapter is dedicated to the combined perspective of three different theories in the single conceptual framework (see section 3.3). In section 6.1, the external and internal analysis of the market environment are combined in a confrontation of the strengths and weaknesses (internal attributes) with the opportunities and threats (external attributes). From the SWOT analysis and confrontation matrix, positive and negative key issues are found. As part of the conceptual framework, these insights are viewed through the regulatory theory perspective, before the strategic analysis is performed. This analysis in section 6.2, results in the answers to the third and fourth research sub-questions: "What is the most suited business strategy considering the current challenges?" and "What circumstances are needed to adapt the most suited business strategy?".

## 6.1. Application of the conceptual framework

To analyze the multiple aspects of the Dutch environmental testing market, a conceptual framework was set up from multiple theoretical perspectives. The framework combines an external analysis method, the competitive forces approach, with an internal analysis method, the resource-based view framework. Additional to these theoretical perspectives, is the economics of regulation theory, due to the large influence of regulation on both the external and internal of the environmental testing market. The next sections are dedicated to this combined perspective analysis.

### 6.1.1. Combining the external and internal analysis

First, the external and internal analysis were integrated. This can be executed through a SWOT analysis, in which the strengths and weaknesses (obtained through an internal analysis) are combined with the opportunities and threats (obtained through an external analysis). After a confrontation of the two analysis types can result in key insights on how firms can use their strengths and how they should improve their weaknesses to benefit from opportunities in the market and to mitigate threats. The outcome of this section can be used for the strategic analysis and support the main research question answered later.

#### SWOT analysis

In this section, a SWOT analysis is performed to support evaluation and preliminary decision making of the strategic position of the organization. The analysis identifies market aspects and categorizes them into four categories. Strengths are aspects that have an organization internal origin, or in other words are attributes of the organization, and that support the achieving of an objective in the organization. Weaknesses are aspects that also have an internal origin but are harmful in achieving the objectives. Opportunities are aspects that are of external origins but could be helpful in achieving an objective. And lastly, Threats are aspects of external origin, but are instead harmful to achieving the company's objectives.

In the 26 interviews taken, the different strengths (57), weaknesses (57), opportunities (64) and threats (30) were coded throughout the whole interview, unrelated to question numbers. In this section we will address the top 5 (or 6 in cases of equal frequency) most mentioned of each category. Figure... visualizes the results from the SWOT analysis.

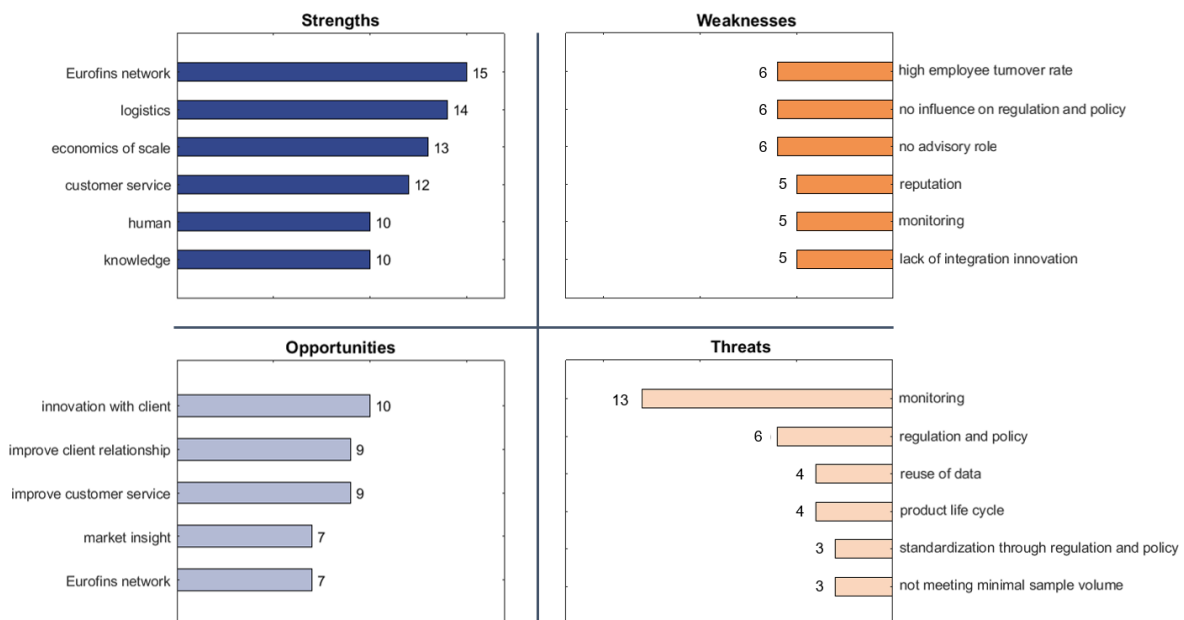


Figure 6.1: SWOT analysis of the expert interviews

### Strengths

The strengths of the organization are characteristics that could present an advantage over competitors. Figure 6.1 shows six strengths that were most frequently answered:

- **Eurofins network:** 15 different participants indicate the extensive Eurofins network which not only supports the in-sourced transport and one stop shop service, but also functions as a back-up monetarily, as a strength of the organization.
- **Logistics service:** 14 different participants mention the logistics of pre-process to be a strength of the organization. This includes delivery of sample packaging and the in-sourced transport service that also accurately scans the samples at pick-up which starts the entire analysis process. This is seen as a strength because of the flexibility of the in-sourced transport and the structured organization of the sample process by scanning the samples at each analysis step, simplifying the communication to clients about the analysis phase of their sample.
- **Economics of scale:** 13 participants point out the economics of scale. The sample volume of some client request can only be processed by Eurofins because of the laboratory size. This is accompanied by pricing and a faster turnaround time, which in turn presents a favorable negotiation position for sales at Eurofins.
- **Customer service:** 12 different interviewees recount customer service as strength of the organization. Especially the knowledge and competence of customer service that support communication to the clients and establish added value of client relation.
- **Human:** 10 different participants acknowledge human resources as strengths of the organization. This resource touches upon the different competences in different departments all through-out the organization (R&D, laboratory, lean, customer service, logistics, etc.).
- **Knowledge:** 10 participants declare knowledge as a strength of the organization. The knowledge within certain individuals and departments, supports the added value of their function or developments in the organization.

Customer service is mentioned frequently as a strength of the organization. Since this is also an expertise group, a closer look was taken into the distribution of the groups in this code. One third of the code frequency originate from the expertise group customer service. Besides this, the strength is most addressed in expertise groups business and process development, together making up almost half of the code frequency. This validates that 'customer service' is perceived as a true strength of the organization and not just by participants involved in this part of the organization.

Of these six resources that were coded as strengths, 'Eurofins network', 'logistics', 'economics of scale', and 'knowledge' were also listed as sources of sustained competitive advantage by the particular internal perspective taken in section 5.2. This is unsurprising because of the definition of strengths within the SWOT analysis. The fact that these resources are also returned as the most frequently mentioned strengths of the organization is further validation of the results obtained on sources of sustained competitive advantages.

### Weaknesses

The weaknesses of the organization are characteristics that could present a disadvantage relative to competitors. Figure 6.1 shows six weaknesses that were most frequently answered:

- **High employee turnover rate:** 6 participants addressed the high employee turnover rate within the organization as a weakness of the organization. This employee turnover rate is experienced in all organization departments.
- **No influence on regulation and policy:** 6 interviewees mention the lack of influence on regulation and policy. Many analysis methods are described in regulation and policy, but when new technology or a different processing step could improve the analysis method, this adaptation of this improvement is slowed by governmental decision making.
- **No advisory role:** 6 different participants indicate that Eurofins is unable to take up the advisory role as an additional service because it could cause conflict with certain clients that offer this service as their core business.



- **Reputation:** 5 interviewees mention that Eurofins is often associated with the high-volume laboratory at low pricing. This reputation can be viewed as a weakness of the organization as clients do not perceive the value of the surrounding service, which would result in an investment of these services that is not returned by the client.
- **Sensoring:** 5 participants point out that the lack of resources related to monitoring or in situ measuring technology is a weakness of the organization. These emerging technologies could potentially disrupt the current operating model of environmental testing companies. This result in either large investments needed to catch up to the developments or dependence on partnerships with companies that are developing these technologies.
- **Lack of integration innovation:** 5 interviewees addressed the lack of integration of innovation and developments internally as a weakness of the organization. Many developments are researched but when an innovation is ready for implementation within the laboratory process there is a barrier than prevents easy integration. Next to this, certain implementation in the laboratory is not translated in a sales strategy and communicated with the clients.

For most above listed weaknesses, the distribution of the expertise group is relatively even over the different groups, except the weakness lack of integration innovation. Of the five times this weakness was coded, the weakness was mentioned three times by a participant of the customer service expertise. This could be caused by CS often being the first one to catch wind of new developments from clients or the market, which they relay to another department within the organization. When the transfer to the next integration step becomes a bottleneck, it could be that CS notices this the most, as they were aware of the innovation process transpiring.

Another thing that stands out within the weaknesses of the SWOT analysis, is the frequency of weaknesses coded is much lower than the strength. This indicates that within the company it is much more clear what the company strengths are, but less wide known are the weaknesses.

#### Opportunities

The opportunities are elements in the environmental that the organization could exploit to its advantage. Figure 6.1 shows the five opportunities that were most frequently answered:

- **Innovation with client:** 10 participants mention innovation with the client as an opportunity for the organization. This opportunity stems from the external driver customer needs and the market. Through innovation with the client, the organization can perform focused innovation based on the customer needs.
- **Improve client relation:** 9 participants point out improvement of client relation as an opportunity for the organization. By creating a strategic relation with the clients, the organization can improve their added value and overall customer satisfaction.
- **Improve customer service:** 9 interviewees indicate improvement of customer service as an opportunity for the organization. This improvement is often related to forecasting supply and demand and better communication.
- **Market insight:** 7 participants mention the need for market insight for focused innovation. An opportunity for the organization would be to create and improve network relations that results in information from the market.
- **Eurofins network:** the fifth most frequently coded opportunity is the Eurofins network. 7 participants suggest that improved collaboration between the different Eurofins entities, could result in faster innovation and an even large portfolio, further supporting the one stop shop service.

