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A Competitor Analysis Tool for a Small to Medium Sized Company

Helsinki Metropolia University of Applied Sciences

Master's Degree

Business Informatics

Master's Thesis

12th November 2017

Helsinki Metropolia University of Applied Sciences

PREFACE

Getting this thesis done was a long and arduous process. Before choosing the final topic for this thesis, several rounds of iterations were needed. I had already written close to 30 pages on another topic, before realizing together with the case company stakeholders that the chosen topic would not bring the desired benefits to the case company. Although it felt frustrating, I understood that a pivot would be needed. I needed to go back to the beginning and start fresh with another topic that would better meet the requirements and expectations set for a Master's thesis work, and at the same time provide tangible benefits for the case company. And now at the end of this process, I am glad that I did. The final thesis and the completed work is something that I can feel proud of.

Overall, the whole process of completing this thesis was interesting and very educational. It taught me a lot about my own way of handling such larger writing and research projects and gave me an opportunity for personal growth on that area. It allowed me to learn new aspects of the case company's operations beyond my current work responsibilities, as well as dive deep into the business aspects of virtual reality.

Throughout my studies I felt inspired by the great teachers in the Business Informatics program. Their positive attitude and expert teaching skills created a highly motivational atmosphere to the Master's program. I would like to especially thank my thesis supervisor, Thomas Rohweder, for his help in keeping my thesis work on the right track and for the great discussions about the topic. I also want to show my gratitude for my family and friends in supporting me and pushing me to get this work completed. My biggest thanks goes to my mom and dad, who for more than 36 years have been guiding me through life, helping me to become the man I am today. And of course thanks to my girlfriend Sanna, for not losing his mind over all the evenings and weekends I spent working on this thesis at the office, instead of being with you. I love you babe, and I couldn't have done this without you.

Jussi Laakso
Helsinki, 4th December 2017

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Author(s) Title Number of Pages Date	Jussi Laakso A Competitor Analysis Tool for a Small to Medium Sized Company 84 pages + 7 appendices 12th November 2017
Degree	Master's degree
Degree Programme	Business Informatics
Instructor(s)	Thomas Rohweder, DSc (Econ), Principal Lecturer

The objective of this Master's thesis was to create and test a competitor analysis tool for the virtual reality / augmented reality enterprise solutions industry. This tool enables the case company, a digital creative agency specializing in technical learning solutions and content creation, to better categorize and assess rival firms operating in this industry.

The conceptual framework of this thesis was based on the existing tools and frameworks in literature on competitive intelligence and competitor analysis in general, and focusing on competitor profiling and categorization. The competitor analysis tool was created based on the synthesis of existing theoretical knowledge, data gathered from within the case company, and data from external, publicly available Internet resources. Methods for data collection included interviews and a workshop with key company stakeholders, and content analysis of data from competitors' websites, social media pages, as well as industry journals, reports, and periodicals.

The outcome of this thesis was the competitor analysis tool, and the initial results gotten from using the tool to analyze known competitors. The tool was used for competitor analysis on two levels. First, it was used to categorize known competitors into strategic groups. Secondly, it was used to evaluate those rival firms that belong to the same strategic group as the case company in more detail. This analysis was based on identified critical success factors in the industry.

The case company benefits from the results of the thesis by gaining a better understanding of the whole competitive landscape and the different strategic groups operating inside the industry, and by identifying key competitors and gaining insights into their capabilities and product quality. Additionally, the thesis work may also assist company stakeholders in making managerial decisions in the future. Last, new recommendations for further analysis of competitors were proposed based on the outcomes of this thesis.

Keywords	Virtual reality, augmented reality, competitive intelligence, competitor analysis, strategic groups, critical success factors

Contents

1 Introduction

This section introduces the case company and business context examined in this thesis. It also explains the business problem, followed by the research objective, output and scope. Last, this section gives an overview of Virtual Reality (VR) and Augmented Reality (AR) technologies, which are the focus of this thesis.

1.1 Case company and business context

The case company is a digital creative agency specializing in technical learning solutions and content creation. The case company has been in the business since 1995 and has a team of around 60 full-timers and freelancers around the world. The case company headquarters are in Helsinki. However, a lot of the case company's work is done with global customers in Madrid, São Paulo, Singapore, Tunis and Montreal.

The company focuses on business-to-business (B2B) services. Product and service offerings include instructor-led (ILT) classroom trainings, hands-on lab trainings, online training webinars, virtual labs, interactive self-study e-learning solutions, and self-study training videos. The case company also offers training and marketing material content creation services, including user guides, how-to videos, classroom training material, 2D and 3D animation, video production, web programming, and other similar content. The topics covered range from generic telecommunications technology theory, such as mobile networks and optical networks trainings, to proprietary client products and services. The case company's existing customers include consumer electronic and mobile phone manufacturers, telecom operators, and telecom network equipment vendors. The typical target groups include engineers, managers, sales and support personnel. The case company also does customized learning and marketing solutions on topics outside the telecom industry for some clients.

The methods and technologies companies use to train their employees have changed radically within the past ten years. The traditional ILT method, typically implemented as a classroom training, or hands-on training, can oftentimes be costly and hard to organize. Accommodation, training venue, and travel expenses can make even single day trainings very expensive. The evolution of computer and telecommunications technology has made other, more cost effective training methods available that can reach many of the

same training goals. These training methods include for example trainer-led online webinars, self-study e-learnings, and massive open online courses (MOOCs). The latest technological innovations that are now being introduced as training and learning tools are Virtual Reality (VR) and Augmented Reality (AR) based solutions.

Specialized and proprietary VR and AR systems have been used by the military and various other large industries already for several years, but they have not been available for many smaller industries or to the general public due to the very high price of the VR/AR equipment, hovering in tens or even hundreds of thousands of dollars. As computing, sensor and display technology has evolved, now for the first time in history VR and AR technology have become commercially available for almost everyone.

The case company has now ventured into the world of virtual reality by extended its service offerings to also include VR and AR based learning and marketing solutions, which are based on this new generation of commercial VR and AR hardware. These VR and AR solutions could be used for a wide variety of customer needs, including product training, product presentations, vocational training, enterprise learning, and other areas.

As VR and AR are new technologies, many readers may not yet be familiar with them. A short introduction to the terms and operating principles behind these technologies is given next.

Virtual Reality (VR) technology immerses the user into a three dimensional virtual world, where the user can experience realistic visual, acoustic and other sensory presentations, such as haptic feedback (like vibration of the controllers). Today's VR platforms use a head-mounted display (HMD) that cover the user's eyes. In the HMD there is a separate lens and display system for each of the user's eyes to provide stereoscopic 3D viewing experience. By projecting a separate image of the same virtual scene from slightly different angles to each eye, the HMD can produce a feeling of depth, similar to how the human eyes take in information from the real world. The virtual experience is typically enhanced with spatial audio, where the sound is given a direction and volume relative to its source.

The VR system tracks the movement of the user's head and moves the displayed virtual world to match the head movement, enabling 360 degree viewing experience and immersing the user to the virtual environment. This is known as rotational-only tracking.

The lower-end VR systems only support this rotational-only tracking method. The higher end VR platforms use more advanced, positional tracking technology, which allows the user to move around in the real world. This movement is then seamlessly mirrored into the virtual world. This enables the user to fully examine the virtual environment around them. By using tracked wireless handheld controllers, whose movement is also mirrored to the virtual world, the user can interact and manipulate objects in the VR environment. All this technology combines to tricking the human brain into visualizing the virtual world as real.

Whereas VR completely blocks out the user's surroundings, isolating them from the outside world, Augmented Reality (AR) on the other hand adds a digital overlay of 3D objects, or holograms on top of the real environment in real-time. AR is all about enhancing the user's interaction with their real environment, rather than separating them from it. In today's AR platforms the overlaid content is added to visual information from the real world either via specialized lenses that the user can see through or the real world information is captured via camera and the digital content is added on top of the displayed image. These two methods are known as transparent AR and pass-through AR, respectively.

Another new technology that is often included to the 'VR world' is 360 video, also known as spherical video. This refers to videos where every direction (or 360 degrees, hence the name) are displayed simultaneously. By using a VR HMD the user can view the recorded video in any direction by simply turning their head. 360 movies and television, as well as 360 YouTube videos are an upcoming trend. The same principle applies to viewing live events. Many sporting and music events are already using this technology to sell 'virtual tickets' to the events. This solves the problem of limited seating and effectively makes the event available to anyone, anywhere. When multiple 360 cameras are deployed to the event venue, then users can even change their point of view in the middle of an event. Although 360 video is partly related to VR, it is not a subject in this thesis and is not analyzed in more detail.

VR and AR technologies are expected to have a major impact on a large variety of industries, including gaming, video entertainment, live events, education and training, healthcare, real estate, retail, and engineering. Most of the focus on VR currently is on consumer solutions, like gaming and entertainment. VR technology can heighten gaming experiences by immersing the player in the virtual world, and AR technology can turn the

physical world into a videogame canvas. However, in addition to consumer-focused solutions a large number of VR and AR solutions are being developed for enterprise use. VR and AR provide unique new benefits especially for training and marketing purposes. Within this thesis the term ‘VR/AR enterprise solutions’ is used to refer to all those VR and AR products that are targeted to enterprise use.

The problem with many training tools used today is that they are static and often disconnected from the real world. Many forms of training focus on learning by memorization, instead of learning by doing. Students read 2-D information, take tests that gauge their memory rather than their ability, and spend days in classrooms looking at PowerPoints. Employees read orientation guides, company policies, and user manuals in paper or digital format. Although functional, the problem with this type of learning is that it is removed from actual doing.

Learning studies show that people typically retain about half of what we see and hear, but around 90 percent of what we practice by doing. Virtual training allows the trainees to benefit from learning by doing approach using the 3D world to simulate equipment and processes. Using VR for training allows the delivery of large amounts of complex information in a way that may be more easily absorbed than conventional video or a book. While wearing a VR headset the students are completely immersed to the task at hand, and the interactive nature of the training keeps students engaged in the learning process. Overall, VR training can offer a number of tangible benefits including improved comprehension, accelerated learning and lower training costs.

Many jobs, especially those in the industrial sector, can only be effectively learned by practicing hands-on on the topic. For example, training employees to how to drive a truck or training them to understand complex machine operation and maintenance cannot be accomplished without letting the employees work with the trucks and machines themselves. In-person trainings for these types of jobs are effective, but cost-intense and often risky, requiring a physical machine and a human trainer. Just some of the costs involved include travel costs (flying), training facility costs, accommodation (hotel) costs, instructor fees, and possible training equipment costs.

For example training employees to operate a very expensive excavator would require one or more of such excavators being removed from real, revenue generating work, and

be allocated for training purposes. There is also always the risk of damaging the expensive equipment, and this risk is heightened when people are just starting to learn how to operate the equipment. VR can be used to improve learning such skills. Students could first get familiar with the operation of the machines in VR. The student can be placed in a realistic virtual world where they are trained on how to operate the machine in a safe environment. This can potentially provide substantial cost savings in the early phases of training. A unique additional benefit of training in VR is that the trainee can be provided with real-time visual and audio feedback on how they are doing, allowing them to self-correct common mistakes at the same time as they are learning to operate the machinery. Collected feedback can be evaluated by a trainer, making the VR solution also a skill evaluation tool.

1.2 Business problem

Currently the commercial VR/AR market is taking of at a high velocity. This VR/AR technology has the potential to spawn a multi-billion dollar industry, and possibly be as game changing and have the same disruptive potential as the TV, PC, the internet, and smartphones. This proliferation of commercial VR/AR hardware has created a completely new industry for VR and AR software and solutions. Because of the VR/AR markets huge potential and rising popularity, the global marketplace is quickly filling with hundreds of new vendors, and many of these vendors are offering similar products and services to the case company, acting as direct competitors. In order to compete on this market and to build and hold a competitive advantage it is critically important for case company to systematically follow and analyze its competitors on this arena.

The business problem for the case company is that currently the case company does not have an effective system for collecting Competitive Intelligence (CI) and competitor analysis data about existing and potential new competitors. This leaves the case company at a disadvantage, and may hinder its ability to react to changes in the marketplace. In order to stay competitive in this marketplace the case company needs to build better competitor analysis capabilities. These capabilities should provide the case company a comprehensive picture of the current and potential future competitors, and a good understanding of their strategic positioning on the marketplace, as well as their products and capabilities. Armed with this knowledge the case company can better formulate strategy and react to changes in the marketplace.

1.3 Research objective, output and scope

The research objective for this thesis is to create and test an easy-to-use competitor analysis tool for the case company. This tool is intended to accomplish two key tasks; enable the categorization and prioritization of competitors based on their chosen strategies, and enable the analysis and structured assessment of competitor's capabilities and products. Analysis of all firms in the industry is too massive of a task to undertake within this thesis. The focus is to analyze the most important rival firms. And in order to identify the most important rivals, the known competitors must first be categorized and prioritized. These key competitors can then be analyzed in more detail by first selecting a set of key parameters, and then scoring and assessing the competitors against those parameters.

In order to develop this tool, an extensive analysis is required of both the current VR/AR industry - its trends and the direction where it is heading - as well as on the rival firms offering similar products and services to the case company. The output of the thesis is the competitor analysis tool, and the results gotten from using the tool with known competitors in the industry.

The scope of this thesis is limited to creating the tool and testing it with current competitors. The thesis does not cover what possible strategic decisions the case company stakeholders will take with the achieved results, such as changes made to company positioning, pricing models, sales channels, sales strategy or related topics. The results achieved within this thesis may also be used later for marketing purposes as well, such as for promoting the key differentiators in the case company's offerings compared to competitors offerings. But these topics are outside the scope of this thesis.

2 Project plan

This section explains the research design and data collection and analysis plan used for this study.

2.1 Research design

The thesis consists of seven sections, as illustrated in Figure 1.

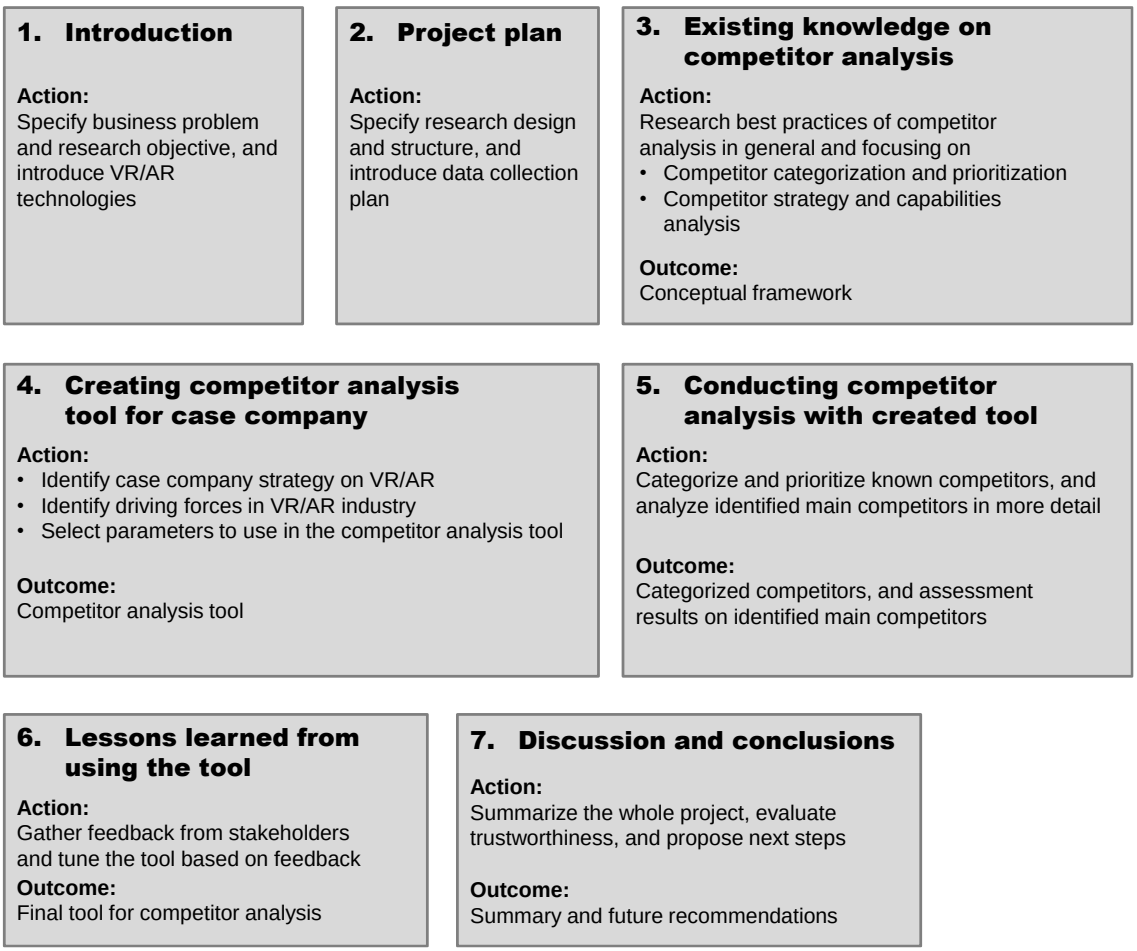

Figure 1. Research design of the thesis

In the first section, the business problem and the scope of research are defined to bring focus to the thesis. This section also presents an overview of the current VR and AR technologies. In the second section the research method and overall thesis structure are defined, together with the plan for data collection and analysis.