In the top 5 most frequently coded opportunities, most opportunities are related to the customer. The price positioning of the organization is being turned around by Eurofins management into a service positioning. This change has not been officially communicated to all employees of the organization. When asked about the company strategy, the most frequent coded strategy is pricing, but not once in the MT expertise group. The management vision is to improve on client relation and provide more added value to the service to distinct from competitors. Although, this vision has not been officially presented, there is no large distribution difference between the expertise groups that indicate the shift to service positioning. These most frequently coded opportunities show that it might be advantageous to the firm to position themselves closer to the buyers of the market.

### Threats

The last part of the SWOT analysis is to identify the threats. The threats are elements that could potentially upset the organization's business. Figure 6.1 shows the five threats that were most frequently answered:

- **Sensoring:** the threat of monitoring and in situ measuring technologies is the most frequent mentioned threat, mentioned by 13 different participants. This emerging technology is perceived as a real disruptor of the current operating model.
- **Regulation and policy:** 6 different participants point out regulation and policy as threats to the organization. When the government changes regulation and policy this could be disruptive to the business and operating model.
- **Reuse of data:** 4 interviewees also see reuse of data as a threat to the organization. The reuse of data will decrease the sample volumes, which in turn affects the organization's profits.
- **Product life cycle:** 4 participants similarly to reuse of data, address the product life cycle of certain analyses. When a contamination has been mapped out, the request to the analysis will decrease. This also affects the organization's profits.
- **Standardization through regulation and policy:** 3 different participants indicate that standardization of analysis, developed by the organization, in regulation and policy is a threat to the organization. This standardization results in an analysis method becoming open source, making it perfectly imitable, which ends a company's competitive advantage.
- **Not meeting minimal sample volume:** 3 participants addressed the decline in sample volume as a threat to the organization. The organization's profits depend on a certain minimal sample volume. Through multiple ways, this volume could decrease and result in a decline in profits for the organization.

Not shown in Figure 6.1, but also mentioned with a frequency of 3 are the threats 'DNA techniques' and 'loss of knowledge'. As addressed before, DNA techniques could change the way contaminations are defined in the environment. Therefore, they are a disruptive threat to the organization that should be considered. The threat 'loss of knowledge' is related to the high employee turnover rate within the organization. When knowledge is not secured in certain systems, the knowledge of individuals is lost when they leave the company. This has the potential to become a threat when the individual leaves the organization for a competitor, or when many experts (with their experience and tacit knowledge) leave the organization.

Taking a closer look to the distribution of the expertise groups in the top 5 most coded threats, it was found that 'sensoring' was mentioned by five of the six participants from the management team expertise group. Also, the threat, regulation and policy, is coded in four of the six interviews from the customer service group. Therefore, the share of the MT and CS of the total coded frequency of the top 5 threats was determined. It was found that these two expertise groups make up 2/3 of the code count in the top 5. It could be that MT and CS are more involved with threats and countermeasures. When taking a look into the code count per expertise group over the total coded threats, MT was indeed found to mention the most threats with a count of 24. Surprisingly, CS (count of 14) was not found to be the second most frequented group. Within the business development interviews, a count of 19 threats was discovered. This difference is largely due to mentions of threats like 'laboratory requirements', 'unfocused decision making', and 'the pressure on the labor market', that lack in the CS interviews.

### Confrontation matrix

To extract the insights from the SWOT analysis, a confrontation matrix is established. To focus the confrontation matrix, the SWOT analysis elements obtained in the previous section are reduced to four units per element each. The four elements from the SWOT analysis are confronted against each other through the four questions set up in section 3.3.2. The correlation of the strengths, weaknesses, opportunities, and threats found are visualized in the matrix shown in Figure 6.2. The correlation scores in the matrix are taken from Table 3.1. The sum of the correlation score of a single element indicates key issues (either positive or negative) for the firm.

		Strengths				Weaknesses				
		Experts	Customer service	Economies of scale	Eurofins network	Lack of integration innovation	No sensing technology	High employee turnover	No influence on regulation	
Opportunities	Eurofins network	0			+			0		1
	Market insight	+	+	-	-		-	0	-	-2
	Improve customer service	++	++	+		-	-	-	0	2
	Innovation with client	++	++	+	+	--	-	-	-	1
	Decline in sample volume	-	+	--	+	--	-	-	-	-6
Threats	Product life cycle			-	0	0	-		-	-3
	Regulation and policy	+	-	-	-			-	--	-6
	Sensing technology	-	-	-	-	-	--	-	-	-9
		4	4	-4	0	-6	-7	-5	-7	

Figure 6.2: Confrontation matrix of the SWOT in the Dutch environmental testing market

First, the confrontations between single elements of SWOT are analyzed. These single element confrontations are:

- **Strengths vs. Opportunities:** confrontation of these elements point to **growth** strategies
- **Strengths vs. Threats:** confrontation of these elements point to **defend** strategies
- **Weakness vs. Opportunities:** confrontation of these elements point to **improve** strategies
- **Weakness vs. Threats:** confrontation of these elements point to **withdrawal** strategies

When the key strengths and opportunities are confronted, it is found that two main strengths of the firm highly play into two of the opportunities found in the market. The strengths 'Experts' (which is a combination of the strengths 'humans' and 'experts' in Figure 6.1) and 'Customer service' are positively confronted with the opportunities 'Improve customer service' and 'Innovation with the client'. With these two strengths, the firm is capable of providing better service to the customer and meeting customer needs more accurately through collaborated innovation.

In the confrontation of internal strengths and external threats, one main negative key insight can be seen. The strength 'Economies of scale' is threatened by 'Decline in sample volume'. The benefit that environmental testing companies enjoy from their economies of scale depends on a certain minimal sample volume. A decline in sample volume reduces the profits made from this strength. This correlation points to the need for a strategy that defends this strength from the threat.

It is also important to observe the confrontation of a firm's weaknesses against the opportunities in the market. This provides insights into how the firm should improve certain weaknesses if they want to act on an opportunity. From the confrontation matrix, one main negative key insight was observed. The weakness 'Lack of integration innovation' correlates with the opportunity 'Innovation with the client'. When the firm wants to take an innovation positioning in the market, they should improve the innovation cycle to not face delays or costly investments.

Lastly, the internal weaknesses are confronted with the external threats. Three negative correlations were found between the weaknesses and threats. The weakness 'Lack of integration innovation' is not being improved to resist the 'Decline in sample volume'. This can lead to the supply of certain analysis not meeting the demand from the market, which is a profit loss for the firm. The correlation of weaknesses 'No influence on regulation' and 'No sensing technology' with threats 'Regulation and policy' and 'Sensing technology' respectively, is evident. These correlations point to a neglectance of relation formation with government or new emerging technology developers. In terms of strategy, a withdrawal of this neglectance could aid the operation.

#### Other insights obtained

In the SWOT analysis, many codes represented the multiple facets of the organization's strength and weaknesses, and the opportunities and threats of the external environment. Notable is that some codes indicated as a company's strength as well as a weakness of the company by different participants. This section is dedicated to the analysis of these insights obtained outside of the confrontation matrix. It elaborates on two resources: the 'Eurofins network' and the 'Readiness to free resources for innovation' (a resource related to the organizational culture).

The Eurofins network was the most frequently mentioned strength of the organization by the interview participants, with 15 different participant mentions. However, 5 different interviewees also mention the network as a weakness. This originates from the cross-divisional competition. It is possible that one division services an industry that partially overlaps with the service of another Eurofins division, or another scenario is that a division penetrates a market in a country that does not possess a division in that industry yet. It can be that investments are made, but eventually the service and resources are allocated to the other division, or a new division is set up in the country. This results in less return on investment. The internal competition also inhibits certain innovation potential of the multinational enterprise. It might benefit the organization to research how the decentralization of the organization structure and operation, can be separated from the collaboration and innovation process cross-division.

Another resource that was coded as both strength and weakness of the organization was the 'Readiness to free resources for innovation'. Four different participants mention that the organizational culture of the firm support quick allocation of financial capital when sudden changes occur in the external market environment, an example being the up-scaling of production at the emergence of PFAS. However, four participants indicate that the readiness to free up resources for innovation is not equal for the different categories of resources. The firm is willing to free the financial resources, but does not exhibit the same readiness when it comes to resources like physical and human resources, even though these resources are needed to support the implementation of the innovation in the operational process.

Overall, the SWOT analysis and the confrontation matrix of the interview data has provided links between the firm's internal assets and the market's external circumstances. In the next section, these insights are viewed through the lens of regulatory theories, before the strategic analysis is performed.

#### 6.1.2. Additional regulatory theory perspective

It was expected that an external and internal analysis of the Dutch environmental testing market might not highlight the impact of institutional intervention, which would result in key insights that might differ from reality. Therefore, the third theoretical perspective is taken in the conceptual framework, to put focus on the role of regulation and policy.

From the SWOT analysis in section 6.1.1, it was found that the largest perceived threats to the Dutch environmental testing market are sensing technologies. These emerging technologies are radical innovations that have the potential to disrupt current the current operating model of companies in the market. One of the explanations of regulation development is the incentive of operators, the companies, to establish a high entry barrier. The emerging technologies are often being developed by smaller companies that do not possess the necessary accreditation and clientele network needed to realize entry to the Dutch environmental testing market. However, the new technology should not be neglected, because regulation in favor of these technologies could occur to lower costs of analysis (related to the reduced effect of market power on the customers) and for the government to gain favor from industries

(related to governmental opportunism). The technological improvement of new emerging technologies could even aid the government in its desire to reduce information asymmetry, as new technology could reduce complexity of the analysis process.

The link between the lack of sensing technology of the firm and the threat of emerging sensing technology can also be seen as an opportunity through the regulatory perspective. The current high entry barrier is not established through incentive of the companies. However, the registration and licensing process, and inspection process elements of regulation set by the government, indirectly result in the high entry barrier advantage for current operators in the environmental testing market. Companies that recognize this gap, can potentially turn this into an advantage. New entrants that have developed the new technology within the environmental testing context, have a hard time satisfying the stringent policies set by the government. This could be caused due to the complexity of the regulation and policy, the small client network, and the high cost of replication of certain resources. One of the opportunities of companies in the environmental testing market, that is also mentioned by interview participants, is to form partnerships with these emerging technology companies. The partnership can be mutually beneficial as current environmental testing companies do not invest potentially costly resources to develop the new technology, while the new entrant can use the partnership to overcome the high entry barrier.