In the third section the best practices to competitor analysis are studied from relevant literature. The literature review examines competitor analysis in general, and focuses on finding tools and frameworks that help with competitor categorization, prioritization, and assessment. This includes tools for analyzing the external environment and the industry, as well as profiling individual competitors and assessing their strategies, capabilities, and customer value proposition (CVP). A conceptual framework for the thesis will be synthesized from this literature.

In the fourth section two key tasks are accomplished. First the case company strategy on the VR/AR enterprise solutions industry is identified. Then the initial competitor analysis tool is created. This tool is designed to accomplish two tasks. First it enables the categorization of known rival firms into meaningful groups, based on the strategies they follow. Secondly, it enables more detailed assessment of the capabilities and products of individual competitors. Because there are so many rival firms in the VR/AR industry, it is not feasible to analyze all of them on the detailed level. This is where the prioritization comes into play. By comparing the case company strategic positioning to the categorized competitor groups, the most important group can then be identified. This is the group that has similar strategic position to the case company, and therefore contains the case company's direct competitors. This group of competitors will then be assessed in more detail. The process of creating the competitor analysis tool is basically about creating a framework for competitor categorization and assessment, and identifying which parameters should be used for the categorization, and what parameters should be used for the more detailed assessment. These parameters are identified by analyzing the VR/AR industry and its macro-environment.

In the fifth section the created tool is then used to carry out the competitor analysis. The analysis happens in two stages, as explained above. First, all known competitors are categorized into meaningful groups based on their strategies. The most important group is identified based on the case company strategic position. Then the capabilities and products of firms inside that group are assessed in more detail.

Section six explains the key findings from using the tool to analyze the competition, and gathers feedback from company stakeholders. Based on the feedback, corrections will be made to the tool to fine-tune it for future use in the case company.

Section seven summarizes the whole thesis project. It shows the research that was done and the results that were achieved, and evaluates the trustworthiness of these results. This section also makes recommendations for future research.

2.2 Data collection and analysis plan

This study used data from several sources to ensure that the topic at hand is covered thoroughly and from multiple perspectives. This thesis employs three separate data collection points. The three data collection points (Data 1, Data 2, and Data 3) relate to

three different stages of study in the thesis. Table 1 describes the three data collection points more closely.

Table 1. Data capture points

	Type	Topic	Target	Desired outcome
Data 1A	Interview	Current status of competitive information gathering	Case company stakeholder	Identify how data on competitors is currently gathered and identify desired future state
Data 1B	Documents / observations	Existing competitor data	Company database	Identify the structure of existing competitor data in company database
Data 1C	Interview	Case company strategy	Case company stakeholder	Identify case company's high-level strategy on the VR/AR marketplace
Data 2A	Documents	Driving forces in VR/AR industry	Industry journals, reports, and periodicals	Identify the trends and driving forces in the VR/AR solutions industry and macro-environment
Data 2B	Web pages	Types of competitors	Competitors	High-level understanding of the types of competitors in the industry
Data 2C	Workshop	Parameters for competitor analysis	Case company stakeholder	Lock down the set of parameters to use in the competitor analysis tool
Data 3A	Web pages and video content	Analysis of competitors	Competitors	Categorization and prioritization of all competitors, and more detailed assessment of main competitors
Data 3B	Interview	Feedback on completed work	Case company stakeholder	Feedback to competitor analysis tool and received analysis results

Data was mainly collected from public online resources (rival firms websites, industry journals, reports, and periodicals, videos in YouTube and Vimeo) and from internal discussions, interviews and a workshop within the case company. A key company stakeholder, who is responsible for Competitive Intelligence (CI) in the case company and who is acting as the project owner for the thesis study, was interviewed during data collection points 1 and 3. Additionally, a workshop was held with this company stakeholder and another project manager at data collection point 2. The interviews and workshop did not include a wider audience because other people in the case company do not work with CI or competitor analysis. Although not listed within these three data gathering points, an important part of the data also came from formal and informal discussions that the

author had with colleagues working on VR and AR content development, customers, as well as from the day-to-day VR and AR –related work that the author has participated in the case company.

The purpose of the first data capture point (Data 1) was to understand what internal information was available in the case company on this topic. During this point the key company stakeholder was interviewed twice. The goal of the first interview (Data 1A, 1.5h) was to identify how competitive information is currently gathered in the case company, what limitations the current system has, and what type of a system the company stakeholders want to develop for the future. After this interview the author examined the data that had already been gathered on existing competitors, which was stored in an internal database (Data 1B).The goal of the second interview (Data 1C, 1h) was to get clarity on company stakeholder views about the company's VR/AR strategy.

The purpose of the second data capture point (Data 2) was to understand what external information was available on this topic, and based on analysis of this external data identify the key parameters to be used in the competitor analysis tool. The theory learned from relevant literature on CI and competitor analysis was used to assist the identification of these parameters. At this stage data was gathered from publicly available online resources, including industry journals, reports, and periodicals (Data 2A) and from the websites of known competitors (Data 2B). These websites were examined to get a high-level understanding of the types of competitors in the industry. The insights gained from this analysis was used to create a list of candidate parameters to use in the tool. This list of candidate parameters was then presented for validation to the company stakeholder. The validation was done in a workshop, attended by the author, the key company stakeholder, and one other project manager. The output of this workshop was the final set of parameters to use in the tool (Data 2C). The competitor analysis tool was then created based on these parameters.

The purpose of the third data capture point (Data 3) was to carry out the competitor analysis using the tool. Data 3A consists of the collected data from competitors. This data was then analyzed, and the output of this analysis was the categorization and prioritization of known competitors, and the more detailed assessment of identified key competitors. Finally, an interview was arranged with the key company stakeholder to present these results and to capture their feedback. This feedback (Data 3B) helped to identify improvements for the tool for future use.

The main data analysis method used for the interviews and public online data in this thesis was content analysis. For interviews and workshops this consisted of analyzing meeting notes and other artifacts produced during the sessions, such as whiteboard drawings. For online resources this consisted of systematically evaluating the available written and visual communication, identifying the relevant features and characteristics within that data, and then categorizing the relevant data into meaningful groups.

3 Existing knowledge on competitor analysis

This section presents the knowledge and best practices from literature on Competitive Intelligence (CI) and competitor analysis. It focuses on those aspects on this area that are important from the thesis topic point of view. At the end of this section the conceptual framework for the thesis is presented. This section is divided into five parts.

The first part introduces the concepts of Competitive Intelligence (CI) and competitor analysis. The second part studies what steps are typically taken when carrying out competitor analysis project. The third part presents the most commonly used frameworks and tools for analyzing the external environment. The fourth part presents the most commonly used frameworks and tools for analyzing and assessing individual competitors. The fifth part combines the information from the other parts into a conceptual framework.

The literature created by different scholars uses different terms about the company offering products and services (organization, seller, company, vendor, service provider, producer, firm) and the user of those products and services (customer, consumer, user, buyer). This thesis aims to use consistent terminology for these entities. The company offering products and services is called the ‘firm’ and the user of those products and services is called the ‘customer’. The field of competitor analysis often also uses its own terminology. Key actors in any competitor analysis project are the ‘analyst’ and the ‘clients’. The analyst’s job is to carry out the project, turning raw data into actionable intelligence. The analyst’s clients are those individuals in the firm who are in need of advice and guidance on a particular competitive intelligence question or questions (Fleisher and Bensoussan, 2015, p.24). In this thesis the author is acting as the ‘analyst’, and the company stakeholders are the ‘clients’ of the project.

3.1 Introduction to competitor analysis

In a business sense, the word ‘competitive’ means that a contest is occurring between two or more parties. Competition for firms is about trying to achieve sustainable winning performance, beating the rival firms who are working towards the same or similar goals (Fleisher and Bensoussan, 2015, p.4). This section introduces the key concepts related to competitor analysis and the different types of tools often used for analyzing competition.

3.1.1 The need for competitor analysis

In recent years the competitive pressures have greatly increased in many industries. There are several reasons for this increased competition. With the rapidly evolving technology, the offered value in many new industries is based on intangible assets, such as intellectual property, knowledge, research and development work, brands, and market position. The use of big data analytics, and the ever increasing communication and information technology has made it harder and harder for firm’s to keep such key competitive information proprietary and out of the sight of competitors (Fleisher and Bensoussan, 2015, p.14).

Also, due to easy access to significant amounts of information from the Internet, today’s customers are more sophisticated and better informed than ever before. Today customers can easily do in-depth research and compare different firms’ offerings on specifications, cost and value provided before making a purchasing decision. With the ever-present nature of social media and easy access to various online forums, bad experiences on products and services can be shared instantly, and the news can travel lightning fast (Fleisher and Bensoussan, 2015, p.14).

Due to increased competition in many industries, the need for staying ahead of competitors has become a necessity rather than a desirable goal. Competition compels firms to respond, preferably in a proactive manner. Designing these responses and assessing their impact are the primary goals of Competitive Intelligence (CI) and competitor analysis (Fleisher and Bensoussan, 2003, p.6).

The term Competitive Intelligence (CI) is used to refer to the overall process, or processes by which firms gather actionable information about their competitors and the

overall competitive environment, and then apply this information to their planning processes and decision-making in order to improve the firm's performance. Competitive Intelligence can be viewed as a progression from raw data inputs into finished outputs, or useful information. This information then becomes intelligence when it is put into a format that is useful for decision-makers needs for understanding a specific competitive aspect of the internal or external environment. Therefore, intelligence can be considered to be information that is analyzed, interpreted, and infused with developed implications (Fleisher and Bensoussan, 2015, p.9-10). Competitor analysis is a narrower view of CI. It is analysis of the competition in the arena where a firm resides. It is one cornerstone of formulating and executing an effective strategy within the firm. Useful analysis gives the decision makers insight to understand and predict critical market-changing actions that may be taken by their competitors (Fleisher and Bensoussan, 2015, p.6-7).

Competitor analysis may be undertaken for several different reasons, including gathering on-going knowledge of competitors, and doing performance comparisons (Hussey and Jenster, 2000, p.96-97). The reason for gathering on-going knowledge of competitors is to ensure that the firm is aware of what their competitors are doing, or might be considering doing, and how that might affect the firm. Having continuous knowledge of competitors calls for a method to record competitor information that is up-to-date, can be easily communicated, and is always available. Hussey and Jenster recommend using competitor profiling for this purpose. Performance comparisons are used to compare competitors' performance across many parameters, or key dimensions. By knowing the competitors' performance a firm can identify where it stands in relation to the competition on critical areas. This information can then be used to further improve the firm's position, by taking advantage of its strengths and fixing its weak points. Doing performance comparisons requires the use of some sort of comparison tool. Some version of a competitor comparison grid is useful for this purpose.

For this thesis, the case company has a need to gather on-going knowledge of competitors so that the case company is aware of what is happening in the industry and who the competitors are and what they are doing. And secondly, the case company needs intelligence on comparing performance with main competitors across selected key parameters. The two concepts mentioned above, competitor profiling and a competitor comparison grid (in the form of a matrix chart) are used in this thesis.

3.1.2 Overview of competitor analysis tools

Doing competitor analysis can be a challenging job. The analyst is tasked with making sense out of often ambiguous, complex, and challenging matters that their firm's decision makers care about. The analyst has to use sound judgement, make sense of – or create meaning from – a typically constraint sample of data and information (Fleisher and Bensoussan, 2015, p.8). To accomplish these tasks, the analysts can use a broad set of analytical tools. The academic community has created literally dozens of different types of tools and concepts intended for CI and competitor analysis (Hussey and Jenster, 2000, p.2-3).

The academic literature has concerned itself with competitor analysis for more than three decades. However, the theoretical foundation and underlying assumptions vary significantly between different authors, as they have started from different viewpoints and with different purposes for their work and discourse. The result of this is that authors have varying perspectives on competitor analysis, and thus the analysis results can have very different outcomes depending on which author's concepts and tools an analyst decides to use (Hussey and Jenster, 2000, p.17). On a high level, two different types of perspectives can be identified. One which focuses on analyzing internal operation of the firms, looking at the firm's strategies and capabilities, and another that analyzes the external environment in which the firms operate.

One of the most common ways of analyzing and assessing the internal operation of competitors is through competitor profiling. At its core, a competitor profile is a set of data, showing key information about a specific competitor. This information can include both hard facts as well as deducted assumptions and judgements. Competitor profiles present a good way of gathering on-going information on competitors and ensuring that all the key information is analyzed and recorded. However, alone such textual competitor profiles do not enable performance comparisons to be made. A traditional competitor profile can be enhanced to also support performance comparisons by including assessed values of key performance parameters. This can help tying the individual competitor profiles together into a more complete and actionable 'industry map'.

Effective competitor analysis may be hard or even impossible to accomplish without taking into account the environment and context in which the firms operate. More often than not, the analysis requires in-depth understanding of the industry where the case company operates, as well as the larger external environment within which the industry is

located. This environment is typically defined as the broad set of forces coming or operating from outside a firm that can affect the firm's competitive performance. Firms can be considered as being open systems subject to a range of external inputs and influences. And because the environment influences the operation and behavior of a firm, effectively evaluating and understanding that environment is critical. It can help the firm to ask the right questions and to make better use of the information that is collected on individual competitors. It can also help to bring a measure of order to the data the firm has on the industry, and on the individual competitors in it (Fleisher and Bensoussan, 2003, p.10; Fleisher and Bensoussan, 2015, p.313; Hussey and Jenster, 2000, p.41-42).

The definition of a firm's environment and the approach by which it may be competitively analyzed can differ depending on the perspective the firm chooses to follow (Fleisher and Bensoussan, 2015, p.314). Most of the influential literature on this subject divides this external analysis to two levels; industry analysis and macro-environmental analysis.

Industry analysis focuses on the forces directly influencing the industry. Michael Porter has become one of the most famous thinkers and authors on this topic with his five forces model. An industry contains rival firms, and it is bounded by suppliers, buyers, substitute products, and potential entrants. Porter's five forces model looks at the competitive forces tied to these elements.

Every industry resides within a broader environment, which is continually changing. The macro-environmental analysis examines forces in the broader environment within which the industry resides. This analysis is based on the idea that industry forces are not the sole explanation of all that occurs within an industry. The broader environment beyond an industry's boundaries can influence what actually takes place within the industry, affecting the demand of the industry's products and the business of the firms on the competitive stage. In some industries these external factors for change can even be among the primary determinants of competition and competitiveness (Fleisher and Bensoussan, 2003, p.270; Hussey and Jenster, 2000, p.53). STEEP/PEST analysis is one of the most common ways of addressing and studying the broader issues that affect the macro-environment.

Industry and macro-environmental analysis can reveal much about the current state of an industry and the environment surrounding it. Nevertheless, change and uncertainty are ever present in any competitive environment. Every situation has forces that cause

things to remain as they are, or to change. Forces that push towards change are called ‘driving forces’. Forces that resist change are called ‘restraining forces’. When the net effect of these driving and restraining forces is altered and moves away from balance, change occurs in either a helpful or obstructive manner. Driving forces analysis is a way of understanding and accounting for this change at the industry level (Fleisher and Bensoussan, 2015, p.243). The term ‘force’ within this context refers to the broad cluster of events, state of affairs, and trends that create influences on changes to an industry’s structure and rival’s competitive conduct, and which therefore impact a firm’s future (Fleisher and Bensoussan, 2015, p.243-244). Examples of driving forces include advancing use of technology like the Internet, smartphones, and – directly relating to this thesis – consumer VR and AR products.

Driving force analysis is an essential component of macro-environmental and industry analysis. These analyzes may not be performed effectively without accounting for what forces are driving them. Understanding the driving forces is the first step toward establishing a framework for analyzing critical trends, particularly as they impact the competitive environment facing an industry (Fleisher and Bensoussan, 2015, p.244-245).

Another factor which affects behavior across the whole industry is the current position of the industry’s lifecycle. Each industry has a lifecycle, moving from emergence to maturity, and then at some stage to decline. The competitive behavior is typically very different at different stages of the lifecycle. Also the industry concentration plays a major role in determining the competitive behavior. In a highly concentrated industry a few firms have a large market share, where as in a fragmented industry no firm has a significant market share (Hussey and Jenster, 2000, p.55; Porter, 2004, 189-191).

3.1.3 Using multiple tools to solve firm-specific issues

Competition and the analysis of competitive behavior is much more complex than the static phenomenon that is described in neo-classical economics, in which a number of firms compete under similar assumptions, with similar products or closely related substitutes and where perfect knowledge of market conditions exist among customers and firms. In real life different firms compete under different conditions, may produce differentiated products for the same market segment, and often neither firms of the customers have a full view of the market conditions. Many factors being analyzed do not act according to history, logic, or certainty (Hussey and Jenster, 2000, p.2). The key authors on this topic think of business and competitive analysis being more of a social science pursuit

than a physical or pure science one. It can be said that competitive intelligence is not purely science or art, but a combination of substantial portions of both (Fleisher and Bensoussan, 2015, p.7-9).