Another key insight from the confrontation matrix was the indication that the firm could use its strengths to adopt growth strategies to position them in innovation and service market's opportunities. These customer centered opportunities were also observed with the regulation theory perspective, since one of the reasons for regulation occurrence is to protect customers from market power abuse. In the current circumstances of the Dutch environmental testing market (Chapter 2), it was seen that the consolidation waves have stagnated and a few key player have been established. It has become unlikely that one is capable of overtaking the other. The chances of the market evolving into a monopoly are small, which in turn will maintain the market competition and protect the customers from an absolute market power. This additional insight shows that the opportunities in innovation and service positioning will not be largely influenced by customer driven regulation.

Most of all the regulation set by the government is to deliver high environmental quality to society. An increased environmental quality contributes to the quality of life, which in turn benefits the institution. The current regulations and policies implemented by the government are set to reduce the information asymmetry between the government and the environmental testing industry. However, these regulations also delay governmental decision making and the innovation rate within the industry (since industry is limited by the standardization). Government and companies alike might reduce this information asymmetry in other forms than regulation.

## 6.2. Strategic analysis

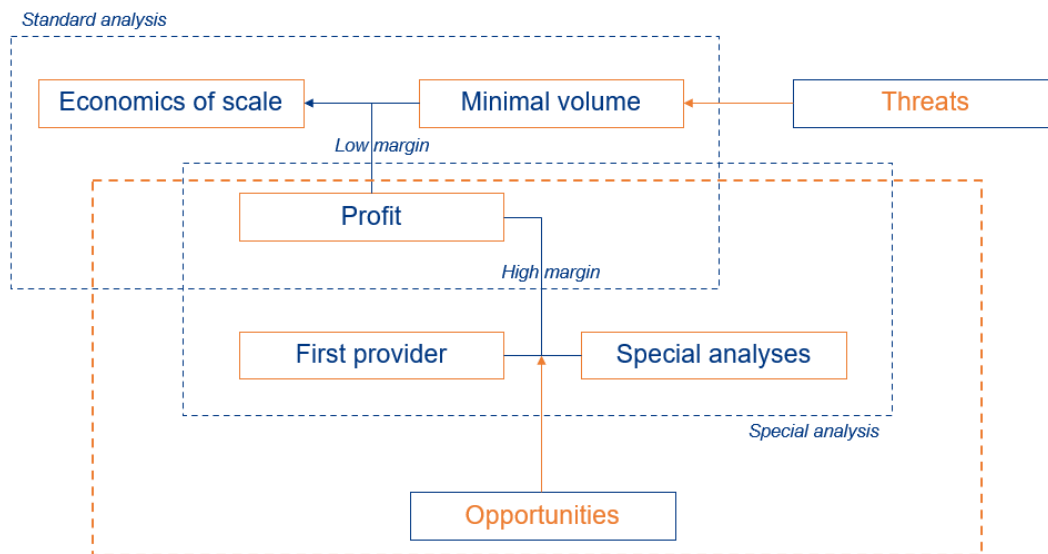
The insights obtained from the confrontation of the external and internal analysis, and the additional insights obtained through the perspective of economics of regulation theories, can be used in the formulation of the most suited business strategies and the circumstances needed to support the strategy. This section is dedicated to combining the multiple insights from the conceptual framework.

### Competitive positioning strategy

Two key insights from the conceptual framework are also correlated. One of the main strengths from the firm, is the economics of scale. Through the economics of scale, the low turnaround time and additional services like the logistic service can be provided. From a Resource-Based View perspective, this resource is a source of sustained competitive advantage due to the cost of imitation. However, majority of interview participant indicates that the resource can be replicated by competitors with sufficient investment. An additional factor is the low profit margins on the standard analyses performed. The low profit margin results in a required minimal volume before the economics of scale returns a profit. This dependence on sample volume was shown to be a negative key issue in the confrontation of the strength 'Economics of scale' with the threat 'Decline in sample volume'.

Currently, the minimal volume is realized, but from the external analysis multiple threats are identified that could possibly affect the volume needed to profit from the economics of scale. From the interviews,

it was made clear that a higher profit margin is made on special analyses for which the organization is the main provider in the market. The example presented is the PFAS analysis package offered at Eurofins. When the PFAS crisis hit, Eurofins was able to quickly scale-up their PFAS production, which enabled them to set higher profit margins on the PFAS analysis. When the sample volume declines threatening the profits made from standard analysis, companies in the environmental testing market should look for another methods to make profit through increase of their added value to customers. This correlates with the positive key issue found between the firm's strengths and the opportunities in the market from the confrontation matrix. Utilizing the firm's 'Experts' and 'Customer service' strengths, they firm can create new analysis methods (also called special analysis method since they deviate from the standard analysis packages) in collaboration with the client and obtain added value to their service by improving the customer service further. These insights indicate innovation- and service-oriented positioning of the firm in the market. Through improved and specific innovation to meet the customer needs, the environmental testing firms can enjoy profits from these special analyses when they are the first provider of these analyses. The combination of these insights is visualized in Figure 6.3.



**Figure 6.3:** A systematic overview of the current threats to the financial performance of the organization, and how opportunities can improve the financial performance.

Although, some interview participants mention that innovation of special analysis methods does not present a source of sustained competitive advantage due to the high development pace in the market and standardization through regulation and policy. Companies in the Dutch environmental testing market should not pursue a source of sustained competitive advantage and maintaining it for 5 years, but they should look for resources that create a continuous temporary competitive advantage.

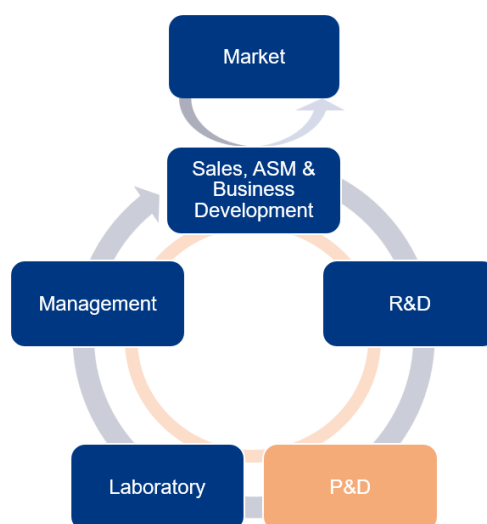
Firms adopting an innovation or a service positioning in the market, should possess certain resources and capabilities to successfully implement such strategies. Section 3.3.3 mentioned that firms adopting an innovation strategy, should possess superior development competencies in combination with both technical and creative abilities. Also, firms should recognize that the innovations need to be tested first before launch, to avoid further investment on unwanted innovations. Firms adopting a service positioning strategy, should recognize the variation in nature and level of service required in the client portfolio. It is critical to possess market sensing attributes, strong customer relation with key customers, systems that support the delivery and monitoring of service, and in particular human resources that provide the service. These criteria and the key issues obtained from the conceptual framework combined, present some internal circumstances that are required for firms adopting these strategies.

#### Criteria for the adoption of the strategy

First, market insight is needed not only to understand the customer needs with regards to their demand in product, but also in the nature and level of service desired. Environmental testing companies should not just service their customers based on their demand, but use the relationship with their client to

create a partnership in which innovation is result of collaboration. Market insight also includes closing watching the process of regulation creation, and even try to influence this process. The institutional context of the testing market was found to be one of the main obstacles in the innovation process. Companies could enjoy an advantage from the creation of governmental ties. This benefit could be mutual, since the government also benefits from the partnership through obtaining more technical knowledge which aids them in their decision making and policies creation process. However, it should be noted that creating governmental ties could be costly. It is not clear what factors lead to obtaining and maintaining these ties, which creates a risk to organization that choose to pursue this resource.

Secondly, experts are needed to support the innovation and service strategies. Not only are human resources needed in development positions in the firm that possess superior innovation competencies, but also experienced employees are needed in servicing positions, since relation with the key customers are social complex resources that need to be cultivated over time. The experts in close contact with the clients also help in testing special analyses before full launch. These experts need to be supported by proper documentation systems, that tracks communication to help delivery and maintaining of the desired level of service. Currently, the market faces high employee turnover rates due to the pressure on the labor market. Every part of the organization plays a role in the operating model and need the right people preserving the operational excellence. Companies can improve employee experience to generate more company loyalty, but organizational attachment remains a social capital. In Chapter 7, social capital will be discussed in more detail. Companies can also counter the impact of experts (and the corresponding knowledge) leaving through knowledge retention in knowledge management systems. The operation model of environmental testing companies should not depend on a certain set of individuals.



**Figure 6.4:** The continuous innovation cycle designed. The cycle supports continuous collaboration between the different departments involved in the innovation process. Additional steps ensure internal communication and the integration of the innovation from R&D to the laboratory.

Innovation is made possible by collaboration of different departments. Employees from sales, customer service, and business development work in close contact with the client and are more likely to pick-up new developments in the market in its initial phase. These initial ideas should be shared with those who possess essential knowledge to research new developments in the context of the company's operation. At Eurofins this is a separate department, but in AL-WEST this is performed by laboratory experts. The laboratory experts at Eurofins collaborate with the R&D department to integration innovations in the current operating model. The management team plays a role both in choosing which developments to invest in as well as adapting new innovations in the company's business model. The sales department can use this to create a new sales strategy to inform clients of the new development. This correlates to one of the key insights of the confrontation matrix: the need to improve the 'Lack of integration innovations'. Proper communication systems between the multiple departments is needed,

while simultaneously a systematic approach of ownership of the innovation is taken. This could prevent the innovation process being delayed in a certain phase of the innovation cycle (proposed in Figure 6.4).

The internal communication of the innovation cycle can be improved by a multidisciplinary approach as visualized by the orange circle. This multidisciplinary approach can be a multidisciplinary team that is responsible for the innovation process or weekly progress meetings between experts of the different departments. The meetings could be used to inform on the progress of developments and pass on responsibilities between departments. Also visualized in Figure 6.4 is an extra group between R&D and laboratory. This group, named Process & Development, can ensure the proper integration of innovations from R&D into the laboratory operation.

Furthermore, firms should invest in a certain level of overcapacity in their internal resources. The resource 'Readiness to free up resources for innovation' was mentioned as both strength and weakness in the SWOT analysis. Eurofins, as an organization, is good at freeing financial resources when faced with a sudden development from the market. An example is the scale-up of PFAS machines in 2019 from one to twelve, while the competitor SGS scaled up from one to two machines. However, Eurofins is less ready to free physical, human, and organizational capital that are needed to support the development of the innovation within the organization. An overall overcapacity in resource helps the organization to easily allocate resources, without obstructing the usual operations.