It is good to keep in mind that in the real world different firms have different competitive analysis needs. Therefore it is worthwhile to have a context-specific viewpoint to competitive analysis, and not treat it as a generally applicable methodology (Hussey and Jenster, 2000, p.19). As analysis of competitors takes on varying forms, it thus becomes critical for firms to develop an appropriate context and broader perspective that is applicable to their unique situation by building on multiple streams of research. Very few competitive intelligence questions can be satisfactorily answered using just a single analytical technique. Most competitive questions are complex and challenging. This requires the analyst to identify the correct techniques and tools to use and the sequence in which they should be used (Fleisher and Bensoussan, 2015, p.92-95). In reality, no individual theoretical perspective can be said to hold the only one truth on the area of competitor analysis. In many cases the problems to be analyzed may benefit from using more than one theoretical perspective (Hussey and Jenster, 2000, p.18-19).

This thesis uses several complementary tools in combination to best satisfy the company stakeholder's analysis needs. This includes analyzing both the external environment and the internal capabilities of rivals.

3.2 Structure for a competitor analysis project

Before starting work on a competitor analysis project the structure for the project must be defined. A clear structure is critical for first of all understanding what steps need to be carried out and in what order.

A competitor analysis project's structure can be based on the intelligence cycle framework. In this context the intelligence cycle presents a systematic process or cycle for collecting and analyzing information about competitor's activities, one's business environment, and business trends to further one's own organizational goals (Fleisher and Bensoussan, 2003, p.6). There is no single, standard model for the intelligence cycle. It is typically shown consisting from 4 to 6 steps. The intelligence cycle model and analysis process steps used in this thesis are adapted from the models proposed by Fleisher and Bensoussan (2015, p.10-45, and 2003, p.6). This 5-step model is shown in Figure 2. This 5-step intelligence cycle model is used as the basis for the work carried out in this thesis.

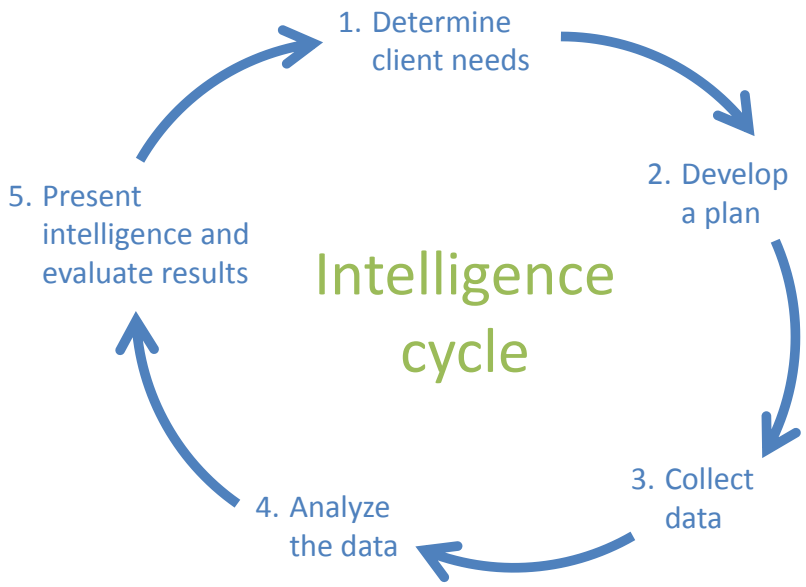

Figure 2. Intelligence cycle for the thesis

The first step is to clearly identify and understand the needs of the clients, or the company stakeholders for the project. Ongoing analyst-client interaction is important at all stages of the project, but it is especially critical at the onset, as it sets the stage for everything that follows. Once the needs are known then the requirements can be established and a plan can be developed (Fleisher and Bensoussan, 2015, p.25). At this point the analyst and clients should engage in dialogue to identify the project's intelligence needs. Key questions that should be asked at this point include the following (Adapted from Fleisher and Bensoussan, 2015, p.26).

- Why is this project needed and what is its purpose?
- What expectations do the clients have on the project outcome?
- What is the scope of the analysis?
- What resources are available for the project?
- How quickly are results expected?
- What data or information has already been gathered on this topic?
- What barriers may exist for completing the project?

Once the needs for the project are identified and understood, then in the second step a plan can be developed that leads from the starting point to the endpoint, where a satisfactory outcome product is delivered to the client. A key part of this plan is determining

the type of needed analysis. This step includes choosing the appropriate analysis frameworks and tools to be used. At this stage the analyst also identifies the type of data needed, and the type of data collection that needs to be carried out (Fleisher and Bensoussan, 2003, p.9; 2015, p.23-24, 92-95).

As a process, analysis depends upon inputs of raw data. The third step is to collect the required data from within and outside the firm. It is critical that the analyst can credibly evaluate their data and information inputs. The analyst needs to keep in mind that not all data are useful and leads to effective analysis. A key criterion for data is that needs to be accurate. In weighing the accuracy and credibility of data the analyst has to consider the nature of their sources (Fleisher and Bensoussan, 2003, p.15; 2015, p.34-35). Competitive analysis often relies on three types of data sources; primary, secondary, and tertiary. Primary sources are original written or non-written materials that provide direct or first-hand evidence on the event or object being studied. This can include for example documents, pictures, videos, social media entries, and information on websites. Secondary sources are information based on primary sources. They are usually created at a later date, lack the freshness of the original materials, and often provide added discussions, commentary, or interpretation of the original source. Tertiary sources are based on a collection, reorganization, or repackaging of primary and secondary sources. They are usually produced to increase readability and usability of the information (Fleisher and Bensoussan, 2015, p.34-35).

The fourth step is to analyze the collected data. Here the analyst applies his skills and experience, together with analytical frameworks and tools chosen for the project in a creative way to generate intelligence that satisfy the clients' intelligence needs. The analyst then draws conclusions and produces the output from the analysis.

Finally in the fifth step the analyst presents or provides the intelligence and insights generated from the analysis to the clients in the chosen format. The finished product may have several forms, such as a chart, graph, table, text, summary, visual, or other communicative aids appropriate for dissemination. The purpose of the end product is to help decision makers make sense of the intelligence (Fleisher and Bensoussan, 2015, p.10-11, 23, 37). The analyst and clients assess the output and related outcomes of the project, and evaluate how well the project has met the clients' needs. At this point gaps may be identified in the understanding and, where needed, improvements are agreed upon and implemented (Fleisher and Bensoussan, 2015, p. 10-11, 23). The results can lead

to the identification of new intelligence needs, starting the intelligence cycle again. The work carried out in this thesis draws its structure heavily on this intelligence cycle concept.

3.3 Tools for analyzing the external environment

This section covers tools for analyzing the external environment. This includes how to specify industry boundaries, how Porter's five forces framework can be used for industry analysis, and how STEEP/PEST framework can be used for analyzing the macro-environment.

3.3.1 How to define industry boundaries

The case company already had basic knowledge of a number of competitors before this study began. However, during the study the author also spent considerable time identifying additional competitors that were out there, and this work required the author to think about how to really determine the 'VR/AR industry' and to decide where the boundaries of this industry should be drawn.

Normally, identifying competitors would seem to be a simple task. A typical criterion would include those firms that serve the same customer base. However, upon deeper analysis this question can become more complicated. What exactly is the customer base? Is it customers of the same product? Is the customer base limited by some geographical reach? At the narrowest level, a firm could define its competitors as other firms offering similar products and services, to the same customers at similar prices. However, in real life firms typically face a much wider range of competitors. At a slightly wider level, a firm might define its competitors as all firms with the same class of products. Even more broadly, competitors might include all firms making products that supply the same service. It is important to use a broad enough sweep at the beginning of the analysis to effectively include all potential rivals, and to keep the analysis from becoming too narrowly focused. Having a too narrow view may cause a firm to overlook latent sources of competition that may someday become a threat (Fleisher and Bensoussan, 2003, p.150; Kotler and Armstrong, 2012, p.552-553; Porter, 2004, p.32).

Firms can identify their competitors from an industry point of view (Kotler and Armstrong, 2012, p.553). To be able to analyze competitors in an industry, the firm must first make a definition of what the industry boundaries actually are. The industry boundaries are

illustrated by the dotted line in Figure 3 (Porter, 2004, p.187). At a high level, an industry can be defined as consisting of all the firms producing products and services that are close substitutes to each other, while being dissimilar from products in other industries. The industry boundaries are formed by the suppliers providing raw materials for the firms in the industry, the buyers of the industry's products and services, firms producing substitute products, and potential entrants, which are firms that are not in the industry currently but which may easily enter it in the future.

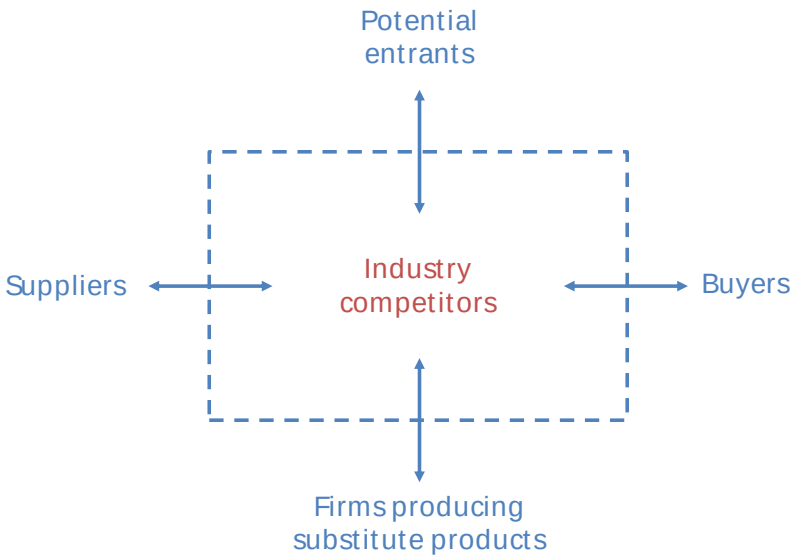

Figure 3. Industry boundaries

These industry boundaries can change as the industry structure evolves. Innovation in the industry or innovation in substitute products can place more firms into direct competition. Structural changes may also allow suppliers to forward integrate, or buyers to backwards integrate to the industry. Today the proper definition of an industry has become an endlessly debated subject. It is typical of many industries that the definition is difficult and often the borders with related industries are hazy. In the end, any definition of an industry should essentially be considered a subjective choice by a firm of where to draw the line between established competitors and substitute products, between existing firms and potential entrants, and between existing firms and suppliers and buyers. Expert authors on the topic have stressed the need to look beyond product to functionality in defining a business, beyond national boundaries to potential international competition, and beyond today's competitors to those that may become competitors tomorrow (Porter, 2004, p.32, 186-187; Hussey and Jenster, 2000, p.141-142).

It should also be noted that a definition of an industry is not the same as definition of where the firm wants to compete, defining the business of the firm. An industry may be defined broadly, but it does not mean that firms in the industry can, or should compete broadly. Decoupling industry definition and that of the business the firm wants to be in can go far in eliminating confusion in drawing industry boundaries (Porter, 2004, p.33). This information also applies to the case company. The case company's business exist on a narrower area of what can be deemed to be the whole 'VR/AR enterprise solutions industry'.

3.3.2 Porter's five forces framework

According to Porter (2004, p.3-4) industry structure has a strong influence in determining the competitive rules of the game as well the strategies potentially available to a firm. Porter identifies five basic competitive forces that have a significant effect on all of the firms in an industry. These forces are the bargaining power of the suppliers, bargaining power of the buyers, threat of new entrants, threat of substitute products, and the intensity of rivalry among existing firms. Porter states that the collective strength of these forces together determine the intensity of industry competition and profitability. Porter's five forces model can be shown as an overlay on the industry model, as illustrated in Figure 4 (adapted from Fleisher and Bensoussan, 2003, p.68).

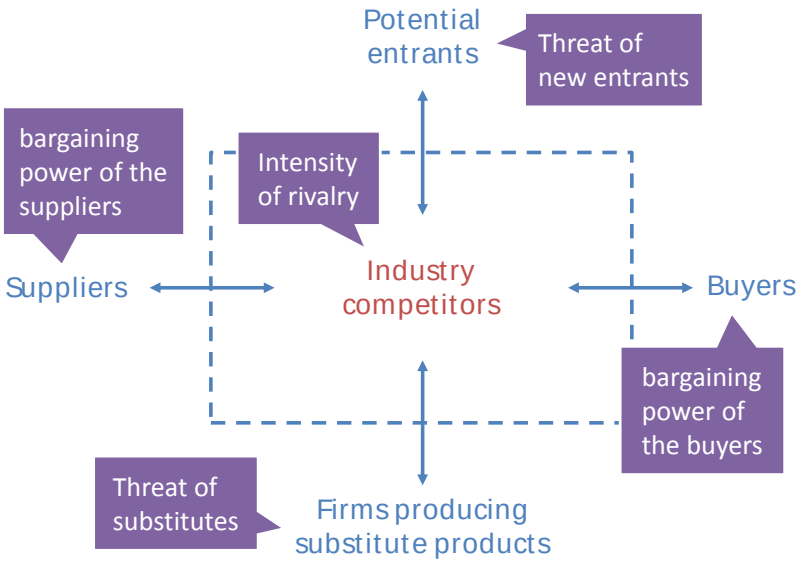

Figure 4. Porter's five forces

Buyers compete with the industry by forcing down prices, bargaining for higher quality or more services, and playing firms against each other. All this happens at the expense of industry profitability. There are several factors that can increase the bargaining power of buyers, such as when a buyer's purchases make up a large portion of a firm's sales, if the buyers face small switching costs, or if the firm's products are undifferentiated from its rivals (Porter, 2004, p.24-25).

Suppliers can also exert bargaining power over firms in an industry by threatening to raise prices or by reducing the quality of purchased goods or services. Powerful suppliers are able to squeeze profitability out of an industry, when firms are unable to recover cost increases in their own prices. The conditions that make suppliers powerful mirror those that make buyers powerful. For example if the industry is dominated by just a few suppliers then the suppliers can exert a lot of power on prices (Porter, 2004, p.26-27).

Rivalry happens among existing competitors as firms are attempting to improve their position, or are pressured to defend their current position on the marketplace. This rivalry uses tactics such as price competition, advertising battles, and new product introductions. The intensity of rivalry depends on the industry, its structure and maturity level. In industries with intense rivalry the actions of one firm can cause intense retaliation from other firms. This pattern of actions and counteractions may lead to all firms in the industry worst off, such as might happen with severe price competition where all firms are forced to make big price cuts (Porter, 2004, p.17-18).

In a broad sense, all existing firms in an industry are competing also with other industries producing substitute products. Substitutes place an upper limit on the price that firms in an industry can profitably charge, as at some point the price-performance ratio of the substitute products will become better. Identifying substitute products is a matter of searching for products that can perform the same function as the products in the industry in question (Porter, 2004, p.23-24).

In addition to existing competitors and substitute products, firms in an industry are also under threat from new entrants, which bring with them new capacity and resources. This may lead to prices being bided down or costs rising for the existing firms, reducing profitability. The threat of entry into an industry depends on the barriers to entry that are present, together with the reaction from existing firms. Major sources of barriers to entry

include economies of scale, cost disadvantages independent of scale, product differentiation, capital requirements, switching costs, and access to distribution channels (Porter, 2004, p.7-13). These entry barriers can, and typically do, change with time as technology evolves and the industry's environment changes.

The idea behind economies of scale is that in some industries the cost of production declines with increased volume per period. Scale economies deter entry as they force entrants to either come in at large scale or to accept higher production costs than their competitors. Established firms may additionally have cost advantages over new entrants that are independent of scale. These can include product know-how or design characteristics which are kept proprietary through patents or secrecy. Another such benefit is the so-called learning or experience curve. By being in the industry longer the established firms have gained experience in producing products with lower costs. Costs can be lower for example because the workers have improved their working methods over time, the firm has had time to develop specialized tools and processes, and has been able to optimize the performance of their products (Porter, 2004, p.11-12). If costs decline with experience in an industry, and if this experience can be kept proprietary by established firms, then this effect leads to an entry barrier. Newly established firms, with no experience, will have inherently higher costs than established firms and must bear start-up losses to gain the experience and achieve cost parity with the established firms.

Product differentiation means that established firms have brand identification and customer loyalties, which stem from past advertising, customer service, product differences, or simply being first into the industry. Differentiation creates a barrier to entry by forcing entrants to spend heavily to overcome existing customer loyalties. This effort usually involves start-up losses and often takes extended period of time. Such investments in building a brand name are particularly risky since they have no salvage value if entry fails (Porter, 2004, p.9).

The need to invest large financial resources in order to compete creates a barrier to entry, particularly if the capital is required for unrecoverable up-front advertising or research and development (Porter, 2004, p.9-10). A barrier to entry is also created by the presence of switching costs. These are the one-time costs incurred by a buyer by having to switch from one firm's products to another firm's products. Examples of switching costs include employee retraining costs, cost of new supporting equipment, as well as the cost and time required in testing or qualifying the new source (Porter, 2004, p.10).

Porter's five forces framework is used in this thesis to gain a better understanding of the structure of the VR/AR enterprise solutions industry and to gain insights to the forces driving it forward.

3.3.3 STEEP/PEST framework

In order to make the task of analyzing a firm's macro-environment more meaningful, the environment is typically broken down into more manageable subcategories. Typically, either STEEP or PEST categorization schemes are used for this. STEEP stands for social, technological, economic, ecological, and political/legal sectors (Fleisher and Bensoussan, 2003, p.272). PEST stands for political/legal, economic, technological, and social sectors. So it is otherwise the same as STEEP, except that it lacks the ecological sector. The ecological issues are typically included as cutting across the other four sectors (Fleisher and Bensoussan, 2015, p.315-316). Each of these sectors operates over a large geographical area – from local to global – and over time, from past to the future (Fleisher and Bensoussan, 2003, p.272). The four PEST sectors are explained in more detail below (based on definitions given by Fleisher and Bensoussan, 2003).

The political component of the political and legal sector relates to government and public attitudes towards various industries, as well as to the lobbying efforts by interest groups and the regulatory climate. The legal component consists of the laws that members of a society are expected to follow. In practically all countries the policies and laws constrain a firm's ability to act in certain ways.

The economic sector indicates the distribution and uses of resources within an entire society. It is important because consumption patterns are largely influenced by economic trends, including spending patterns and levels of disposable income.

The social sector describes characteristics of the societal context in which a firm exists. Factors contributing to this sector include demographics, cultural attitudes, education levels, customs, beliefs, values, lifestyles, the age distribution, and the geographic distribution.

The technological sector describes the impact of science and technology in product and process innovation, and how major technological changes have opened new areas to commercial competition. This includes new types of raw materials, new approaches to

producing goods and services, new procedures, as well as new equipment. The major task of the analyst is to identify and monitor the effects of technological change as it affects competitive strategy.

The PEST framework is used in this thesis to gain a better understanding of the overall environment surrounding the VR/AR enterprise solutions industry and to gain insights to the forces driving it forward. This thesis takes a look at the economic, social, and technological sectors, but does not deal with the political/legal sector as it is not seen as important currently in this industry.

3.4 Tools for analyzing competitors

This section covers how competitor profiling can be used for analyzing the internal operation of competitors. It also covers how competitors can be categorized into so-called strategic groups based on the strategies they follow. Additionally, this section studies how Critical Success Factors (CSF) and Customer Value Propositions (CVP) can be used to assess competitors.

3.4.1 Competitor profiling

Competitor profiling is one of the most often used methods for analyzing and assessing the internal operation of rival firms. A competitor profile may contain a large variety of different kinds of information. The list below shown typical types of competitor profile information (adapted from Hussey and Jenster, 2000, p.99-103; Fleisher and Bensoussan, 2003, p. 147-148).

- Background information
- Product/service analysis
- Marketing and sales activity
- Personnel information and policies
- Manufacturing and customization capabilities
- sources of competitive advantage
- scope of international operations
- Apparent competitive strategy
- strengths and weaknesses
- Organizational structure and philosophy
- Management profiles
- R&D and technology expertise

- Customer types and numbers
- Financial results

Firms may be able to gather large amounts of information about their rivals, but unless this information can be put into use within the firm then it really serves no function. In order to use the information the firm needs a way to process and analyze it, and give it a useful context. One way to give this information context is to use Porter's model for competitor analysis (2004). Porter was one of the first authors to propose a formal and systematic process through which to gather and analyze information about competitors (Fleisher and Bensoussan, 2003, p.146).

Porter (2004) identified four diagnostic components to competitor analysis. Porter's model on the components of competitor analysis is shown in Figure 5 (Adapted from Porter, 2004, p. 49). The left side of the model focuses on more subtle topics of what is driving the behavior of a competitor. This includes the competitor's future goals and assumptions components. Often these driving factors are much harder to observe than actual competitor behavior. Yet they often determine how a competitor will behave in the future. The right side of the model focuses on the current situation of a competitor. This includes the current strategy and capabilities components. The information on these four components makes up the competitor's response profile.

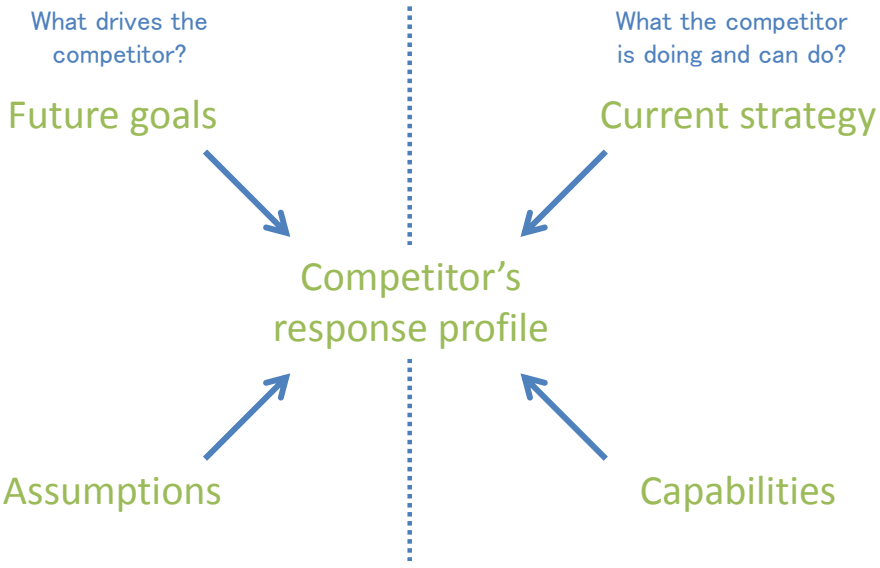

Figure 5. The components of competitor analysis

The future goals component contains that information about a rival that would allow predictions to be made about whether the competitor is satisfied with its current position and financial results. This could then be used to estimate how likely it is for the competitor to change its strategy, and to evaluate how strongly it would react to outside events and strategic changes of other firms (Porter, 2004, p.50-51).

The assumptions component contains information on the competitor's assumptions about itself, as well as the competitor's assumptions about the industry and the other companies in it. Every company holds assumptions about its own situation and the situation of the environment. Regardless if these assumptions are accurate or not, they guide the way the firm behaves and reacts to events. Examining assumptions can help a firm to identify competitor's biases and blind spots that the firm can then take advantage of (Porter, 2004, p.58-59).

The current strategy component contains information on how the competitor is currently competing. More truthfully, this component could be called 'apparent strategy', as outsiders to the analyzed rival firm have limited visibility into how they operate, and can only try to deduce what the rival's strategy is. There is always uncertainty on both whether the deductions are correct and how long they will remain correct. Even though the strategy may be either implicit or explicit, one always exists in one form or another (Porter, 2004, p.63; Hussey and Jenster, 2000, 103).

The capabilities component includes information on the competitor's strengths and weaknesses on a variety of key areas of business. Example areas that may be of interest in a competitor profile include products, marketing and selling, operations, R&D, and overall costs (Porter, 2004, p.63-65).

This thesis focuses on gaining insights to what the current competitive environment looks like and what the competitors are currently doing. For this reason this thesis uses only the right side of Porter's model, examining competitors' current strategy and capabilities. The strategy component can provide a good starting point for categorizing competitors. Different firms may follow very different strategies, and generally speaking, firms whose strategies are similar compete more with each other. The capabilities component can give a good starting point for making performance comparisons. The following sections dives into more details on how competitors can be categorized based on their strategies, and how firms can be compared based on their capabilities.

3.4.2 How to categorize competitors based on their strategies

One way to categorize competitors is based on the strategies they follow. On a very high level, there are three generic strategic approaches that firms can pursue. These strategies are cost leadership, differentiation, and focus (Porter, 2004, p.35). Focus strategy can be based on either the cost or the differentiation strategy. This gives us the 2x2 matrix shown in Figure 6 (adapted from Porter, 2004, p.39).

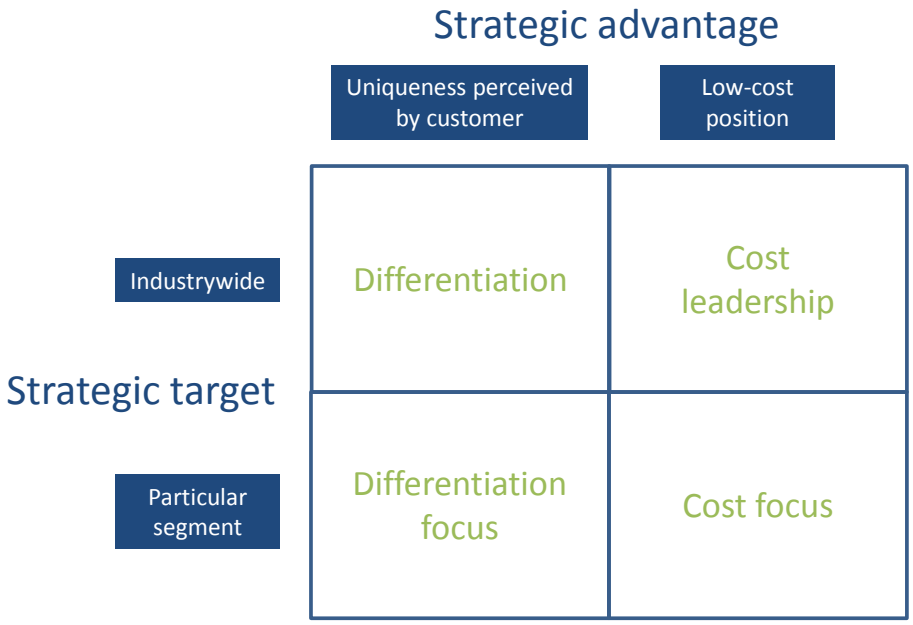

Figure 6. Generic strategic approaches

Cost leadership strategy attempts to achieve a low cost position in the industry. With this strategy a firm puts its efforts into aggressive cost minimization throughout the firm's operations. With differentiation a firm puts its efforts into offering something unique in the marketplace, as perceived by the customers. This uniqueness can come in many different forms, including design or brand image, technology, features, customer service, or other dimensions. Commonly, achieving differentiation implies a trade-off with cost position, as the activities required to achieve differentiation are inherently costly. With the final strategy, focus, a firm focuses its efforts into a particular buyer group, segment of the product line, geographic market, or similar narrow target. A firm can use the focus strategy either on cost leadership or on differentiation. The focus strategy is aimed at serving the chosen narrow target very well. This idea rests on the premise that the focusing firm is able to serve the narrow target more effectively or efficiently, than rival firms who are competing more broadly (Porter, 2004, p.35-46).

Cost leadership, differentiation, and focus are very generic categories of strategy. In most industries firms have adopted very different competitive strategies along a lot larger set of strategic dimensions. Porter (2004, p.127) gives a list of strategic dimensions that typically firms have differences in. Some of the key dimensions on this list are shown below. Note that other dimensions may also exist and it is up to the analyst to determine the most important ones in the industry in question.

- Specialization: the degree to which a firm focuses its efforts in terms of width of its product line, the target customer segments, and the geographic markets served
- Brand identification: the degree to which a firm seeks brand identification rather than competition based mainly on price or other variables. Brand identification can be achieved via advertising, sales force, or a variety of other means.
- Product quality: the level of product quality, in terms of specifications and features, and so on
- Technological leadership: the degree to which a firm seeks technological leadership versus following imitation. Note that product quality and technological leadership do not necessarily go together.
- Channel selection: the choice of distribution channels a firm chooses to use
- Price policy: the firm's relative price position in the market. This is usually related to other variables, such as cost position and product quality, but price is a distinct strategic variable that must be treated separately

Competitors can be grouped into so-called strategic groups based on the strategy they follow. A strategic group is made up from a group or cluster of rival firms in an industry following the same or a similar strategy along the key strategic dimensions. The firms in a strategic group have similar competitive approaches and positions within the industry (Kotler and Armstrong, 2012, p.554; Porter, 2004, p.129-130; Fleisher and Bensoussan, 2003, p.75). According to Porter, industries typically have a small number of strategic groups that capture the essential strategic differences among the firms (Porter, 2004, p.129-130).

Generally speaking, the more one firm's strategy resembles another firm's strategy, the more the two firms compete. This basically means that if a firm enters a specific strategic group, the other firms in that group become its key competitors (Kotler and Armstrong, 2012, p.554). Although competition is most intense within a strategic group, there is also rivalry among groups. Some strategic groups may appeal to overlapping customer segments, or customers may not see much difference in the offers of different groups (Kotler and Armstrong, 2012, p.554).

The strategic group concept can aid industry structural analysis by providing an intermediate frame of reference between looking at the industry as a whole and considering each firm separately (Porter, 2004, p.132). However, it is good to keep in mind that ultimately in real life every firm is unique, and therefore classifying them into strategic groups may raise questions of judgement about what degree of strategic difference is important.

The strategic groups in an industry are typically displayed on a two-dimensional strategic group map. Figure 7 shows an example map (Adapted from Porter, 2004, p.131) of a hypothetical industry. Because such a map is limited to two dimensions, the analyst must carefully choose the most important strategic dimensions along which to construct the map. In the example map the chosen dimensions are level of specialization and level of vertical integration. If there are more than two key dimensions then multiple maps may be created.

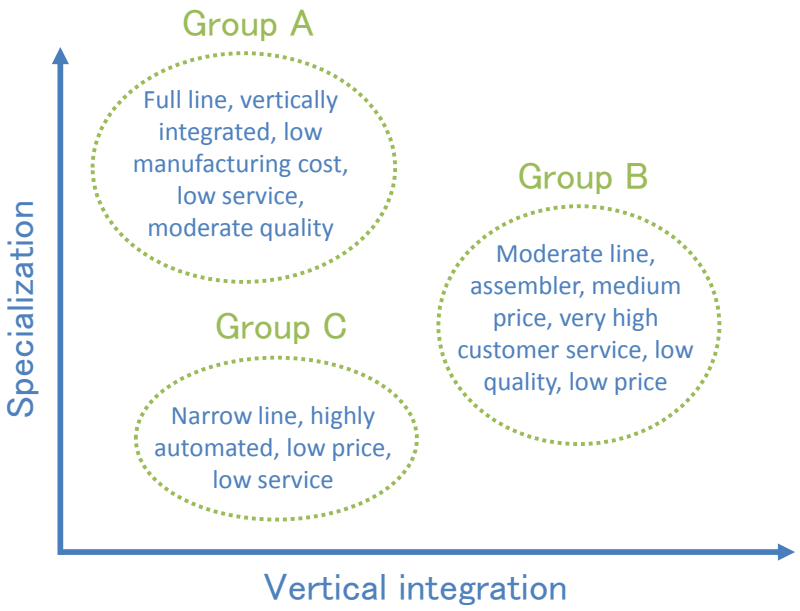

Figure 7. Strategic group map example

Mostly strategic group analysis is seen as a subset of industry analysis that studies the effect of the five competitive forces on firms in an industry. As different strategic groups have different positions within an industry, they are affected differently by Porter's five forces (Fleisher and Bensoussan, 2003, p.74-75).

The barriers to entry depend on the particular strategic group that the entrant seeks to join (Porter, 2004, p.133). For example, if cost advantages from accumulated experience are important in an industry, then they protect the strategic groups consisting of experienced firms, whereas inexperienced ones are at a higher risk. These entry barriers not only protect firms in a strategic group from entry by firms outside the industry, but also provide barriers for firms to move from one strategic group to another. This means that the factors creating entry barriers that result from competing with a particular strategy elevate the cost to other firms of adopting that strategy. These 'moving costs' may in the worst case completely eliminate the expected gains from the change. These factors that deter the movement of firms from one strategic position to another are known as mobility barriers (Porter, 2004, p.133-134).

Different strategic groups carry with them different levels of mobility barriers, which provide some firms with persistent advantage over others. Mobility barriers protect firms' competitive position and profits from erosion through competitor imitation. Without mobility barriers, firms with successful strategies could be quickly imitated by others, leading to a drop in the firm's profitability. Those firms that are located in strategic groups with high mobility barriers will have greater profit potential than those in groups with lower mobility barriers (Porter, 2004, p.134; Fleisher and Bensoussan, 2003, p.75-76). These barriers also provide a rationale for why firms continue to compete with different strategies, despite the fact that all strategies are not equally successful.

The presence of more than one strategic group in an industry also has implications for industry rivalry, or competition in price, advertising, service, and other variables (Porter, 2004, p.138-139). The most important influence on rivalry among strategic groups is their market interdependence, or the degree to which the groups are competing for the same customers, or competing for customers in distinctly different market segments. Typically, when strategic groups have high market interdependence, differences in strategy will lead to high rivalry. And oppositely, when groups are targeting very different segments, their interest in each other is much less severe. As the customers segments they are selling to become more distinguished, the rivalry becomes more and more as if the groups were in different industries (Porter, 2004, p.138-139). The second key factor influencing rivalry is the degree of product differentiation between groups. If different strategies lead to distinct and differing brand preferences by customers, then rivalry among the groups will typically be much less than if the product offerings are seen as interchangeable by customers (Porter, 2004, p.139).