Lastly, interview participants mentioned the need of a clear management policy. A clear management policy can define when and how action is taken when new market developments occur and assign responsibility to different phases of the innovation cycle. This shortens the innovation cycle and can result in a flexible structure in which the different departments operate. Innovation is predominantly focused on generating and vetting new ideas. The downside of this, is that most big corporation identify too many opportunities. A clear management vision simplifies the decision-making process and the allocation of resources, and enables their development in a coordinated and efficient way.

As mentioned previously, investing in sources of potential sustained competitive advantage possess a high risk due to the unknown development in the market. However, companies in the Dutch environmental testing market can create a continuous temporary competitive advantage through development of special analysis methods that return high profit margins until imitation or standardization. The five internal circumstances needed described in this section, can function as pillars to support the flexible, customer-oriented, innovation strategy structure of the organization.

## 6.3. Summary of Chapter

In conclusion, the Dutch environmental testing market was observed using the conceptual frameworks. The combined insights obtained from the external market analysis approach, the internal firm analysis approach, and the added theoretical perspective of regulation theories, indicate the firms can use their beneficial internal attributes to take up an innovation- and service-oriented business strategy. They should use their expert knowledge and customer service strength to create special analysis methods based on customer needs. The interview participants indicate that the possibility of maintaining sustained competitive advantage for over 5 years is low. Firms should not pursue a sustained competitive advantage for such a period of time, but continuous innovation could create continuous first provider advantage of special analysis methods. The higher profits enjoyed on exclusive special analyses in combination with the lower profits on standard analysis packages, could make up the threat 'Decline of sample volume' on the strength 'Economics of scale'. To adopt the innovation- and service-oriented strategy, multiple internal firm criteria were identified. A firm wanting to adopt such strategy, such invest in market insight both customer related as well as governmental, experts in all levels of the firm, internal communication systems, an overcapacity in resources for easy resource allocation, and clear management policies.



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# 7

## Discussion

*"If we knew what it was we were doing, it would not be called research, would it?"*

*- Albert Einstein*

This chapter is dedicated to the discussion of the multiple aspects of this research. First, a reflection of the different theoretical perspectives is presented in section 7.1. It elaborates on the usefulness of the theoretical perspectives taken, in obtaining insights on the different developments in the Dutch environmental testing market. The section also reflects on the theoretical power of the conceptual framework used in this research. After, section 7.2 addresses certain limitations of the research, including choices made in the research design in section, including a more detailed discussion of certain research findings in section 7.2.1. The chapter will conclude with future recommendation for follow-up research in section 7.3.

## 7.1. Reflection on theoretical perspectives

This research has used multiple different theoretical perspectives. Classical strategic analyses of markets combine an external market analysis, often called the macro- and meso-environment of the market, and an internal market analysis of the micro-environment (the market at firm level). From literature, multiple external and internal analysis methods were considered. For this study, two of the main trends within strategic management research were chosen for the external and internal analysis. The competitive forces approach, popularized by Porter (1980), was chosen as the analysis method for the external market environment. For the analysis of the internal firm environment, the main trend of the resource-based theories, the RBV was chosen. From literature, it was known that these external and internal analysis method might be too general to properly take into account the role of regulation on the market. Therefore, a third theoretical perspective was added through the lens of economics of regulation theory. This section is dedicated to a reflection on each particular theory and the insights obtained from it, and their combined perspectives in the conceptual framework. A more in-depth elaboration is presented of the different insights obtained and the theoretical usefulness of frameworks.

### 7.1.1. Particular theoretical perspectives and their usefulness

Theoretical perspective 1: external analysis approach

First, the external analysis was performed using the competitive forces approach. The objective of this theoretical model is to identify entities in the market with higher or lower market power. This can help in estimating opportunities and threats in the market, and in identifying competitive market positioning not yet occupied, which could present an opportunity to obtain a competitive advantage. The framework has been used widely in managerial research. In this study, the individual use of the competitive forces framework (section 5.1) has led to identification of the forces 'bargaining power of buyers', 'threats of new entrants', and 'threat of substitute product or service' as the most interesting competitive forces.

This external analysis method has proven useful in the identification of emerging analysis technologies and new emerging substances as threatening forces. The high entry barrier of the market and potential requirement of certain special analysis methods, indicate an opportunity for current environmental testing companies to develop these emerging technologies and special analysis methods. It has also shown that the low bargaining power of customers and the necessity of analysis, provide an opportunity for companies to position themselves more customer-oriented. Although these insights are useful, not all companies possess the attributes and competences to position themselves in these positions in the market.

Theoretical perspective 2: internal analysis approach

After, a different approach to examining a market was taken. The internal firm analysis approach is dedicated to identifying firm attributes that are the firm's strengths and weaknesses. With this understanding, firms can formulate strategies that play into their strengths and improve their weaknesses. For the internal analysis approach, the RBV framework was chosen. The theory recognizes that not all firms possess the same set of strategic resources and that these resources are immobile. Because of these two attributes, firms can obtain a competitive advantage not enjoyed by competitors. The theory points out that not all firm resources can become sources of long-term competitive advantage. Resource must be valuable, rare, costly to imitate, and be exploited by the organization (also called the VRIO criteria) to become sources of sustained competitive advantage.

Application of the internal RBV framework, insights were obtained on sources of different potential competitive implication. Especially the identification of sources of sustained competitive advantage, sources of unexploited competitive advantage, and sources of competitive disadvantage, are useful for the organization. The framework is useful in identifying which resources should be maintained, which should be improved, and which should be let go. After application of the framework, multiple sources of sustained competitive advantage were found. However, most interview participants indicate that a competitive advantage cannot be sustained because of standardization in regulation and policy.

Theoretical perspective 3: regulatory theory

Both the external and internal approach touch upon regulation. In the competitive forces approach, the necessity of analysis influences that bargaining power of buyer, while in the resource-based approach,

the identified sources of sustained competitive advantage might not return this advantage in practice because of regulation. These external and internal analysis approaches do not provide insight in how and why the regulation has occurred, and how companies can use this to their advantage. This indicates the added value of taking a regulatory perspective on the Dutch environmental testing market. The positive regulation theories indicate four reasons for regulation occurrence: the government-driven desire to reduce information asymmetry, customer-driven desire to be protected against market powers, operator-driven desire to set high entry-barriers, and operator-driven desire to minimize government opportunism.

Using the regulation theoretical perspective, it was found that regulation is mostly motivated by the government's desire to reduce information asymmetry and to retain comparability of analysis. The theoretical perspective has provided additional insight into the high entry-barrier as a side-effect of regulation in the market. This indicates multiple opportunities where companies can benefit from this high entry-barrier. Chapter 5 might suggest that the theoretical perspective of regulatory theories is explored less in-depth than the external and internal analysis approach. This might be due to the later addition of the theoretical lens. However, it does not decrease the importance of the insights generated using this particular perspective.

### 7.1.2. Combined theoretical perspectives and its usefulness

This study has suggested and applied a conceptual framework in which the three different theoretical perspectives, described above, are combined. The conceptual framework suggested an integration of the external analysis approach with the internal analysis approach through the construction of the SWOT analysis and the confrontation matrix. The individual external analysis identifies the opportunities and threats in the market. On the opposite side, the internal analysis derives multiple strengths and weaknesses of the firm. The conceptual framework confronts these two analysis approaches, and identifies which opportunities and threats are the most interesting to the firm, when considering its strengths and weaknesses. This confrontation helps in selecting the right growth, improve, defend, or withdraw strategies for the firm. These insights from the confrontation of the external and internal approach do not only provide insight to the most suited business strategy, but also to points of improvement when the firm wishes to adopt such strategy. The addition of the regulatory lens further supports and clarifies certain opportunities and threats in the high-regulated market.

This combination of the three theoretical perspectives in the applied conceptual framework has provided links between certain aspects of the market and its developments, there were less clear or not found when approaching the market through the particular perspectives of these theories. This study has shown that not only the confrontation of the external analysis approach and the internal analysis approach are useful tools in strategic management, but also that the addition of regulation theories is highly suitable in the Dutch environmental testing market. Additionally, the conceptual framework has identified governmental ties as important resources within the category political resources, previously not described by RBT scholars. This insight broadens the current resource-based perspective research.

## 7.2. Limitation of research

It is recognized that the research conducted contains imperfections. This section reflects on the most notable choices and interpretations made during the research and how these choices or interpretations could have influenced the results of the research. In the design of the research methodology certain assumptions were made. In this section, two of the assumptions, that are expected to influence the results, are discussed.

In Chapter 4, it was explained that due to the complexity of the research topics and the potential lack of deeper understanding by an interview participant, interview responses that were based on a feeling, were also taken into account in the data analysis stages. However, in the interview analysis, no distinction was made between interview answers that were given with certainty or answers that were based on a feeling. This was done to avoid introducing the objective nature of this assessment to the systematic approach (the researcher would have to decide when an answer is based on experience and know-how of the interviewer, or when the answer is based on a feeling or something that they might

have heard somewhere). Because this distinction is not made, the analysis results could vary (especially when results based on expertise groups were analyzed). This challenge could be reduced by asking interview participant to answer with "I don't know" for question answers that they are unsure of. However, there is a possibility that this introduces another kinds of challenges to the research design. Firstly, it could significantly reduce the interview answers and therefore the statics power of the research design (which is already under pressure because of the interview research method). Secondly, it would present an unneeded difficulty when analyzing the data, since the researcher would have to keep track of how many could answer per interview question, instead of looking at the total amount of interview participants. Lastly, it could introduce a similar bias as the Dunning-Kruger effect, where unskilled individuals overestimate themselves and think that they are certain of their answer, while experts underestimate themselves and could have the tendency to answer that they are unsure of the interview answer (Dunning, 2011). A possible method to mitigate this limitation of the research design, could be the set more stringent criteria in the interview participant selection process. However, this purposive sampling presenting a limiting factor in itself, since this could result in the loss of interesting insights (Henderson, 2011). In the end, it is unsure how this limitation could be solved, and therefore, it is assumed to be a part of doing qualitative research.