The concept of strategic groups and strategic group maps are used in this thesis for categorizing and prioritizing competitors.

3.4.3 How to make comparisons on competitors' capabilities

One popular tool for studying a firm's capabilities is through core competences analysis, created by Prahalad and Hamel (1990). Their idea is that the competitiveness of firms in the long run comes from the collective knowledge that the individuals in the firm possess, and how the firm is able to coordinate the use of that knowledge and put it into use. As Prahalad and Hamel (1990, p. 82) state the following about core competences.

> Core competencies are the collective learning in the organization, especially how the company coordinates diverse production skills and integrates multiple streams of technologies.

Gallon et al. (1995, p.20) summarize core competences as being the things that a firm knows how to do uniquely well, and that has the scope to provide them with better-than-average degree of success over the long term. So the main idea is that core competencies are the special qualities that a firm owns that provide competitive advantages for the firm.

Core competences have specific qualities that make them unique from other capabilities that a firm might own. A core competence provides potential access to a wide variety of markets, meaning it provides market mobility. A core competence should make a significant contribution to the perceived customer benefits of the end product. And a core competence should be difficult for competitors to imitate (Prahalad and Hamel, 1990, p. 83-84).

Gallon et al. (1995, p.21-22) state that the majority of capabilities that are critical to firms are either technological or related to the market interface. With technological competencies the technology is the major determinant of uniqueness. Examples of such capabilities are applied science capabilities, where fundamental know-how is derived from basic research, and design and development capabilities, where the firm converts a product idea into an operational reality. The latter capabilities could include knowledge on using CAD, project management, prototyping, or software development. With marketing-related competencies the underpinning critical capabilities relate to product management, pricing, communication, sales, and distribution.

Core competencies focus on analyzing firm-specific capabilities, and is typically used for firm-internal analysis. However, focusing solely on the firm can easily give a too narrow scope and provide misleading results as to what is really meaningful on an industry-level. Critical success factor (CSF) analysis offers a similar concept to core competences, except that it focuses more on assessing important capabilities on an industry-wide level. CSFs are the few things that a firm must do well in order to ensure success for the firm in a specific industry. Often these CSFs are created by the driving forces in the industry. Similar to core competences, CSFs may exist in many different processes, including technology, manufacturing, distribution, marketing, or skills and capability. The idea behind assessing these factors is that a firm is likely to be successful if it is competitively better than its competitors in one or more industry-level CSFs (Fleisher and Bensoussan, 2015, p.222-231).

A variety of different methods can be used to identify CSFs. Individual methods may not be sufficient to identify a CSF, but by combining multiple methods, the risk is lowered that the analyst will miss a CSF, or the relative importance of one. Authors on this topic recommend a CSF identification technique that spans three levels of analysis; macro-environmental analysis, industry analysis, and firm-level analysis (Fleisher and Bensoussan, 2015, p.232). This three-level analysis will be used in this thesis to identify CSFs in the VR/AR enterprise solutions industry.

One helpful starting point to identifying CSFs is by asking and trying to find answers to the following questions (adapted from Fleisher and Bensoussan, 2015, p.231).

- On which basis (attributes, characteristics) do buyers' of the industry's products or services choose between competing brands?
- Given the nature of competitive forces and rivalry, what capabilities and resources does a firm require to be competitively successful?
- What limitations or shortcomings among product/service attributes, competencies and capabilities are almost certain to put a firm at a significant competitive disadvantage?

Core competences and critical success factors can be considered two terms relating to the same topic; key things that firms in an industry need to do well in order to succeed. As such, they provide a good theoretical basis for doing performance comparisons, or evaluating the strengths and weaknesses between firms in the VR/AR enterprise solutions industry. Making such comparisons requires that the identified CSFs can be as-

sessed numerically. After specifying numerical scales for the CSFs, then the main competitors can be scored on how strong or weak they are in regard to each CSF, and then the scores of different competitors can be compared against each other.

There are several ways to present the outcome of such competitor comparisons. Often the results are presented on some form of a chart. The Internet is filled with examples and ready-made templates of such charts. Example chart types include a spider chart (also called a radar chart), a scatter chart, a bubble chart, and a matrix chart. This thesis uses one version of a matrix chart that is convenient to create in Excel. In this matrix chart the main competitors are listed on one axis, and the identified CSFs are listed on another axis. Additionally, as different CSFs may have different importance in the industry, each of them is given a weighing factor. For example CSF 1 could have a weighing of 30%, and CSF 4 could have a weighing of 15%. The total sum of all the weights should equal 100%. An example of such a chart is presented in Table 2.

Table 2. Example competitor matrix chart

	Weight	Competitor A	Competitor B	Competitor C	Competitor D
CSF 1	30 %				
CSF 2	25 %				
CSF 3	20 %				
CSF 4	15 %				
CSF 4	10 %				
Total	**100 %**				

One way to analyze marketing-related capabilities is by analyzing firms' value propositions. To win, keep, and grow customers, a firm must outperform its competitors. To do this the firm needs to gain a competitive advantage. A firm gains a competitive advantage by offering greater customer value, either by having lower prices or by providing more benefits that justify higher prices. A competitive advantage should be sustainable, allowing the firm to protect it from either imitation or substitution by competitors (Kotler and Armstrong, 2012, p.552; Fleisher and Bensoussan, 2003, p.2). Another way to think about a competitive advantage is as something unique that the firm has to offer. Without this uniqueness customers have no special reason to choose the firm, and when rival firms do offer something unique, customers choose them instead. In other words, the firm's product or service needs to be a better option than that of the competitors in at least one meaningful way. This 'better-ness' does not have to be an objectively quantifiable measure, but it does have to be better than the competitors' alternatives inside the customers' mind. As long as the customers believe that a specific firm offers the best

option for them in at least one way, they have a reason to choose that firm's product instead of the competitors' products.

The firm must also be able to communicate this 'better-ness' to its customers. The firm must make the customer understand how its offerings' value potential is translatable to specific needs that the customer wants fulfilled. The firm achieves this by creating value propositions that strive to be better or more compelling than those of the competitors (Vargo and Lusch, 2004 and 2008). The customer is then the one who decides whether to accept or reject the firm's value proposition.

Today the term customer value proposition (CVP), or just value proposition is often featured as a part of a firm's sales and marketing strategy. It could be stated in commercials and advertisements, or laid out on the company's webpage. The concept of value proposition originates from the work of McKinsey & Co. consultants Michael J. Lanning and Edward G. Michaels (McKinsey, 2000; Skålén et al., 2015). Lanning and Michaels state the following about value propositions

> Value proposition is a simple statement of the benefits that the company intends to provide to each segment, along with the approximate price the company will charge each segment for those benefits.

Other scholars' have their own definitions of value proposition, which for the most part are some variations of the definition given by Lanning and Michaels. Grönroos and Ravald (2011, p.14) state the following.

> Value propositions are suggestions and projections of what impact on their practices customers can expect. When such a projection is proposed actively to customers, it is a promise about potential future value creation.

So the value proposition is a statement that clearly describes the overall perceived value of the firm's product or service to its target customers. It is not just a story about the product itself, but a story of everything that the target customers perceive as being valuable in the firm's offering.

Both Camlek (2010) and Anderson et al. (2006) acknowledge that although the term 'value proposition' has become very popular in business markets, but there is little agreement on what a value proposition should contain, and what makes it compelling and

persuasive. Camlek (2010) notices that when a series of value propositions are evaluated it becomes clear that not all value propositions are created equal. Many of them appear to be mere statements of features and functions rather than fully developed value statements. Often companies simply make a series of claims about their products' superiority, or simply list their products' features. Neither of these approaches can be considered to give a truly compelling value proposition. Simply boasting with unsubstantiated claims may often dilute the marketing message so much that it can lose its persuasiveness. The message easily turns into marketing jargon. Simply giving the customer a list of features may often not compel the customer to buy the product, because the firm has not presented what benefits the customer obtains from purchasing that product.

Camlek (2010) makes a point that value propositions should not simply be related to product features, functions or the familiar 'bells and whistles'. A customer cannot be expected to purchase a product because the firm says it is better than all the other options. The competition most likely uses the exact same trick. Rather, the firm should illustrate from the customer's point of view what is the offered value and how it adds to the customer's business. Anderson et al. (2006) talk about similar concerns, stating that most value propositions make claims of savings and benefits to the customer without backing them up. An offering may actually provide superior value, but if the firm doesn't demonstrate and document that claim, a customer manager will likely dismiss it as marketing puffery.

Based on the work of Camlek (2010) and Anderson et al. (2006) it could be said that a strong value proposition is largely about persuasion. A strong value proposition doesn't just answer the customer's question of 'why should I purchase your offering?', but instead clearly answers the question of 'why should I purchase your offering instead of your competitor's offering?'.

3.5 Conceptual framework

This thesis has studied many different tools, frameworks, and best practices that are used extensively in competitor analysis projects. This part explains how these frameworks are applied in this thesis in the form of a conceptual framework.

While creating this thesis the author studied a number of existing thesis works. During this phase the author noticed a trend that many thesis' authors had chosen a few frame-

works or tools from existing literature and used them as-is to build their conceptual framework, without any modifications or adaptations. This gave the feeling that in many of these works the business problem was formulated to fit the tools at hand. The idea used in this thesis is that the tools must be adapted to fit (and help solve) the business problem, not the other way around. For this reason the conceptual framework used in this thesis combines ideas and concepts from macro-environmental analysis, industry analysis, strategic group analysis, competitor profiling, and assessment of critical success factors into a hybrid model that best serves the competitor analysis needs of the case company. The conceptual framework is illustrated in Figure 8, and explained in more detail below.

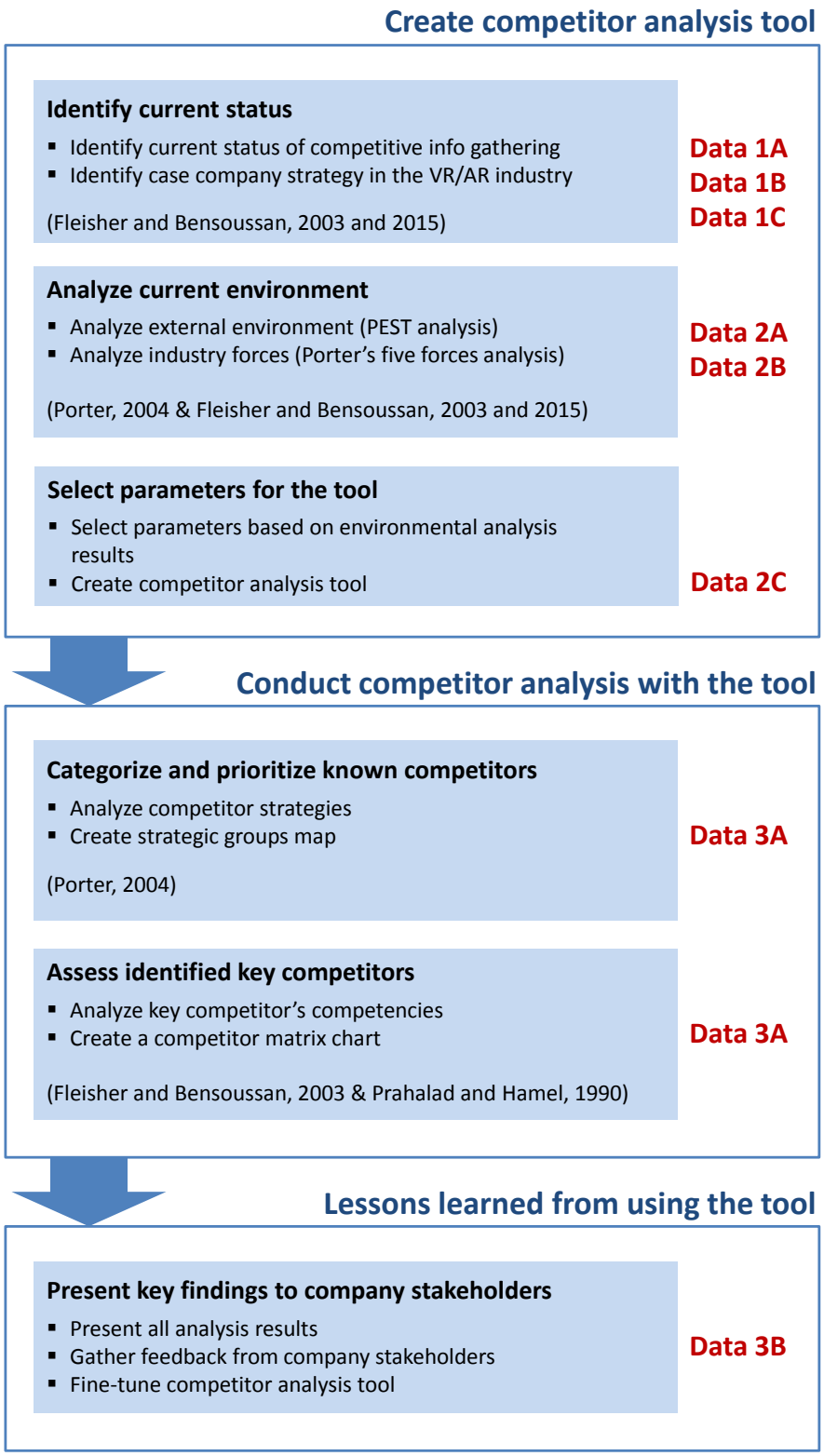

Figure 8. Conceptual framework

The analysis work is divided into three parts (corresponding with the following three sections of the thesis). First is the creation of the competitor analysis tool. This is started by

first identifying the current status of how competitive information is gathered in the case company, and by identifying the case company strategy in the VR/AR enterprise solutions industry. During this part the case company stakeholder needs for the competitor analysis project are also identified. This sets the boundaries within which the enquiry takes place, and specifies what steps need to be carried out and in what order. After this, a high-level environmental (PEST) and industry (Porter's five forces) analysis is carried out to get a better understanding of the trends and driving forces in the industry. On the macro-environmental analysis side, this thesis focuses on examining the technological drivers, with economic and social drivers acting in supporting roles. On the industry analysis side, this thesis focuses on the threat of new entrants, threat of substitute products, and the intensity of rivalry among existing firms. The outcome of the environmental and industry analysis is the key parameters used in the competitor analysis tool. This includes identifying the parameters to use for the creation of strategic groups, and identifying parameters for assessing the key competitors in more detail (Critical Success Factors / core competences).

After the parameters for the tool are ready, then the known competitors are analyzed with the created tool. First all competitors are plotted on a strategic group map, using the identified parameters. Then the group to which the case company belongs is identified for further analysis. As the industry is fragmented, with over a hundred firms, analyzing each rival firm in detail is not feasible, nor needed for the purpose of this thesis. Instead, the analysis focuses on rival firms in the same strategic group as the case company. These firms' capabilities are then assessed in more detail, using the identified CSF parameters. The case company is also similarly assessed, but due to confidentiality reasons this part of the analysis is not described in this thesis. This detailed analysis may be used by the company stakeholders in strategic decision making later on.

Finally, the analysis results are presented to company stakeholders. Company stakeholder feedback on the tool and the results is captured and used to fine-tune the tool for future use.

4 Creating competitor analysis tool for case company

This section covers the creation of the competitor analysis tool. The tool creation is based on analyzing both company internal and external data. First, company internal knowledge is examined in order to understand the current state of competitor information

gathering in the case company. Then the case company's high level strategy in this business is identified. This internal analysis makes up Data 1 in this thesis. Following this, external information is analyzed to identify the trends and forces driving the VR/AR industry forward. Then based on this external analysis, candidate parameters that should be included in the tool are formulated. Finally, these identified candidate parameters are presented to the company stakeholders in a workshop, in which the final set of parameters to use is locked down. The external analysis and workshop outcome makes up Data 2 in this thesis.

4.1 Current status of competitor analysis and company strategy

Before the author could start creating the competitor analysis tool, he had to identify how competitive information was currently being gathered in the case company. By identifying what shortcomings the current system had and how the company stakeholders would like to do competitor analysis in the future, the author could then create a plan for the project. To identify how competitive information was currently being gathered the author had an interview (Data 1A, 1.5 hours) with a key stakeholder. Key questions for this interview were based on the questions list created by Fleisher and Bensoussan (presented in section 3.2). The meeting noted from this interview are included in Appendix 1. In the interview the author learned about how and where competitor data was stored in the case company. After the interview the author then explored this system and the existing competitor data contained in it (Data 1B). The key takeaways from this interview and from the exploration of the current system are explained next.

Currently the case company does not have a formal and structured mechanism of gathering information about competitors. When case company personnel come across firms creating VR or AR solutions they are recorded to a company internal database. The main issue with the current model is that the stored information does not have a clear and easy-to-use structure. Each identified VR/AR firm has their own individual page on a list in the database. The collected data is fairly general, such as the firm's name, website, and a high-level overview of what the firm does. As only a single 'competitor page' is viewed at once, it makes it very difficult to obtain a full view of what is happening in the industry, or to make any meaningful comparisons between different rival firms.

The company stakeholders want to develop a more structured method for gathering and displaying competitor information. They don't want the information to be collected to large volumes of written reports, as they would most likely not be read by anyone. Instead the

company stakeholders would like to be able to view key information about all identified competitors in a numerical format, or on a graph. This approach would enable the company stakeholders to quickly and easily take in a large amount of information of the whole competitive environment, as well as allowing meaningful comparisons to be made between rival firms. Such graphs would allow the company stakeholders to quickly see a full situational picture of the VR/AR enterprise solutions industry, and could enable them to asses various strategic issues and identify trends.

To achieve this outcome, it was initially agreed that a competitor profile would first be created on each identified competitor. These profiles would contain the key strategic, competency, and capability information as a list of parameters. The competitors would then be scored on each parameter. After all identified competitors would have been assessed in this manner then they could be compared against each other.

Although some useful parameters to use were discussed during the interview, the set of parameters to use for the competitor profiles were not decided at this point. Instead the author was given the task to come up with a candidate list of suitable parameters. This list would then be assessed together with the company stakeholders later on, and the final set of parameters to use would be agreed upon.

Due to the vast number of firms and limited time and resources available the company profiles and assessments would rely on available online information, mainly focused on the published information on each competitor's website. More detailed information gathering would be done on an opportunistic basis, for example from meeting competitors on fairs and other events.

The initial expected outcome of the thesis would be the competitor profiles with scored values for the chosen key parameters. A full 'industry map' could then be generated from this intelligence. A model of the initial planned competitor analysis system is illustrated in Figure 9.

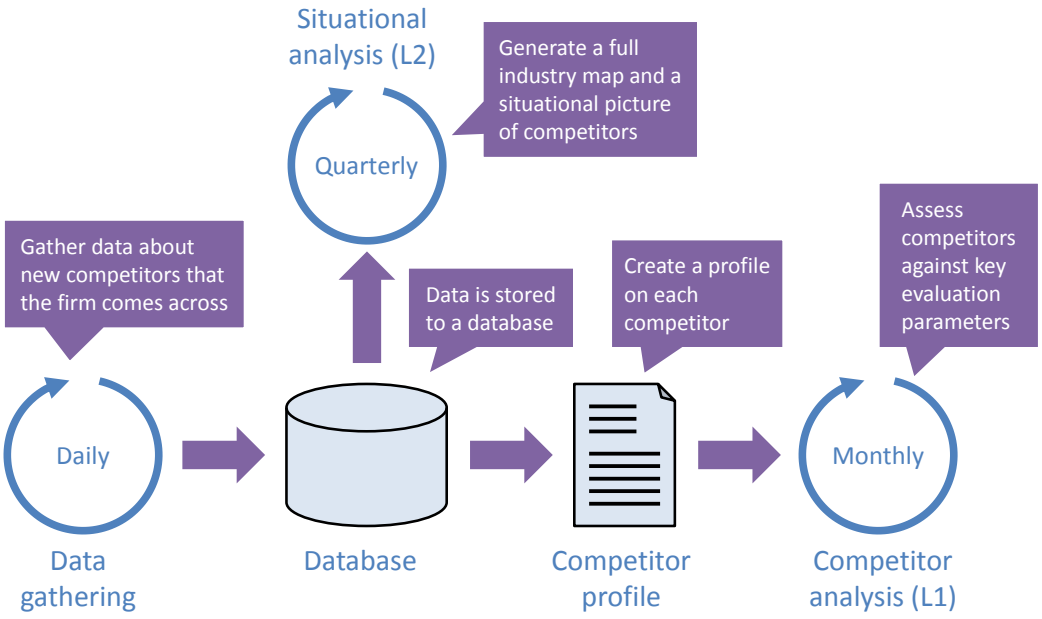

Figure 9. Conceptual model of competitor analysis system

Daily information gathering on new identified competitors would continue in the case company as it has before. A new competitor profile would be created to the database for each identified competitor. Initially these profiles could contain only the bare minimum information, such as the name and website address. Then periodically, such as once per month, the competitor profile information would be filled for all new identified competitors, giving numerical grades for the chosen parameters. This could be called level 1 analysis. Then, on a longer periodical basis, such as quarterly, a full industry map, or graphs displaying the situational picture of competitors would be generated from all the competitor profiles. This could be called level 2 analysis.

Later, the author also had another interview with the key stakeholder to clarify the case company strategy on the VR/AR solutions industry (Data 1C, 1.5 hours). The meeting notes from this interview are included in Appendix 2. The key takeaways from this interview are explained next.

The case company focuses on providing high quality VR and AR solutions to customers. These solutions are based completely on the commercially available VR and AR hardware. The case company is not planning to employ custom hardware, such as custom controllers or operator cockpits, at this point in time. Custom hardware is used by some firms offering ‘simulator’ products for various industries, like the heavy machines industry. Example products include crane simulators with realistic crane cockpits. The main

markets of interest for the case company's solutions are those industries where VR and AR systems have not been feasible before due to their very high price, but which could now benefit greatly from VR solutions using cheaper commercially available hardware. The reason that for example the expensive crane simulators have had a market before is due to the fact that the actual equipment is even more expensive, costing hundreds of thousands or even millions of dollars.

360 video solutions are currently not in scope for the case company. The recording equipment is very expensive, and becomes obsolete quickly due to the fast pace of technical advancements. Also there is already a very large number of firms competing on the 360 video market. Mobile AR solutions on the table, but not primary focus. This is due to the fact that there are a huge number of firms creating mobile AR content. Additionally, there is already a large ecosystem of cheap or even free AR apps available from online app stores, further limiting the market for customer-specific mobile AR apps. Many existing mobile AR firms are facing the pressure from these commercially available apps that provide basically the same functionality for a fraction of the price, or even for free. Furthermore, Apple and Google are providing extensive support for AR developers to create content to their platforms, which makes it even harder for these mobile AR firms to maintain competitive advantage from having better than average development competencies.

The case company's main focus is on learning and training solutions, it is not your average marketing agency. When creating learning solutions the case company must first learn the content area in-depth before it can implement it as a VR solution. The best markets would be those that have large user bases, and extensive needs for various types of learning and training solutions. However, the case company doesn't want to keep its solution scope too narrow. Instead the company is ready to implement practically anything what customers want and that makes sense from a business point of view, including marketing and promotional VR content, VR walk-around, configurator products, and so on. The case company has extensive knowledge on what works in VR and what doesn't, as well as strong competencies in instructional design and high quality learning solution development. These are all sources of potential competitive advantage for VR development.

4.2 Analysis of current environment

The first interview (Data 1A) with the key company stakeholder identified the need to find suitable parameters to use for competitor assessment. However, it left open what those parameters should be. It was clear for the author from the beginning that better insights to the VR/AR industry as a whole would be needed in order to come up with meaningful parameters to use. After reading through relevant literature on competitor analysis it was determined that examining the current macro-environmental factors and the key structural forces in the VR/AR enterprise solutions industry would be helpful in identifying these parameters. The outcomes of this analysis of current environment is explained here.

The environment could be analyzed generally, without the help from current theory about competitive environments. However, by relying on the existing literature the analysis can provide better focus on the important topics and help make sense of the events that are observed happening in the industry. This section relies on the existing literature and the analytical tools on PEST analysis, Porter's five forces analysis, and analysis on the state of maturity and concentration in the VR/AR industry. The purpose was not to do full in-depth environmental analysis, but more to gain insights to the key driving factors and trends and see how they reflects to the operation and behavior of the firms in the industry. The analysis tried to find answers to the following questions.

- What is the state of maturity of the industry, and how does this state affect firms' behavior?
- What technological, economic, and social forces or trends are driving the industry development forward, and what forces are restraining that development?
- How do these technological, economic, and social forces affect firms' behavior?
- What is the power of buyers and suppliers in the industry?
- How does the threat of new entrants, and substitute products affect firms' behavior in the industry?
- Taking into account all the other environmental and industry factors, what is the level of current rivalry in the industry?

The information and data for this analysis was gathered from a variety of sources. Primary data was based on the knowledge that the case company and the author has on the VR/AR enterprise solutions industry. It came from formal and informal discussions with co-workers, company stakeholders, and customers, as well as through the day-to-day VR and AR –related work that the author has participated in the case company. Secondary data was captured from various industry journals, reports, and periodicals

created by several sources, as well as from VR/AR –related websites (Data 2A). This data helped the author to better understand where the industry was heading. Only those web pages and reports from which direct references are taken are found from the reference list. Many of these reports are not separately included in the references list, as the insights were gained by summarizing information from multiple sources. A complete list of all the reports and VR/AR –related websites used as data sources are presented in Appendix 3.

The industry journals and reports do not show what individual firms are actually doing. Therefore, data was also captured from known competitors' websites (Data 2B). The purpose of this data capture was to get a better understanding of what types of competitors there are in the industry. Overall, 64 known competitor's websites were examined at this point. The list of competitors was obtained from the case company database and is presented in Appendix 4. At this point the competitors were not yet analyzed in detail, as the author did not yet know what parameters should be used as the basis for that analysis. Instead the idea was to gain a high-level understanding of what they do and what their history is.

4.2.1 This is an emerging industry

By examining the current state of the VR/AR enterprise solutions industry, two key defining characteristics can be found. First of all, this is an emerging industry. Secondly, it is a fragmented industry. These topics and their repercussions are discussed in more detail below.

Porter identifies emerging industries as newly formed (or re-formed) industries that have been created by technological innovations, shifts in relative cost relationships, emergence of new consumer needs, or other economic or sociological changes that elevate a new product or service to the level of a potentially viable business opportunity (Porter, 2004, p.215). The VR/AR solutions industry was basically created around 2016 with the emergence of commercially available VR and AR hardware. This period of an industry's development typically contains growing pains in the form of uncertainty and risk, which can have a major effect on the formulation of firms' strategies. Essential characteristics and roots of competitive problems of most emerging industries is that the rules of the competitive game are largely undefined, the structure of the industry unsettled and probably changing and the competitors in the industry are hard to diagnose (Porter, 2004, p.215, 229-230).

Porter (2004, p.216-219) identifies many typical characteristics of emerging industries that apply very accurately to the current situation in the VR/AR industry. These include technology uncertainty, strategic uncertainty, the presence of a large number of new companies, and the issue with first-time buyers. These topics are examined in more detail in the following parts. Related to technological uncertainty, but broader in cause, are a wide variety of strategic approaches often tried by industry participants. No 'right' strategy has been clearly identified, and different firms are trying out different strategic approaches to product/market positioning, marketing, servicing, and so on, as well as betting on different production technologies or production technologies. Closely related to this problem is that the firms often have poor information about competitors, characteristics of customers, and the industry conditions. No one really knows who all the competitors are, and reliable industry sales and market share data are often simply not available. This fact became quickly apparent as the author started to search for information on the competition.

Porter explains that a fragmented industry is one where no firm has a significant market share. Usually fragmented industries are populated by a large number of small- and medium-sized companies. Although there is no precise quantitative definition of a fragmented industry, the essential notion that makes these industries unique is the absence of market leaders with the power to shape industry events (Porter, 2004, p.191). The VR/AR enterprise solutions industry currently fits the definition of a fragmented industry very well. There are well over a hundred firms providing highly differentiated solutions. Industries become fragmented for a wide variety of reasons. The principal reason for fragmentation in the VR/AR enterprise solutions industry seems to be its newness. As Porter points out, industries can be fragmented because they are new and no firms have yet developed the skills and resources to command a significant market share (Porter, 2004, p.200). Other reasons include highly diverse market needs. In the VR/AR solutions industry the buyers' tastes are diverse, with many buyers desiring different types of custom VR and AR solutions. To meet these customer needs the firms in the industry are offering highly diverse products and solutions.

4.2.2 Technological, economic, and social drivers

The key driver for commercial VR/AR industry is technological. Without these technological innovations in sensor, optical, display and processor technologies the entire industry wouldn't exist. Specialized and proprietary VR systems have been used by the military

and various other large industries for several years now, but they have not been available for the general public due to the very high prices, often hovering in tens or even hundreds of thousands of dollars. As technology has evolved, now for the first time in history, VR technology has become commercially available for everyone.

Many of the technology giants have released their own affordable VR platforms. The most famous current platforms include HTC Vive (www.vive.com), Oculus Rift (www.oculus.com), Sony's PlayStation VR (www.playstation.com/en-us/explore/playstation-vr/), Samsung's Gear VR (http://www.samsung.com/us/explore/gear-vr/), Google Daydream View (https://vr.google.com/daydream/), and Google Cardboard (vr.google.com/cardboard). On the AR side, the most famous product is Microsoft's HoloLens product (www.microsoft.com/microsoft-hololens). Mobile AR does not require dedicated hardware, but instead the mobile AR apps can run on most modern smartphones. Because of these and other similar solutions, 2017 will be remembered as the year that consumer virtual reality technology shifted from a concept to the real world.

The arrival of these VR headsets in 2016-2017 started the emergence of a new ecosystem of firms developing hardware, software, and content for a vast and growing variety of applications, ranging from gaming and entertainment to enterprise and medical applications. The different VR and AR hardware have different capabilities and limitations. As practically all the content creating firms are relying on the same VR hardware products, these capabilities are heavily impacting the strategies of these firms. This thesis uses the VR hardware segment categorization scheme proposed by Superdata research report (2017).

The 'console segment' includes VR headsets that require a connection to an external video game console. An example product in this category is PlayStation VR. The 'PC segment' includes VR headsets that require a connection to an external PC. Examples include the HTC Vive and Oculus Rift. The 'mobile segment' consists of headsets that use a smartphone as the brains of the system, handling all visuals and processing. The smartphone slides into the headset and its screen is used as the VR headset display. The mobile segment can be divided into two sub segments. 'Light mobile' contains low-cost headsets that do not have any hardware of their own, and they do not interact with a smartphone's operating system. An example product is Google Cardboard, which is basically just a cardboard holder for the phone with two plastic lenses. 'Premium mobile' headsets may contain some of their own hardware like sensors, and they interact with

the smartphone's operating system. So the phone knows when they are in the headset. Example product includes Samsung Gear VR and Google Daydream View.

The ‘PC segment’ contains the high-end products with the best features. Besides better graphical capabilities, the key feature of PC headsets is positional tracking. This allows the system to detect the movement of the user’s head through space, like forward, backward, up and down motions. PC systems also have hand-controllers with similar positional tracking. Good positional tracking is a huge benefit to immersion, enabling free movement and comfort within the virtual world. This positional tracking is currently achieved using so-called ‘outside-in tracking’ which relies on external sensors called beacons. Current mobile products only support rotational tracking. This means they can track the turning and tilting of the user’s head, but cannot track movement.

Mobile VR headsets are cheaper than PC VR headsets, and offer an affordable entry point for virtual reality. However they cannot support as rich content as the PC versions can. On the other hand, what mobile VR loses in performance it makes up in availability and ease of use. Almost everyone in the developed countries has a smartphone that they carry with them every single day. The PC headsets and the accompanying beacons need time to set up, and are cumbersome to move from place to place. Mobile VR headsets on the other hand are easy to relocate and carry with the user. In those enterprise applications where positional tracking and best-of-breed performance is not mandatory, the cheaper price and ease-of-use can in many cases tip the favor on the side of mobile VR.

Currently the industry is focusing on developing enterprise solutions and apps for both the PC and mobile VR platforms. The console segment is almost solely focused on games and entertainment. Due to the technology differences, the VR experiences achievable with PC VR headsets are very different from those achievable with mobile VR headsets. This has direct and major Implications to all the firms in the VR solutions industry. The choice of the hardware platform to develop on depends on the required application functionality. Another challenge for firms is the lack of standards in the industry. Currently content created on one hardware platform is not compatible with other platforms and requires adaptation. The current VR headset market has a large number of firms working on software and content, and these firms are using a mix of proprietary and open approaches. Common standards have been at the heart of the computer and smartphone revolutions. To enable widespread enterprise and consumer uptake, VR and

AR will need similar universal standards that allow content developers to make applications that are open and interoperable across different headsets. As it stands now, VR has still a long way to go before it can support a simple plug-and-play capability.

Firms in the VR/AR solutions industry are using different strategies on which platform they develop content on. Some firms are focusing solely on one platform, such as PC VR. This interest in developing an experience for one platform first may be because that's where these firms see their greatest chance of success, or maybe they intend to port their work to other platforms at a later date. Then again many firms seem to not want to put all their eggs in the same basket, and opt instead to target multiple platforms, such as both PC VR and mobile VR. Some firms go for the whole buffet of platforms, and also provide solutions for headset-based AR and mobile AR segments.

As the industry is still going through rapid innovation and development, it is difficult to estimate what kind of enterprise solutions are going to be available in just a few years. The solutions will evolve together with the ever improving technology. Already a new generation of VR headsets is expected to arrive in late 2017 – early 2018. These 'standalone segment' VR headsets will be fully self-contained, so that all visual and processing are handled by the headset itself without the need for a PC or a smartphone. These future headsets are expected to include so-called 'inside-out tracking' which needs no external beacons to achieve positional tracking. An evolution is also happening in the mobile AR space. Currently, most mobile AR apps require a markers. These are printed images with a specific pattern that the app recognizes and uses for positioning the 3D content on top of the real world. In the near future, mobile AR apps do not need markers anymore. Apple has introduced ARKit and Google has introduced ARCore. These are platforms that allow the phone to sense its location purely based on what it sees through the camera, and enable correctly positioning 3D content in the environment without markers.