Another potential limiting factor in the research design is the assumption that employees of Eurofins (in this case participants of both Analytico and Agro), are sufficient to represent the entire environmental testing market. Due to the non-disclosure agreement in the internship contract with Eurofins and the time-frame of the research project, it was deemed to complex to invite participant among other stakeholders within the Dutch environmental testing market. Therefore, it was assumed that, since Eurofins possess the largest market share and contains multiple facets in the organization in which they are unique (like a lean team that ensures optimization of the process flow), the insight from employees from Eurofins would cover all available resources to environmental testing companies. However, there is always the possibility of this not holding true. This part of the research design could be a potential weaknesses in the external validity of the analysis results. Although this possibility exists, the long market history (and the related networks that aid in the organizational insights and understanding of the market) and market size of Eurofins, and the interview participant selection process designed, minimize this risk. The research remains an acceptable external validity and reliability.

### 7.2.1. Other research findings

The Dutch environmental testing market was identified as a highly regulated market. As mentioned in section 6.1.2 companies could benefit from possessing specific political resources. These resources could help firm to face and even neutralize contradictory interest of other stakeholders, participate in policy debates, and even shape policy decisions (Boddewyn, 1994; Dean & Brown, 1995). It is no surprise that several authors have argued in favor of investment and development of these political resources (Baron, 2003; Dahan, 2005; Oliver & Holzinger, 2008; Wei, 2006). Furthermore, another study even showed the positive impact of governmental ties on a firm's innovation performance (Zhou et al., 2019). Although it was noted that government ties positively relate to the innovation performance, it is also noted that the associated costs should be taken into account (Zheng et al., 2015). Excessive investments into political resources can distract the firm from its operations, routines, and even strategies. Before investment into political resources, firms should perform a cost-benefit analysis of the investment.

Another point of discussion is if these political resources can be sources of sustained competitive advantage in the first place. In this research, resources were defined as "anything that has an enabling capacity", from a research performed on competencies and human resource management (C. Hunt & Meech, 1991). The RBV framework assumes that all resources available to the organization can become strategic resources of competitive advantage, when rare and cost to imitate. If such resource is also exploited by the organization, this competitive advantage can be sustained over an extended period of time. Exploitation by the organization indicates that the organization has some level of control over the resource. The political resources can be classified as social capital. In a study by Robison et al. (2012), the selfishness motive was introduced. They explain that an agent's allocation of resources is independent of the relations with others. In other words, one can wonder if these political resources can be controlled and exploited by the organization. And if not, can these resources be potential sources of

competitive advantage. This certainty could pose a risk when investing in political resources, as there could be no return of investment. Organizations in the environmental testing market should assess if they risk this investment by themselves, or if they wish to obtain this resource through combined efforts.

### 7.3. Future recommendations

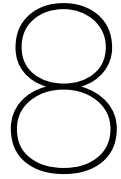
Exploratory research often leads to new insights and multiple follow-up studies. This is not different for this research, as the key findings and limitations of the research, result in remaining questions still left to be discovered. In this section four possible follow-up studies are described.

One of the main critiques of this research, is the external validity of the research performed. For a better understanding of the entire Dutch environmental testing market, a more extensive market wide analysis should be performed, in which multiple market players are included. It is not recommended to completely copy the research design from this thesis research, as performing the number of interview at different stakeholders will be a lengthy process. Also, some stakeholders in the market might not be businesses that concern themselves with product, resources, and strategy. With a proper interview participant selection process and clear criteria, the number of interviews can be reduced and still remain statistically relevant.

As mentioned previously, knowledge has been named as a vital element of competitiveness in the current fast paced industry, driven by the information age (Assensoh-Kodua, 2019; Castro et al., 2013). Some researchers even go as far to say that organizations that fail to implement knowledge management, are preparing to fail in times of growing confusion in the external business environment. This lead to a downward trend in their economic performance in turn (Blake, 1988). In this research, knowledge management as part of the strategic business management was not included. However, that does not mean it is not relevant as an addition to the key findings of this research. Knowledge management is seen as a precursor for innovation (Menor & Kristal, 2007). Therefore, understanding how knowledge management support or fit in innovation and service positioning strategies, can be beneficial to environmental testing companies.

As discussed in section 7.1, the Dutch environmental testing market is a highly regulated market. In this study, the innovation and service positioning in business strategy was proposed as the better alternative to the pricing positioning adopted at the moment. The continuous innovation cycle was presented as a method to create continuous temporary competitive advantage. Although, this business strategy approach raising many new research topic, an interesting one could be to look at strategic management approaches for the diffusion of innovation in the market. Highly regulated markets usually limit firms substantially in their strategies, in a study of two MNE in the Italian health-care market, strategic approaches are identified to both achieve regulatory compliance and promote the diffusion of the innovation (Schiavone & Simoni, 2019). Applying similar research on the Dutch environmental testing market could result in a better understanding of guaranteeing the final step in the innovation cycle.

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# Conclusion

This chapter is dedicated to the concluding remarks of this master thesis. The following chapter presents an overview of the work performed and the key insights obtained. In this research, the main research question was explored through four sub-questions. The questions were formulated as followed :

Main research question:

*"What business strategy should companies in the environmental testing companies in the Netherlands adopt and what circumstances are needed for this shift?"*

Sub-research questions:

1. What are the current circumstances in the Dutch environmental testing market?
2. Which theoretical perspectives provide insight into the developments of the environmental testing market?
3. What is the most suited business strategy considering the current challenges?
4. What circumstances are needed to adapt the most suited business strategy?



The environmental testing market is an integral part in ensuring environmental quality and maintaining high quality of life for most living organisms. Each of the three main components of the environment (soil, water, and air) have seen an increase in the public awareness of their impact on social welfare, due to recent events like the emergence of harmful compound PFAS, flooding, and the most defining event of all, the Covid-19 pandemic.

This raising awareness and multiple consolidation waves have resulted in a rapid growth of the soil and water testing market in their original forms, over the last years. However, these markets have become saturated and the growth is stagnating. The demand in these saturated markets is even expected to decline in the future, following the classical product life cycle. Furthermore, the Dutch environmental testing market is facing a two-sided challenge regarding their future business model. One challenge is that the highly competitive market nature has resulted in pricing strategy and cost reduction strategies. These strategies are reaching limits where profit margins have decline to barely feasible levels. The other side of the challenge is that the market is at the tipping point of disruptive change from emerging technologies, regulation & policy, or emerging of potentially alarming substances. The anticipated decline in demand, the low profit margins, and multiple factors that could potentially disrupt the current operating model, leave environmental testing companies with the managerial challenge on what strategy to adopt. Therefore, this research was focused on answering the main research question: "What business strategy should companies in the environmental testing companies in the Netherlands adopt and what circumstances are needed for this shift?". The research was conducted in collaboration with Eurofins Analytico, the environmental testing division of MNE Eurofins Scientific. The scope of the research was limited to geographic boundaries, because of the complexity of international regulations and the time-frame of the research. The research questions was divided into four sub-research questions for an organized research methodology.

First, the current market circumstances are examined through an extensive desk research. At the moment the total market size of the environmental soil and water testing market is estimated at €70M in the Netherlands. The three main players, that have remained after the consolidation waves in the industry, are Eurofins Analytico, SGS and AL-WEST. These companies possess 57%, 25%, and 11% market share, respectively, resulting in a joint market share of more than 90%. Therefore, it is assumed that analysis of these players are a sufficient representation of the total market. The three companies have their differentiating elements. Eurofins is praised for the short turnaround time on the analyses and their in-sourced logistics service. SGS, like Eurofins part of a MNE, is more known for their innovation prowess. While in comparison, AL-WEST is smaller and can offer more intimate client relations. For a complete overview of the current market circumstances, other main stakeholders like the clients and regulatory organizations were also taken into account. The customers of environmental testing companies are often made up of technical consultancy firms or monitoring organizations (both governmental and non-governmental). For Eurofins, 70% of their clientele are technical consultancy firms that advise multiple industries that are involved with moving soil (like construction firms) or that use water in their production process (like dairy processing companies). These companies are required to show that their activities will not harm environmental quality. This requirement is imposed through multiple regulations and policies. Similarly, Dutch regulation and policy state that environmental testing companies must be accredited to adhere certain levels of quality and reliability. Furthermore, most analysis methods are fixed in regulation and policy to make comparison of analysis results between different laboratories possible. Due to this, the products that environmental testing companies offer, the analysis packages, are mostly similar for each company.

From a state-of-the-art literature review of multiple strategic management frameworks, three different theoretical perspectives were chosen to analyze the different aspects of the market. The competitive forces approach was chosen for the external analysis and the resource-based view was chosen for the internal analysis. It was expected that the role of regulation in this highly regulated market might not be observed sufficiently using these two theoretical perspectives. Therefore, an additional theoretical lens is offered through the economics of regulation theories. A conceptual framework was set-up that combines the three different theoretical perspectives for the analysis of the Dutch environmental testing market. To achieve this, a face-to-face, semi-structured, expert interview protocol was designed based on the initial scales of competitive advantage by Moeneart and Robben. Due to the complexity of the

research, interviewees could not be selected throughout the entire organization. Therefore, criteria were established based on employee expertise. Five different expertise groups were identified: Management Team, Customer Service, Business Development, Process Development and Competition Expert. This last group was established to obtain a broader coverage of the entire Dutch environmental testing market, while limited to a single organization. For each expertise group, 4-6 participants were selected to improve data significance.

Performing the interview protocol resulted into data from 26 different participants. A systematic approach to qualitative content analysis was set-up to safeguard the comparability of the results, improve external validity and the corresponding generalization. In the QCA method, categories are crucial for effective research. Therefore, it was chosen to use thematic categorization to analyze the data. The 7 phases of thematic content analysis using the computer-aided qualitative data analysis software Atlas Ti as proposed by Frieze et al. (2018) was used as data analysis method.

First, the data analysis is approached through the three particular theoretical perspectives. The external analysis provided insights into opportunities and threats from the external market environment. The five competitive forces from buyers, suppliers, new entrants, new substitutes, or rivalry among competitors in the industry were analyzed. It was found that the largest threats were the threat of new entrants and the threat of substitute products or services. The external analysis also showed opportunities for customer-oriented positioning, because of the reduced bargaining power of buyers. After, an internal analysis of the firm's attributes was performed using the RBV framework. Resources within the environmental testing market were identified and analyzed using the VRIO criteria. It was found that although the framework does identify to possess potential sustained competitive advantage implication, interview participants indicate that a sustained competitive advantage in the Dutch environmental testing market is improbable. They mention standardization by regulation and the corresponding higher mobility of resources as the main reasons for this. Finally, a particular view is taken through the regulatory perspective lens. Economics of regulation state that regulation occurs because of four reasons. Identification of the reasons applicable in the market, provides insights into opportunities and threats that testing companies should take into account when formulating their strategies and objectives. The regulation perspective showed that regulation mostly occurred because of two reasons: the government's obligation to improve and maintain social welfare and the government's desire to eliminate information asymmetry. This insight showed why sustained competitive advantage is undesired by the government, but also how companies can use the regulatory restrictions in the market to their advantage. The institutional intervention has created a high entry-barrier in the testing market, which makes it hard for new entrants that develop new technologies or new analysis methods, to enter. This provides an opportunity for environmental testing companies to form partnerships and to obtain access to these new technological developments.