The VR and AR technologies act as the enabling drivers for the whole VR/AR solutions industry. However, the major driver that brings firms into this industry is the economic opportunity that these firms see. The initial push for this technology has created a lot of action and hype. Many technology giants, industry experts, and analyst firms believe that the consumer VR and AR technologies could be the next big thing for consumer and enterprise electronics markets. The authors of the Oppenheimer VR industry report (2015) believe that in the long run VR technology and its derivative content, application,

and services can have the same disruptive potential as the TV, PC, the internet, and smartphones. The authors state that major technology companies are providing unprecedented funding, human resource, and technology infrastructure to grow the VR and AR market.

The Goldman Sachs VR/AR report (2016) states that VR/AR technology has the potential to spawn a multi-billion dollar industry, and possibly be as game changing as the advent of the PC. In this report Goldman Sachs predicts that virtual and augmented reality will grow to be an $80 Billion market by 2025 ($45 Billion in hardware, and $35 Billion in software), which is around the same size of the desktop PC market today. This report shows the value of the 225 VR/AR venture capital investments made in the past two years to top at 3.5 Billion US dollars. This includes the 2014 deal when Facebook bought the virtual reality technology firm Oculus VR for an equivalent of $2 Billion US dollars (400 Million in cash plus over 23 million Facebook shares). Most people probably heard about the purchase from Mark Zuckerberg's Facebook post (Mark Zuckerberg, 2014). Although no one can be sure of what the future brings, and the market estimates vary wildly between different author's reports, the fact of the matter is that a very large number of firms believe in great success for these commercial VR and AR technologies.

Porter (2004) notes that the emerging phase of an industry is usually accompanied by the presence of the greatest proportion of newly formed firms (in contrast to newly formed units of established firms) that the industry will ever experience. Without established rules of the game, and possibly weak entry barriers, newly formed companies are in a position to get into emerging industries (Porter, 2004, p.218). Often firms enter emerging industries because they are growing rapidly, because existing firms are very profitable, or because the ultimate industry size promises to be large (Porter, 2004, p.236). This is definitely true for the VR/AR enterprise solutions industry. A large portion of the known rival firms are new firms, solely focused on creating content for the current VR and AR platforms. As these platforms are only a few years old, so are the firms in question. There is also a large number of newly formed units of existing firms. Many marketing agencies have jumped to the VR and AR business, adding VR and AR content as a new entry to their portfolio of video and 3D animation creation. The industry has also attracted a number of training-focused firms with similar background to the case company; these firms have been offering instructor-led trainings, e-learning trainings, and other types of computer-based self-study materials, and are now adding VR and AR –based trainings into their portfolios.

There are also many social drivers that are molding the behavior of the industry players. The initial main social driver has been all the hype and buzz that the big players in the industry have generated on these technologies. After the initial hype, people have started to realize the unique benefits that VR and AR can provide for various industries, and the high-profile 'killer apps' have kept people's interest up. Also the 'wow' effect brought on by the completely new experiences that most people have never seen before is keeping peoples' interest high. However, although the VR and AR industry has generated a lot of buzz for the last couple of years, VR and AR technologies still feel very new or the majority of people. Even though these are hot topics currently, the research done by many organizations in the industry is showing that this is not necessarily translating to mass adoption just yet. According to Mindshare report (2017) there is some disconnect between awareness and experience with these technologies technology. Mindshare reports that two thirds of people are aware of VR technology, but only a quarter have tried a VR experience. On the AR side, awareness of the technology is significantly lower with only a third of the people being aware of the technology. However, most who were aware of the technology had also had an AR experience. This is quite understandable, as almost anyone with a modern smartphone can easily download an AR app on their phone, such as Pokémon Go. To experience VR on the other hand requires the user to have access to separate hardware. The key findings in the Mindshare report were that currently most people have limited knowledge of the technologies and were not aware of their differences, nor frankly did they care for this detail. In their minds, pretty much everything fell under the umbrella term 'virtual reality'.

This confusion is further exacerbated by the lack of clear standards in the industry itself. Different firms use the term 'virtual reality' and 'augmented reality' to mean different things. Some firms use the term 'virtual reality' to refer to their 3D simulation applications that are used from computer or tablet, and not from a VR headset. Others use the term 'virtual reality' to refer to their 360 video -based applications used with a VR headset. Neither of these are 'real' virtual reality experiences, and simply further add to the confusion of customers. Microsoft has also made things messier by branding their solutions as 'Mixed Reality'. In the Perkins Coie report (2016) the interviewed people in the industry share this concern of confusion and exclaim that more public demonstrations are necessary to promote AR/VR to the general public, as according to them typical means of advertising are inadequate at explaining the technology to the unfamiliar.

Porter (2004, p.222) notes that such customer confusion is typical in many emerging industries. This confusion can be seen as the result of the newness of the products, presence of multiple product approaches, variations in used technology, and the conflicting claims and counterclaims made by competitors. All of these are symptomatic of technological uncertainty and the resulting lack of standardization and general technical agreement by industry participants. Such customer confusion raises the new buyer's perceived risk of purchase and this may limit industry sales.

Porter (2004, p.221) further notes that the speed of technical innovation in the industry may also act as an impeding factor for growth. This is due to people perceiving a high likelihood of obsolescence. Many potential VR and AR buyers may fear that second- or third-generation technologies will make the currently available products obsolete in a few years. These buyers may want to wait instead for the pace of technological progress and cost reductions to slow down before they commit money to VR and AR.

4.2.3 Porter's five forces in the VR/AR industry

Threat of substitute products in the VR/AR enterprise solutions industry is relatively high. These substitutes consist mainly of the products and services that have been used before the emergence of the VR/AR industry. The VR and AR solutions were brought to the market as substitutes for these existing solutions. For example in the training solutions market, the new VR and AR solutions are being introduced as substitutes to classroom and practical trainings, e-learning trainings, and other computer or mobile training applications. In marketing, VR experiences that allow a user to walk around and examine virtual products, such as cars or heavy machinery like excavators, are introduced as substitutes to walking around and examining a real product, or mockup products.

As Porter (2004, p.219) notes, buyers of an emerging industry's products or services are inherently first-time buyers. Therefore the marketing task for the firms in the industry is thus one of inducing substitution. The firms needs to get the buyer to buy their new product instead of something else. And to accomplish this the potential buyer must be informed about the basic nature and functions of the new product or service, be convinced that it can actually perform these functions, and be persuaded that the risks of purchasing it are rationally borne given the potential benefits. Basically this means that the firms need to have, and be able to communicate to the customers a very persuasive value proposition.

This is also evidenced by the actions of firms in the VR/AR industry currently. Many firms seem to understand this challenge of first-time buyers, and have extensive educational information on their websites on what the VR and AR technologies are and how they work, as well as explaining the benefits that these technologies can provide. Effectively, this information attempts to provide reasoning as why the VR and AR solutions are superior substitutes to other legacy solutions. Many firms also offer the possibility for interested potential buyers to come for a visit and get a demonstration on the technology and the firm's solutions.

Besides informing potential buyers in the general features and capabilities of VR technology, it is also important for the VR/AR firms to explain the benefits of the product on the specific market segment or use area. The firms in the VR/AR solutions industry provide solutions to a wide spectrum of markets, ranging from education and marketing to real estate and engineering. And each of these different market segments contain their own substitute products. Firms in the VR/AR solutions industry should identify the substitute products on their chosen market and formulate a marketing strategy and value proposition based on the threat of those specific substitutes. The firms must effectively communicate the expected benefits that their product provides compared to the substitutes. In the Perkins Cole report (2016) the Interviewed industry experts state the following on this topic.

> VR and AR cannot simply recreate the same experience we have today on mobile and web. It has to bring a significant incremental value-add—not just be a slight enhancement to existing technologies and experiences.

The experts also state that more content is needed directed at specific use areas, rather than promising the moon to consumers.

As the industry matures and customers become more aware of the technology and its features and benefits, this type of marketing will most likely diminish in importance. However, in this early phase a firm's value proposition, meaning all the marketing efforts that are aimed at prompting buyers to commit themselves early to these new products and services can be considered very important.

Porter notes that different markets, market segments, and even particular buyers within market segments may have greatly different receptivity to new products. A number of criteria seem to be crucial in determining this receptivity. According to Porter perhaps the

most important determinant of receptivity of the buyer to a new product or service is the nature of the expected benefit (Porter, 2004, p.225-226). The expected benefits can range from a pure cost advantage at one end of the spectrum, to performance advantages unachievable through other means on the other end of the spectrum. Intermediate cases include solutions that provide advantages in performance, but which could be replicated through other means at higher cost (Porter, 2004, p.226). According to Porter the earliest markets purchasing a new product, other things being equal, are usually those in which the advantage is one of performance. This situation occurs because the achievement of a cost advantage in practice may often be viewed with suspicion when buyers confront the newness, uncertainty, and often erratic performance of the emerging industry (Porter, 2004, p.226).

Overall the VR/AR enterprise solutions industry has low barriers to entry. In this regard, the VR/AR solutions industry is a classic example of a fragmented industry. Porter (2004) notes that nearly all fragmented industries have low overall entry barriers. Otherwise these industries could not be populated by so many small firms. There seem to be several reasons for these low entry barriers. First of all, there are quite small capital requirements to get into the industry. At its core, a developer only needs a VR or AR headset, a powerful computer, and the 3D development applications needed to create the virtual world.

While observing the rival firms in the industry the author noticed that many of the newly formed firms are ‘one-man shops’ offering VR development services. Like most other fragmented industries, the VR/AR enterprise solutions industry is also characterized by the absence of significant economies of scale. The cause for this is because the VR/AR application development work is intrinsically hard to automate and routinize. Established firms are able to erect some barriers to entry by being further on the experience curve. By being in the industry longer the established firms have been able to develop programming tools and processes, and have had longer to experiment what type of experiences and interactions work best in the VR and AR worlds, and how to best mitigate the nausea and physical discomfort effects that VR causes for some people. The industry is still young, and the VR and AR hardware is rapidly evolving. However, the established firms have the possibility to reap some first-mover advantages by getting in to VR and AR early, testing the technology and figuring out what works best with the current hardware, and what kind of business problems customers are interested in solving with VR and AR solutions.

When examining the bargaining power of suppliers, the first thing to note is that there are very few supplied raw materials and resources for the VR/AR enterprise solutions industry, as the industry mainly produces software. The main suppliers for the industry can be considered to be the VR and AR headset vendors. The market is dominated by a few big vendors and products (HTC Vive, Oculus Rift) which supply the headsets to both consumers and to the firms creating entertainment and enterprise solutions. In the beginning of 2017 these PC headset manufacturers have been forced to radically drop their headset prices due to intense rivalry and due to lower than expected consumer uptake. In the summer of 2017 the price of Oculus Rift was discounted from $500 to $400 for a summer sale (Road to VR, 2017a). This prompted price slashing retaliation from HTC, which brought the complete Vive system down by $200 to a new permanently lowered price of $600 (Road to VR, 2017b). Later, Oculus Rift also saw a permanent price drop to $399 (Road to VR, 2017c). Most industry experts agree that the prices for these PC headset need to continue coming down before the majority of consumers will be willing to buy them. Based on this it can be said that the power of suppliers is not very strong, and this topic is not analyzed further in this thesis.

The same is currently true also to the power of buyers. Typically in a fragmented industry – such as the VR/AR solutions industry – the large number of competitors ensures that the buyers have a great deal of bargaining power and are able to play one competitor against the other. However, according to Porter this effect can be negated in emerging industries, where buyers are generally unfamiliar with the new products, and may require education and service from the firm (Porter, 2004, p.212). This seems to hold true to the VR/AR solutions industry. The current buyers are first time buyers, and are largely still unfamiliar with the technology, product features, and major differences between competing firms' solutions. Currently the power of buyers is not seen to very strong. This may change in the future as the industry matures and the potential buyers become more familiar and informed about VR and AR technologies and about the vendors offering enterprise solutions.

Currently it is hard to estimate how much rivalry there is among existing firms due to the newness of the marketplace. Most firms have completed only a few customer-specific solutions and real sales data is not readily available. There are very many firms offering VR and AR solutions, and in the future rivalry could be expected to be strong. Generally speaking, the more competitors there are the more likely it is that one or more of them

will try to gain customers by cutting their prices. To survive in this industry, differentiation and specialization can be deemed to be very important.

An important fact to note is that not all firms in the industry are directly competing with each other. There is very high degree of differentiation on the types of solutions being offered. First of all, there is differentiation in the used hardware. Firms focusing solely on mobile VR may not compete fiercely with firms focusing on PC-based VR solutions, nor with firms creating AR-based solutions. There are also several firms in the industry who are using custom hardware in addition to the PC VR headsets. For example several firms are offering training solutions for learning to operate heavy machinery, such as cranes, excavators, and boom lifts. These firms are using a Vive or Oculus Rift headset for immersing the user into a virtual cockpit, and additionally they have custom controllers for operating the machine. The cost of these solutions is considerably higher than solutions based purely on consumer hardware, but they also provide the most realistic environment for learning the machine operation. Such custom hardware solutions are closer to 'simulators' and could be considered to be in almost a different industry compared to the simpler consumer hardware –based solutions. These two groups of products have low market interdependence, and competition between them is almost nonexistent.

According to Porter (2004, p.208) when industry fragmentation is accompanied by the presence of numerous items in the product line, an effective strategy for achieving above-average results can be to specialize on a tightly constrained group of products. This specialization may allow the enhancement of product differentiation with the customer as a result of the specialist's perceived expertise and image in the particular product area. This can be seen happening in the VR/AR enterprise solutions industry. Even when firms are creating solutions for the same hardware platform, there is a high degree of product differentiation. Some firms are carving out their own niches in the industry by specializing heavily on specific verticals (like education, construction, or healthcare) or horizontals (like training, marketing or sales). Some firms focus solely on marketing solutions, others on training solutions, and still others on real estate solutions or healthcare solutions. This is in contrast to those firms whose business is in offering custom solutions for any horizontal or vertical, based on what the customer desires.

Most rival firms provide promotional videos on their existing solutions, and these videos provide means of analyzing the rivals' product quality, for example in terms of graphical performance and included functionality. In some cases some of these solutions are also

available for download from online VR and AR app stores. By analyzing these apps, or promotional videos the case company has noticed that there is a great deal of variance in product quality. According to Porter (2004, p.223) this is very typical in emerging industries. The erratic product quality is a result of many newly established firms, lack of standards, technological uncertainty, and solution developer's unfamiliarity with the new medium.

4.3 Selecting key parameters to be included in the tool

The analysis of the VR/AR solutions industry provided a lot of insight to the current competitive environment. There was a lot of complex and disparate information to analyze, but the applied concepts of macro-environmental analysis and industry analysis helped a lot in organizing that information and made it easier to focus on key questions. Key insights gained from this environmental and industry analysis are summarized below.

- VR/AR enterprise solutions industry is an emerging industry, that is still evolving and going through rapid changes
- The industry is highly fragmented, with well over 100 firms offering enterprise focused VR and AR solutions.
- The industry consists mainly from a large number of small and medium sized firms
- Low entry barriers and high expected industry growth will most likely continue to invite many new entrants into the industry
- Firms come from many different backgrounds, a lot of new startups companies who only do VR/AR, as well as many new branches of existing firms
- There is very high degree of product differentiation, no one yet seems to know what all the best 'killer apps' will be for VR or AR
- There seems to be a great deal of variance in product quality
- Firms in the industry are highly polarized on the width of the served industries; many firms specialize on a very narrow field, offering products only for a specific vertical industry or market, and many are on the complete other end of the spectrum offering solution development for a wide variety of industries
- Due to the industry being young, practically no firm has yet a strong brand identification in the minds of customers
- Practically all current customers are first-time buyers. Combined with the confusion many potential customers still have on VR and AR technologies, the creation

of a strong value proposition that focuses on inducing substitution is currently important.

From the insights gained from the environmental and industry analysis the author then created a candidate list of key parameters that should be captured from known competitors. The author determined that these parameters should be divided into three categories; general information, strategic information, and capability information. The general information would be used as the core of a competitor profile created for each competitor. It would consist of basic textual information about the competitors. This information would give a good overview of the competitor.

The strategic information category would be used to capture information about the apparent strategic choices the firm was pursuing. Most of this information would be captured in numerical format on a scale from 0-10, so that it could be used to compare different rival firms' strategic approaches. The competitors could then be categorized by plotting the firms on a strategic group map. In order to create a strategic group map, two parameters were needed that would indicate the most important strategic dimensions in the VR/AR industry. These parameters would allow the creation of a strategic group map. The capability information category would be used to capture more detailed information about the most important competitors – meaning those competitors that belong to the same strategic group as the case company. These parameters represent the identified critical success factors (CSF) in the VR/AR enterprise solutions industry. They would also be evaluated numerically on a scale from 0-10. The created candidate list of key parameters is presented in Table 3.