After taking the particular perspectives of the three theories, the data analysis is approached from the combined theory in the conceptual framework. An integration of the external and internal analysis is performed through the SWOT analysis and the confrontation matrix. Through confrontation of the firm's internal strengths and weaknesses, with the external market's opportunities and threats, key insights can be generated. The key insights are also analyzed using the regulatory perspective for added value. After, the combined perspective results in insights that can support the business strategy formulation.

It was found that one of the main strengths is the economics of scale. However, this strength is dependent on a minimal sample volume before firms can enjoy profit from it. This minimal sample volume is being threatened by multiple aspects in the development of the market. Related to this, is the positive correlation found between the strengths 'Experts' and 'Customer service' and the opportunities 'Improve customer service' and 'Innovation with the client'. These innovation- and service-oriented positioning by the firm could meet customer demand more accurately and result in higher profit margins through first provider advantage. These insights combined indicate a strategy shift from pricing positioning, to more innovation- and service-oriented competitive positioning.

**Key insight 1:**

The potential decline in sample volume and its effect on the strength 'Economics of scale' combined with the positive correlation of the strengths 'Experts' and 'Customer service' with the opportunities 'Improve customer service' and 'Innovation with the client', indicate the shift from pricing positioning by the firm to more innovation and service positioning.

Interview participants indicate that the innovation positioning does not yield a sustained competitive advantage because of the high incremental development pace in the market and standardization through regulation and policy. However, the perspective taken from the regulation theories showed that regulation in the Dutch environmental testing market stem from governmental desire to reduce information asymmetry in the industry. A result from this elimination of information asymmetry, analysis methods and technologies are standardized in regulation, reducing the competitive potential of the innovation. This points to the low probability of sustained competitive advantage in the environmental testing market. Therefore, companies should focus on continuous innovation and creating a continuous temporary competitive advantage.

**Key insight 2:**

Regulation in the Dutch environmental testing market hinders obtaining and maintaining sources of sustained competitive advantage. Therefore, companies should focus on a continuous innovation cycle, through which continuous temporary advantage can be enjoyed.

Finally, to support adaptation of innovation- and service-oriented strategies, certain internal circumstances are needed to successfully execute these types of strategy. Criteria from literature and current short-comings identified in the confrontation matrix were used to formulate the five most important internal circumstances needed:

- Establishing market insight through customer and government ties, is needed
- Experts with sufficient knowledge are needed in the right places of the organization
- Internal communication systems should be secured between the different departments
- Overcapacity in resources to ensure easy resource allocation without interruption of the standard operation
- Standard protocols to promote fast decision making and define clear ownership during the cycle

**Key insight 3:**

A flexible organizational structure is needed to support a continuous innovation cycle. To support this structure, five internal circumstances need to be assured: market insight, experts, internal communication, overcapacity in resources and standard protocols to ensure fast decision making and clear ownership during the innovation cycle.

Governmental ties were seen as a potential source of competitive advantage by some participants. Creating insight into regulation and policy could benefit the organization as it presents clarification on the external business driver. However, the cost of generating the governmental ties could be high due to factors like historical conditions, causal ambiguity, and the social complexity of obtaining the resource. Furthermore, some studies argue that social capital, like governmental ties, cannot be sources of competitive advantage since they are not in complete control of the organization, and can therefore not be exploited by the organization at all times. Firms should consider the risk on investing in this resource by themselves, or reduce competitive advantage of combining effort to create governmental ties.

Finally, an answer can be formulated to the main research question:

*"What business strategy should companies in the environmental testing companies in the Netherlands adopt and what circumstances are needed for this shift?"*

It was concluded that companies in the Dutch environmental testing market should change from a pricing positioning strategy to innovation and service positioning strategies. To make this shift regardless of which external business driver will take the overhand in the future, a flexible organizational structure is needed to ensure a continuous innovation cycle. This cycle can generate promotion of quick market adaptation with the support of market insight, experts, internal communication, overcapacity and standard protocols.

The point for discussion remains that the results are obtained through expert interviews with employees of a single environmental testing company. Although this company contains the largest market share, generalization of these findings to the entire environmental testing company remain a weakness of this study. Future research should be conducted in collaboration with experts from other market players as well. A smaller topic scope or adopted research design might be desired in that case. The exploratory research has also raised additional research topic that can improve the understanding of the market. One example is knowledge management as part of strategic management approach, since knowledge being more and more as a vital resource in firms. Other additional research can be performed into the different parts of the innovation cycle and how the cycle can be maintained. One such step that can be interesting in highly-regulated markets, like the Dutch environmental testing market, is the diffusion of the innovation. More research into the functioning of the environmental testing market should be performed to create a better understanding of this topic, ultimately leading to environmental quality in the Netherlands and improving public welfare in general.

Reflecting back on the research relevance of this study, it can be concluded that application of the different theoretical perspective individually is capable of describing a certain aspect of the market. However, the combination of the three theories provides the links between a firm's strengths and weaknesses, and the market's opportunities and threats more clear. It was shown that adding the regulatory perspective is highly valuable in highly-regulated markets. Using this conceptual framework, important insights were obtained, and the change in competitive positioning proposed could mark a new beginning for the operation of the Dutch environmental testing market. In future research, Dutch environmental testing market should be observed through multiple theoretical perspectives. The researcher has applied the knowledge obtained during the master program of Management of Technology in a highly competitive market environment. The technological innovation-oriented mindset of the program has helped this research thesis come to fruit. However, even more was learned through application of this knowledge in practice at an environmental testing company. The educational value of real-life experience in industry should not be lessened. Therefore, the researcher recommends all future students of the Management of Technology master program to apply for a company internship, and appeals to the program director to reconsider a general course in the program dedicated to the real-life application of the education in industry.

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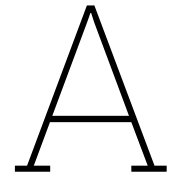
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# Interview Questions

**Table A.1:** Interview questions designed for semi-structured expert interviews

Nr.	Questions
Q1	How would you describe the product of this organization and what demand in the market does it fulfill?
Q2	How does the current product perform in the total market?
Q3	Are there comparable or substitutable products that endanger the current product?
Q4	What is the value proposition of the current product?
Q5	Can you offer the same value to the customer using different resources?
Q6	Which resources do you consider most important?
Q7	Is the product a result of distinctive resources with a strong link to the organization?
Q8	Which resources generate a lot of profit for the organization? Is the total resource package optimized?
Q9	Which resources contribute the most to customer value proposition?
Q10	Have there been recent additional resources that may contribute to adaptation of emerging market trends?
Q11	What is the current competitive strategy of the organization?
Q12	Does the organization have a sustained competitive advantage (of minimal 5 years) based on current resources that are hard to duplicate?
Q13	What are important resources that are perceived as better than the competition?
Q14	Does the (emerging) competition hold important resources that are hard to duplicate?
Q15	In what different areas could the organization invest in for a better value proposition?
Q16	Which resources are important for flexibility regarding market developments and formulating a fitting business strategy?



# Ethical Research Conduction Documents

*When conducting research that uses humans as a method of gathering data, it is important to perform the research ethically and safe. This Appendix is dedicated to the informed consent form and the data management plan. The informed consent form was shared with the interviewees beforehand. This document was signed by both interviewer and interviewee to show that they understand what the purpose of the research is, how the data will be processed and shared, and what their rights are. The data management plan is set up to clarify how the data will be secured, processed, and shared.*

You are being invited to participate in a research study titled: Exploration of the Special Analysis Methods Niche Segments of the Environmental Analytical Testing Service Market in the Netherlands Using the Research-Based View. This study is being done by Simona Lu from the TU Delft in collaboration with Eurofins Analytico for the fulfilment of requirements for the degree of Master Management of Technology.

The purpose of this research study is to highlight certain resources using the RBV framework by Barney (1991) and their role in sustained competitive advantage. The interview will take you approximately 60 minutes to complete. The anonymized data will be used for formulation of my thesis outcome and will be reported in my final thesis, which will be made available immediately to my exam committee and my company supervisors. The report will be opened on the university repository after the agreed disclosed time period. We will be asking you for both your personal and professional opinion, and knowledge on the product, resources within the market and strategy of your linked organisation.

As with any online activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. We will minimize any risks by transcribing the recorded audio and saving the file by date instead of personal name. The transcribe text will not be shared with others, will be saved on a personal drive (not accessible to others) and will be deleted when the research is completed, to minimize the risk of privacy violation and alteration of relationships. The interview data will be analysed based on key words. If quotes and interview summaries are used in the report, the references will not contain personal data or person unique words.

Your participation in this study is entirely voluntary, any discomfort can be indicated and you can withdraw at all time. You are free to omit any questions. If a change of heart is made about your participation, before the end of the research, you can withdraw your participation and your interview answers will be taken from the dataset. After the report is submitted to the exam committee, your answers cannot be excluded from the dataset.

For contact after the interview:

Email: *Left out for privacy reasons*

Mobile: *Left out for privacy reasons*

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
<b>A: GENERAL AGREEMENT – RESEARCH GOALS, PARTICIPANT TASKS AND VOLUNTARY PARTICIPATION</b>		
1. I have read and understood the study information dated ....., or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	<input type="checkbox"/>	<input type="checkbox"/>
2. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	<input type="checkbox"/>	<input type="checkbox"/>
3. I understand that taking part in the study involves: <i>[see points below]</i>	<input type="checkbox"/>	<input type="checkbox"/>
<ul style="list-style-type: none"> <li>▪ <i>Giving my personal and professional opinion as answer to the interview questions on a known and understood research topic</i></li> <li>▪ <i>The interviewer takes notes during the interview, which are only accessible to the interviewer</i></li> <li>▪ <i>The interview audio being recorded and transcribed into text, saved on a personal drive (only accessible to interviewer and responsible researcher), afterwards destroying the recorded audio</i></li> <li>▪ <i>My answers being used for both research and report which will eventually become open-access</i></li> </ul>		
4. I understand that I will be not compensated for my participation	<input type="checkbox"/>	<input type="checkbox"/>
5. I understand that the study will end when the student has successfully defended the thesis to the exam committee (expected time: October 2022)	<input type="checkbox"/>	<input type="checkbox"/>
<b>B: POTENTIAL RISKS OF PARTICIPATING (INCLUDING DATA PROTECTION)</b>		
6. I understand that taking part in the study involves the following risks regarding physical discomfort, potential psychological negativity, social and privacy risks. I understand that these will be mitigated by the ability to stop the interview at any time and a high degree of interview anonymity in reporting and saving of data	<input type="checkbox"/>	<input type="checkbox"/>
7. I understand that taking part in the study also involves collecting specific personally identifiable information (PII) [name, company function, interview audio and potential photographs] and associated personally identifiable research data (PIRD) [personal or professional views] with the potential risk of my identity being revealed	<input type="checkbox"/>	<input type="checkbox"/>
8. I understand that some of this PIRD is considered as sensitive data within GDPR legislation, specifically:	<input type="checkbox"/>	<input type="checkbox"/>
<ul style="list-style-type: none"> <li>▪ <i>Religion, Political views</i></li> <li>▪ <i>Data concerning criminal activities will/may be collected and processed</i></li> <li>▪ <i>Research has a Data Processing Impact Assessment (DPIA) in place</i></li> </ul>		
9. I understand that the following steps will be taken to minimize the threat of a data breach, and protect my identity in the event of such a breach: storing pseudo-anonymous data on secure, inaccessible (with the exclusion of interviewer and responsible researcher) drives of the TU Delft and only publicizing summaries of interviews	<input type="checkbox"/>	<input type="checkbox"/>
10. I understand that personal information collected about me that can identify me, such as [name, professional function, audio or photograph, personal and professional views], will not be shared beyond the study team.	<input type="checkbox"/>	<input type="checkbox"/>

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
11. I understand that the (identifiable) personal data I provide will be destroyed one month after the end of the research	<input type="checkbox"/>	<input type="checkbox"/>
<b>C: RESEARCH PUBLICATION, DISSEMINATION AND APPLICATION</b>		
12. I understand that after the research study the de-identified information I provide, will be used for the thesis report, which will eventually be open accessible on the university repository website. My (identifiable) personal information [recognizable images, quotes and other PIRD] will be excluded from this report. I understand the anonymized research output can be used for secondary use at Eurofins Analytico.	<input type="checkbox"/>	<input type="checkbox"/>
13. I agree that my responses, views or other input can be summarized or quoted anonymously in research outputs	<input type="checkbox"/>	<input type="checkbox"/>
<b>D: (LONGTERM) DATA STORAGE, ACCESS AND REUSE</b>		
16. I give permission for the de-identified of the interview answers that I provide that can be implemented into the research report to be archived in TU Delft thesis repository so it can be used for future research and learning.	<input type="checkbox"/>	<input type="checkbox"/>

<b>Signatures</b>		
_____	_____	_____
Name of participant [printed]	Signature	Date
<p>I, as researcher, have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.</p>		
_____	_____	_____
Researcher name [printed]	Signature	Date
<p>Study contact details for further information: [Name, phone number, email address]</p> <p>Name: Simona Lu</p> <p>Email address:</p> <p>Phone number:</p>		

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## Plan Overview

*A Data Management Plan created using DMPonline*

**Title:** TPM MSc MOT Graduation Thesis Project: Exploration of the Special Analysis Methods Niche Segments of the Environmental Analytical Testing Service Market in the Netherlands Using the Research Based View

**Creator:** Simona Lu

**Affiliation:** Delft University of Technology

**Template:** TU Delft Data Management Plan template (2021)

### Project abstract:

For my master thesis project, I'm performing a competitive market analysis of the environmental analytical testing service market in the Netherlands. Using the Resource-Based View framework (Barney, 1991) the focus will be put on important resources that are needed/need to be allocated/need investing in/need to be cut out, for firms in this market to adapt to potential emerging market trends of certain special analysis methods. To highlight important resources, interviews with experts in different aspects of this market, is chosen as the suited research methods. Data will be collected from 20-25 interview participants, that are recruited based on their knowledge of the different aspects both from internal (i.e. product/process development, customer service, management) as well as external parties (i.e. government, regulation, innovative potential market entries, advise organizations). These participants are selected based on the internal and external networking of responsible company supervisors. They will be approached for an interview of maximal 90 minutes containing questions relating market product, resources and strategy (15-20 questions in total) and will be presented with an elaborate description of the interview goal and data management plan before consent to the interview is asked.

**ID:** 104786

**Start date:** 15-08-2022

**End date:** 05-09-2022

**Last modified:** 29-07-2022

## TPM MSc MOT Graduation Thesis Project: Exploration of the Special Analysis Methods Niche Segments of the Environmental Analytical Testing Service Market in the Netherlands Using the Research Based View

### 0. Administrative questions

#### 1. Name of data management support staff consulted during the preparation of this plan.

Nicolas Dintzner

#### 2. Date of consultation with support staff.

2022-07-29

### 1. Data description and collection or re-use of existing data

#### 3. Provide a general description of the type of data you will be working with, including any re-used data:

Type of data	File format(s)	How will data be collected (for re-used data: source and terms of use)?	Purpose of processing	Storage location	Who will have access to the data
pseudo-anonymized interview data	.m4a .docx	In-person audio-recorded interview after informed consent. Transcribe audio to text	Highlight important resources within the Dutch environmental analytical testing service market	Eurofins Analytico OneDrive	Responsible researcher (Simona Lu)
anonymized participant interview notes	.pdf .docx	In-person note taking by the interviewer on useful parts of the interview	Organize the interview for analysis	Eurofins Analytico OneDrive	Responsible researcher (Simona Lu)
Informed consent documents	.pdf	Signed by interviewee at the start of the interview	Give consent to their personal and professional opinion being used in the research	Eurofins Analytico OneDrive	Responsible researcher (Simona Lu)
Analysis of the interview data	.docx .xlsx	post-interview processing	research outcome and discussion of findings	Eurofins Analytico OneDrive	Responsible researcher (Simona Lu) Corresponding researcher (Tom Dolkens) Company supervisors (E. Langerak & E. v. Noort)
literature/public and private documents	.docx	Documents gathered to obtain an understanding of current market circumstances and company performance	Preparing research methodology and interview questions	Eurofins Analytico OneDrive	Responsible researcher (Simona Lu) Corresponding researcher (Tom Dolkens) Company supervisors (E. Langerak & E. v. Noort)

**4. How much data storage will you require during the project lifetime?**

- < 250 GB

## **II. Documentation and data quality**

**5. What documentation will accompany data?**

- Methodology of data collection

## **III. Storage and backup during research process**

**6. Where will the data (and code, if applicable) be stored and backed-up during the project lifetime?**

- OneDrive

## **IV. Legal and ethical requirements, codes of conduct**

**7. Does your research involve human subjects or 3rd party datasets collected from human participants?**

- Yes

**8A. Will you work with personal data? (Information about an identified or identifiable natural person)**

*If you are not sure which option to select, ask your [Faculty Data Steward](#) for advice. You can also check with the [privacy website](#) or contact the privacy team: [privacy-tud@tudelft.nl](mailto:privacy-tud@tudelft.nl)*

- Yes

**8B. Will you work with any other types of confidential or classified data or code as listed below? (tick all that apply)**

*If you are not sure which option to select, ask your [Faculty Data Steward](#) for advice.*

- Yes, data which could lead to reputation/brand damage (e.g. animal research, climate change, personal data)
- Yes, data related to competitive advantage (e.g. patent, IP)
- Yes, confidential data received from commercial, or other external partners

**9. How will ownership of the data and intellectual property rights to the data be managed?**

*For projects involving commercially-sensitive research or research involving third parties, seek advice of your [Faculty Contract Manager](#) when answering this question. If this is not the case, you can use the example below.*



During the active phase of research, the responsible researcher will oversee the access rights to data (and other outputs), as well as any requests for access from external parties. Only anonymized interview data will be released publicly no later than at the time of publication of corresponding research report as property of the company. The pseudo-anonymized interview data is stored for one year after the end of the master thesis project.

The datasets underlying the report will be publicly released after the set non disclosure agreements as per graduation agreement and following the TU Delft Research Data Framework Policy.

#### 10. Which personal data will you process? Tick all that apply

- Other types of personal data - please explain below
- Signed consent forms

Name and company role

#### 11. Please list the categories of data subjects

The interview subjects will be selected expert employees of the company categorized in 4 groups: product development, process development, customer service and management team, and contacts of external parties involved in the environment testing service market in the Netherlands selected through networks of the company.

#### 12. Will you be sharing personal data with individuals/organisations outside of the EEA (European Economic Area)?

- No

#### 15. What is the legal ground for personal data processing?

- Informed consent

#### 16. Please describe the informed consent procedure you will follow:

All interview participants will be asked to fill in the informed consent document set up using the template as presented by the TU Delft HREC on their website before the start of the interview.

#### 17. Where will you store the signed consent forms?

- Same storage solutions as explained in question 6

#### 18. Does the processing of the personal data result in a high risk to the data subjects?

If the processing of the personal data results in a high risk to the data subjects, it is required to perform [a Data Protection Impact Assessment \(DPIA\)](#). In order to determine if there is a high risk for the data subjects, please check if any of the options below that are applicable to the processing of the personal data during your research (check all that apply).

If two or more of the options listed below apply, you will have to ~~to~~ [complete the DPIA](#). Please get in touch with the privacy team: [privacy-tud@tudelft.nl](mailto:privacy-tud@tudelft.nl) to receive support with DPIA.

If only one of the options listed below applies, your project might need a DPIA. Please get in touch with the privacy team: [privacy-tud@tudelft.nl](mailto:privacy-tud@tudelft.nl) to get advice as to whether DPIA is necessary.

If you have any additional comments, please add them in the box below.

- None of the above applies

**22. What will happen with personal research data after the end of the research project?**

- Personal research data will be destroyed after the end of the research project
- Anonymised or aggregated data will be shared with others

**23. How long will (pseudonymised) personal data be stored for?**

- Other - please state the duration and explain the rationale below

Pseudo-anonymized data will not be stored or shared at all.

**24. What is the purpose of sharing personal data?**

- Other - please explain below

Pseudo-anonymized data will not be stored or shared at all.

**25. Will your study participants be asked for their consent for data sharing?**

- Yes, in consent form - please explain below what you will do with data from participants who did not consent to data sharing

If participants do not consent to data sharing, their dataset will be taken from the total dataset and destroyed. It will in no way show up in the research outcomes.

**V. Data sharing and long-term preservation****27. Apart from personal data mentioned in question 22, will any other data be publicly shared?**

- I do not work with any data other than personal data

**29. How will you share research data (and code), including the one mentioned in question 22?**

- I will upload the data to another data repository (please provide details below)

Anonymized data used as research result and discussion will be in the TU-Delft educational repository after the embargo time as set in the graduation agreement.

**31. When will the data (or code) be shared?**

- Other - please explain

Anonymized data will be shared with the company at the end of the research project, while pseudo-anonymized data will be destroyed after one year.

## VI. Data management responsibilities and resources

### 33. Is TU Delft the lead institution for this project?

- Yes, leading the collaboration - please provide details of the type of collaboration and the involved parties below

Company Eurofins Analytico B.V.

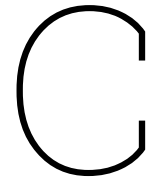
### 34. If you leave TU Delft (or are unavailable), who is going to be responsible for the data resulting from this project?

Corresponding supervisor will take over responsibility of data related to the final report. Company supervisor will take over responsibility of anonymized data.

### 35. What resources (for example financial and time) will be dedicated to data management and ensuring that data will be FAIR (Findable, Accessible, Interoperable, Re-usable)?

There are no additional resources

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# Phases of Thematic Content Analysis

*To extract the desired information from the interview transcripts, the computer-assisted qualitative data analysis software Atlas Ti was chosen. A study by Friese et al. (2018) defined seven phases of thematic content analysis in Atlas Ti.*

**Table C.1:** Application of the various stages of thematic content analysis in Atlas Ti

Phases of thematic content analysis	Steps in Atlas Ti
Phase 1: Pre-analysis, becoming familiar with the data	<ul style="list-style-type: none"><li>• Create a project</li><li>• Add documents</li><li>• Group documents</li><li>• Write first memos on the overall project aim including the research questions</li><li>• Explore the data using word clouds and word lists</li><li>• Read the documents</li></ul>
Phase 2: Material exploration, generating initial codes	<ul style="list-style-type: none"><li>• Generate or import a list of codes</li><li>• Read the data, select data segments and code them - either applying existing codes or creating new codes</li><li>• Write code comments to explain what the intention is, how to use the code and what it means</li></ul> <p>Additional features for latent level analysis:</p> <ul style="list-style-type: none"><li>• Write quotation comments</li><li>• Name quotations</li><li>• Link quotations to each other</li></ul>

Continuation of Table C.1

Phase 3: Building a structured code system	<ul style="list-style-type: none"> <li>• Work with the list of codes in the Code Manager</li> <li>• Group codes / use them as filters</li> <li>• Split codes</li> <li>• Retrieve data segments by code, read them</li> <li>• Rename codes</li> <li>• Build categories and sub codes</li> <li>• Write code definitions</li> </ul>
Phase 4: Searching for themes	<ul style="list-style-type: none"> <li>• Explore categories and their potential fit with a theme</li> <li>• Begin to write a memo for each theme</li> <li>• Generate networks to explore how the various codes that make up a theme relate to each other</li> <li>• Review the coded data</li> </ul>
Phase 5: Reviewing themes	<ul style="list-style-type: none"> <li>• Explore the themes further to see whether relations hold across the entire data set or only apply within certain groups. The tools in ATLAS.ti are: Code-Document table, Code Cooccurrence Table / Explorer / operator, Query Tool for queries based on Boolean and proximity operators.</li> <li>• Refine themes accordingly</li> <li>• Write memos</li> <li>• Relate themes to each other in networks</li> </ul>

Continuation of Table C.1

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**Phase 6: Defining and naming themes**

- Write memos
- Link quotations to memos
- As needed, use any of the above listed query options
- Review networks

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**Phase 7: Producing the report**

- Export memos with quotations and construct your result section in Word around those memos
  - Export networks and insert into the report where suitable
  - Export tables and insert into the report where suitable
  - Prepare a few screen shoots, e.g. for the method section to show how a coded document looks like in ATLAS.ti
  - Export a code book (code list + comments) to insert into the appendix
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# D

## Resources

**Table D.1:** Additional table to table 4.5

Competitive implication	Resource	V	R	I	O
Temporary competitive advantage	<ul style="list-style-type: none"> <li>• Automation</li> <li>• Business-to-customer market</li> <li>• Information platform</li> <li>• Simplicity of process flow</li> <li>• Added value of the analysis report</li> <li>• Collaboration other laboratories</li> <li>• Collaboration partnership network</li> </ul>	Yes	Yes	No	
Competitive parity	<ul style="list-style-type: none"> <li>• Expert individuals</li> <li>• Humans</li> <li>• R&amp;D department</li> <li>• Service surrounding product</li> <li>• Advisory service</li> <li>• Sales force</li> <li>• Innovation</li> <li>• Internal communication</li> <li>• Long history</li> <li>• Employee loyalty to organization</li> <li>• Communication with customers</li> </ul>	Yes	No		

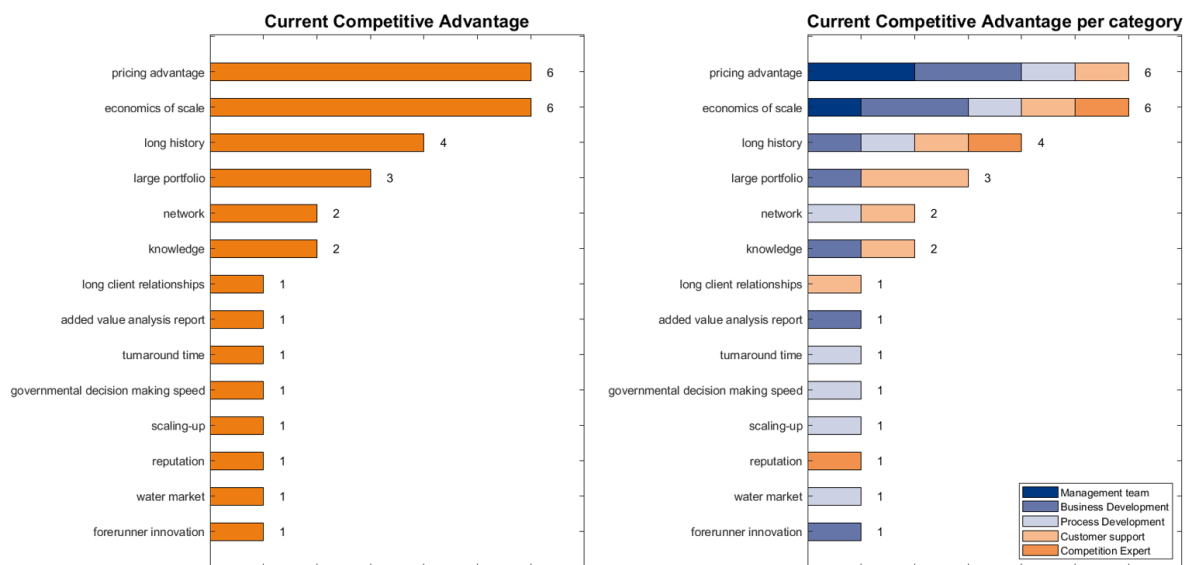
Continuation of Table D.1

Competitive implication	Resource	V	R	I	O
Competitive parity	<ul style="list-style-type: none"> <li>• Long client relations</li> <li>• Centralization</li> <li>• Management policy</li> <li>• Synergy organization</li> <li>• Database</li> <li>• Machines</li> <li>• Easy order system</li> <li>• In-sourced IT system</li> <li>• Financial capital</li> <li>• Water market</li> <li>• Laboratory</li> <li>• Communication</li> <li>• Customer service</li> <li>• Partnerships</li> <li>• Decentralization</li> <li>• Knowledge</li> </ul>	Yes	No		

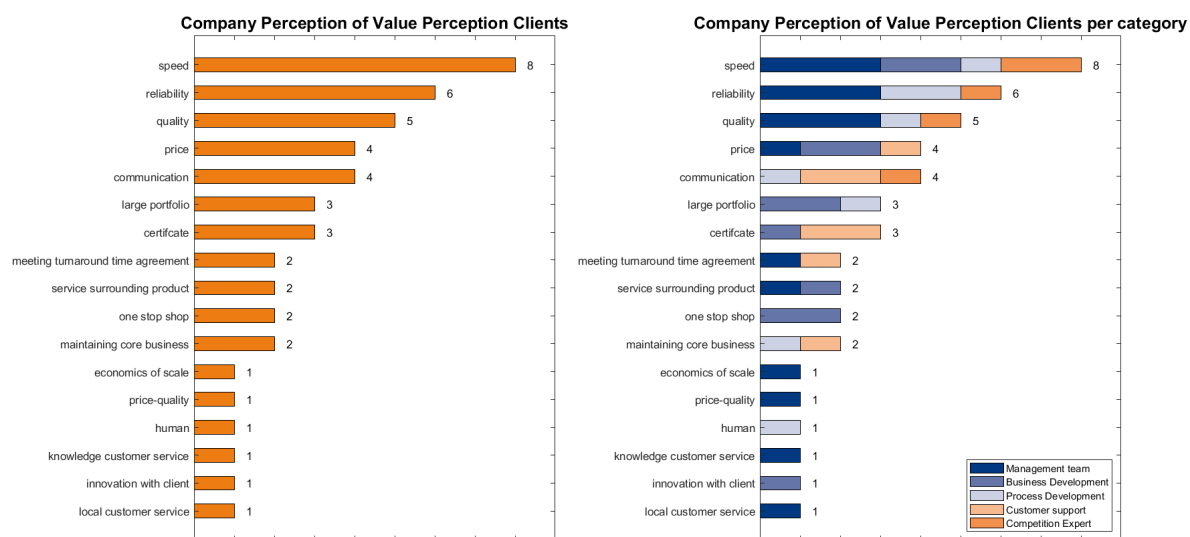


# Supplementary Images

*This appendix is dedicated to the additional image visualizing the interview data.*



**Figure E.1:** Ungrouped resources related to competitive advantage in the Dutch environmental testing market as extracted from the expert interview data. The code distribution over the five different expertise groups, management team, customer service, business development, process development and competitive experts, are visualized.



**Figure E.2:** The total list of attributed of the Dutch environmental testing market that is perceived by the organization as what clients value the most.