Table 3. Candidate parameters

General information	Strategic information	Capability information
Firm's name	Specialization	Product quality
Short description	Product leadership	Number of VR/AR solutions
Highlights	Hardware platform that the firm develops to	Development competencies
Website URL	VR/AR focus of the firm	Innovation
LinkedIn URL	Focus on enterprise solutions	Online marketing efforts
Headquarters		
Year of establishment		
Ownership		
Headcount		
Known customers		
Known partners		

Most of the parameters are self-explanatory, but a few of them require a bit more explanation. In the general information category the short description parameter would briefly explain what the firm does, and the highlights field would describe anything especially noteworthy of this firm.

Deciding on the two strategic parameters for building the strategic group map, by which the competitors would be categorized, was probably the hardest part of the whole competitor analysis project. This difficulty arose from the fact that the VR/AR enterprise solutions industry is highly fragmented, emerging industry. Different companies come from very different backgrounds, are trying out very different strategic approaches, and are serving a very wide set of horizontal and vertical markets. Technological leadership is not very useful as a strategic dimension, because practically all firms are using the same hardware, and the hardware is still rapidly changing. However, at the same time the choice of hardware does have a major effect on what type of products the firms are producing, as PC VR, mobile VR, and AR possibilities are very different. Further complicating things is the fact that even when firms are developing on the same hardware platform the firms have major differences on what 'level' of experiences they are aiming to create.

Some firms are using VR and AR technologies for pretty simple 'VR experiences' where the user is basically a passive viewer in the VR or AR world and has very limited interaction capabilities. On the other end of the scale are fully interactive experiences, where the user is able to interact with VR world, and can manipulate objects or the environment itself in various ways. These include many solutions intended for training purposes, as well as many marketing solutions, such as the so-called 'configurator' solutions where the user can experience a company's product in the VR world and is able to change various configuration options on the product, such as product color and features. Or the user is able to look inside the product or disassemble parts of it. Popular examples of such configurator products are car configurator products, where potential customers can view and configure a car to their liking in the VR world.

Due to all of these strategic differences between firms it was very hard to identify strategic dimensions that were important to all firms industry-wide. After testing out several ideas, the author decided that the parameters to use should be those that have the biggest effect on perceived customer value. The author then posed the question on what parameters would best assess if firms provided highest possible value to end customers,

and assess how well the firms targeted the correct customer base that would want to engage with that value. Through this lens the author identified ‘specialization’ and ‘product leadership’ as the two strategic parameters that would be used to for building the strategic group map. These two parameters are explained in more detail below.

The specialization parameter would define the degree to which the firm focuses its efforts to serve specific vertical or horizontal markets. The idea behind assessing this strategic parameter is that firms with a high specialization are most likely able to serve the narrow target more effectively or efficiently, than rival firms who are competing on a broader market, and therefore are able to provide better value for the customers. It is noted that assessing firms with a single specialization parameter may lead to grouping firms together who have products aimed at very different verticals. However, in this case this is considered acceptable in order to maintain a full view of the industry. Because the VR/AR firms serve such a wide variety of different vertical markets, it would be very difficult to analyze firms on each vertical separately while maintaining a good view on the industry as a whole. Furthermore, identifying firms with high specialization will assist in future analysis of firms working on different verticals.

An argument can also be made that firms who have high specialization are similar to each other in certain key internal and external operations. The more a firm specializes to specific industries, the more in-depth it needs to learn about the content area, and focus its resources to gain experience about the industry in question before it can implement VR and AR solutions for that industry. This may require for example field trips for studying the industry’s equipment operation in the real-world. In practically all cases this requires tight cooperation and interworking with the customers and partners to obtain this knowledge and experience. Regardless of the industry in question, the firms need similar competences for fast and efficient learning and customer intimacy.

The product leadership parameter would indicate the degree to which the firm seeks to bring superior products to the market (and most likely charges a premium price for them). The more complicated VR solutions are naturally more difficult and time consuming to create, but in most cases also offer a lot more customer value, and can be sold at a higher price. Firms that create these high-end products, or are aiming for such product leadership are the ones pushing the limits of what is possible to accomplish with VR and AR technologies. Product leadership is really about using the VR and AR in ways that takes advantage of the unique benefits of these new technologies, and that provides

some added value over other non-VR and non-AR solutions. Understanding these benefits requires in-depth understanding of what the current VR and AR platforms are capable of, and what kind of functionality makes sense in the VR and AR environments. This is where the author's expertise on VR and AR technologies and solutions became critically important.

For example, while examining competitors' solutions the author came across a few different Hololens-based solution for big data analytics. The idea in these solutions was that a user could examine data in a graphical representation by seeing the data float in front of them via Hololens' holographic display. The user could make selections from the data with hand gestures. The demo video looked nice, but having worked with Hololens the author knew that in reality Hololens is a pretty cumbersome device to use. It provides a very narrow field of view, and the hand gesture based interaction doesn't yet currently work very well to be usable in production environment applications. In effect, this solution did not provide any added value over viewing the data from a computer monitor, and the hand gesture-based interactivity could actually be considerably worse than interaction via a mouse and a keyboard. In this case there really is no product leadership. Although the solution uses a very high-tech device, the way that it is applied does not provide additional value.

The other strategic information parameters would act in a supporting role, providing more insights to competitors' strategic choices. The VR/AR focus parameter would indicate how big of a part VR and AR solutions are of a firm's overall portfolio. The focus on enterprise solutions parameter would indicate how much the firm focuses on enterprise solutions, as opposed to entertainment and gaming solutions. This parameter was deemed necessary as several rival firms did both entertainment and enterprise solutions. All the above mentioned strategic information parameters would be evaluated on a scale from 0-10. The last strategic information parameter; hardware platform that the firm develops to, would not contain a numerical value but instead would include four fields. These fields would be for PC VR, mobile VR, headset based AR (currently only Hololens), and mobile AR platforms.

In the competency information category the product quality parameter would indicate the overall level of existing products' quality, in terms of graphics, features, audio, and so on. The number of VR/AR solutions parameter would indicate of the number of VR and AR projects that the firm has successfully completed. This was deemed more suitable

than examining a firm's product portfolio, as many VR/AR firms only create customer-specific solutions and don't have commercial products on sale. The development competencies parameter would indicate the firm's skill level in competencies deemed critical in creating high quality VR and AR content. These competencies are separate from existing products' quality, and are more of an indication of what the firm is capable of in terms of designing animated characters, doing 3D modelling, UI design, and having sound instructional design in their solutions. This separation was deemed necessary as many existing firms that have other products and services in their portfolio exhibit strong competencies in these areas on their other products (such as applications designed for computers and tablets). These firms may easily take advantage of these core competences in the future with their VR/AR solutions as well (these competences have high market mobility). The innovation parameter indicates the extent to which the firm is doing something unique that seems to make sense in the VR/AR world. As stated before, there is a very high degree of product differentiation, and many firms are trying different things in the search for the 'killer apps'. The last parameter, online marketing efforts, indicates the level of sophistication the firm has in their VR/AR marketing. This would take into account the quality of the firm's overall CVP, and the extent of their content marketing (does the firm offer white papers, product videos, a blog, other marketing material related to VR and AR).

This list of candidate parameters was used as the main input in a workshop (1.5h) with the key company stakeholder and another project manager. The purpose of this workshop was to lock down the set of parameters to use. The results of this workshop was captured as Data 2C in this thesis. In this workshop the author presented the overall findings from the environmental analysis together with the candidate parameters, and the results were then discussed. Overall, the company stakeholder considered that the research and chosen parameters were on the right track. However, the stakeholder desired that a considerably larger set of parameters would be created that would go into more detailed level on the assessment. So for example instead of measuring specialization with a single value, the stakeholder wanted the tool to have separate fields to all different verticals and horizontals that competitors were working on. Instead of measuring development competencies with a single composite value, the stakeholder wanted the tool to have separate fields for each individual critical competency, such as animation, 3D modelling, and so on. The company stakeholder also suggested several additional parameters to be added to the tool, such as the software platform that the firm develops on, the firm's geographical reach, and the delivery platform used for providing

the VR/AR applications for end customers. In the new suggested model not all parameter fields would be filled for a competitor. For example a competitor would get a marking in only those vertical and horizontal market fields in which it operates. The stakeholder's idea behind collecting data on so many parameters was that once this would be completed for all competitors, then the data could be entered into a separate data analysis application, such as R (www.r-project.org) for further analysis and graphical presentation.

The author was somewhat reserved on this method of data capture, but none the less captured all the improvement suggestions. After the interview the author then proceeded to create on one large Excel chart that included all the discussed parameters. With everything implemented, the Excel had 10 categories of parameters, which when combined contained over 100 fields to capture data about competitors. The author then started adding data of competitors to this created Excel sheet to see how well this approach would work

After going through around ten competitors it became obvious that this type of data collection would be problematic for as few key reasons. First of all, due to the sheer number of fields in which to capture data the work was very slow. When combined with the fact that there were dozens of known competitors the expected workload would be huge. Secondly, and even more importantly, attempting to carry out the analysis on such a detailed level left many 'holes' to the competitor profiles. The main data source for data capture was the firms' websites. Each competitor's website was unique and contained different types of available information, and in most cases there was limited visibility to firm's business. Trying to gather data on very detailed and narrow topics with this somewhat limited information ended in the result that holes were left in the captured data for practically every competitor. So even if the analysis would have been completed in this manner for all known competitors, because of the lacking data the results may have not proven very insightful.

The author did understand the added value that profiling competitors on such a detailed level could provide, but for the practical reasons of having limited time and data access, this level of analysis was deemed too demanding to be carried out at this time. To solve this problem the author proposed a change to the data capture method to the company stakeholder. Data would be captured on two different stages. This new model would be basically a combination of the author's initial idea of using a few selected parameters,

and the company stakeholder's idea of using a large number of parameters. The first stage would include the initial higher level analysis, and the second stage would go into more details, and would be carried out on a later date.

During the first stage data would be captured on the higher level parameters that were already listed in Table 3. The strategy and competency related parameters could be thought as composite parameters that may include sub-parameters underneath them. This idea of using composite parameters, or looking at the topic at hand from a more inclusive perspective was considered to give clearer and more easily measurable results, while compromising some accuracy. So for example the 'Development competencies' parameter would be evaluated with a single value, and underneath that there would be separate parameters for individual competencies (animation 3D modelling, UI design, etc.). The 'specialization' parameter would be evaluated with a single value, and underneath it would be individual sub-parameters for different types of vertical specializations and horizontal specializations. The sub-parameters would be attempted to be filled in the second stage. This two-stage approach would also facilitate further development for the tool, as the tool could be modified and fine-tuned before stage 2 analysis, based on the results received from the stage 1 analysis.

4.4 Competitor analysis tool

This part introduces the created competitor analysis tool, and in effect summarizes the outcome of the development process explained in the previous sections. The whole tool is presented in Appendix 5. The tool has a future looking stance on competitor analysis and it will be used to capture competitor information in two stages. In the first stage, high-level assessment of competitors is carried out. This high level assessment is reported in this thesis. The second stage will include a more detailed data capture and assessment, and it will be carried out on a later date. The first stage includes capturing data for a subset of all the parameters included in the tool. These parameters are presented with real examples in this section (same parameters as in Table 3 earlier). Placeholders for the stage 2 parameters are also included in the tool and can be viewed in Appendix 5.

The competitor analysis tool was created in Excel. The tool contains a large number of fields for different types of competitive information. Competitors are listed vertically on the rows of the Excel and the different parameters are listed horizontally on the columns. The tool enables capturing general information of each competitor. This information is captured in textual format, and acts as the core of each competitor's profile. An example

of the general information captured for a competitor is shown in Table 4 (the fields have been turned vertical in this example to ease readability).

Table 4. General information example

Firm's name	InMediaStudio
Short description	Creative studio making VR and other 3D content creation, focuses on educational experiences and immersive experiences, some very nice looking and extensive projects, 16 completed VR projects.
Highlights	Makers of very nice looking VR project: Acciona Follo Line. Includes a lot of interactivity. See: https://vimeo.com/214480970
Website URL	http://inmediastudio.com/en/
LinkedIn URL	https://www.linkedin.com/company/3048259/
Year of establishment	2010
Ownership	Privately held
Headquarters	Spain
Headcount	51 - 200
Known customers	Acciona and Ghella, Santillana, RTVE
Known partners	-

The tool also enables capturing strategic and capability information on the competitors. Data for most of these parameters is captured numerically on a scale from 0-10. A low grade means that the firm performs poorly on the area that the parameter measures and a high grade means that the firm performs exceptionally well. Some parameters capture data in 'yes/no' format. This is used for example to capture data on which VR/AR platforms a firm develops content to. Each platform has its own field in the Excel, and these fields will be filled with either a 'yes' or a 'no'. The parameters that capture data in 'yes/no' format may also be used to filter competitors in the Excel. For example the rows in the Excel may be filtered to show only those firms that develop mobile VR apps. An example of the strategic and capability information captured for a group of competitors is shown in Figure 10 (the competitors' names are masked in this example for reasons of confidentiality).

	STAGE 1 STRATEGIC INFORMATION								STAGE 1 CAPABILITY INFORMATION				
	Specialization	Product leadership	VR/AR focus	Focus on enterprise solutions	PC VR	Mobile VR	Mobile AR	Hololens	Product quality	Number of VR/AR solutions	Development competencies	Innovation	Online marketing efforts
Competitor A	7	4,00	10	10	Yes	No	No	No	7	2	3	1	4
Competitor B	6	5,00	8	10	Yes	No	No	No	6	3	5	3	2
Competitor C	8	2,00	2	10	Yes	No	No	No	3	2,5	7,5	4	4
Competitor D	9	7,50	3	10	Yes	No	No	No	8,5	3	9	5	7
Competitor E	3	1,00	2,5	2	Yes	Yes	No	No	6	7	6	7	2,5
Competitor F	2	7,00	2	10	Yes	No	No	No	8,5	1	8,5	2	4
Competitor G	5	8,00	10	10	Yes	No	No	No	9	7	8	8	8,5
Competitor H	1	2,50	3	9	Yes	Yes	No	No	2	1	1	1	1
Competitor I	9	9,00	1,5	10	Yes	No	No	No	7	2	10	7,5	5

Figure 10. Strategic and capability information example

The tool itself just acts as the data capture repository, it does not specify how this data should be analyzed. Once the data points have been captured on competitors then several different analysis methods may be applied to the data. The analysis carried out within the scope of this thesis is explained in the next section.

5 Conducting competitor analysis with created tool

This section covers the competitor analysis that was carried out using the competitor analysis tool created in the previous section. First, an overview of the competitors included in this analysis is presented. Next, the categorization into strategic groups, and identification of the most important strategic group is covered. Last, the analysis of key competitors' capabilities is explained.

5.1 Overview of analyzed competitors

The competitors included in the analysis were selected from the list of known competitors in the case company's database. There were already a large number of known competitors before the start of this thesis work, and a number of new competitors were identified and recorded during the thesis progression. The insights gained from the environmental and industry analysis helped a lot with the search of new rival firms.

64 known firms working with VR/AR solutions that were in the company's database were initially selected as candidates for the analysis (the same list of competitors as in Data 2B). However, in the end not all these firms were included in the analysis. To be included to the analysis the firms had to meet a few important criteria. First of all, the firms had to have some existing work to showcase. While examining the known rival firms the author noticed that several of them were completely new startups with no products, or existing projects to show and/or had very little information available about them. 12 firms were disqualified, as they had no existing work to show, or because there was practically no online information available about the firm. Secondly, only those firms whose solutions run completely on the commercially available VR and AR hardware were included to the analysis. Firms whose solutions used commercial headsets with additional custom hardware, such as custom controllers, or operator cockpits were disqualified from the analysis. Although VR-based, these solutions were deemed to basically exist in their own 'simulator industry' and have low market interdependence to the 'commercial VR/AR industry'. 4 firms use custom hardware and were disqualified. Third, firms working only with AR solutions were also disqualified from the analysis. At this point the case company focuses mainly on VR solutions, and therefore the analysis was focused on rival firms creating VR solutions. Whether these firms also do AR is of course important and was included as one data point to capture. 7 firms were disqualified from the analysis as they only work on AR solutions. This left 41 firms that were included in the analysis.

The author then proceeded to capture data of all 41 rival firms into the competitor analysis tool. The main source of data capture was each firms' website. Additionally, highly valuable data sources were videos that the firms had published in YouTube (www.youtube.com) and Vimeo (www.vimeo.com). Data was also captured from the firms' LinkedIn page (www.linkedin.com), as well as from Crunchbase data collection site (www.crunchbase.com), when available. This captured data became Data 3A in this thesis. The captured data is presented in Appendix 6 (parameter grading shown on a scale from 0-100, the scale was later adapted to 0-10).

Below are some of the key insights gained from analyzing these firms. Figure 11 shows where the firms have their headquarters. Out of the 41 firms being analyzed, most had their headquarters in the United States (10). Next were England (7) and somewhat surprisingly, Finland (5).

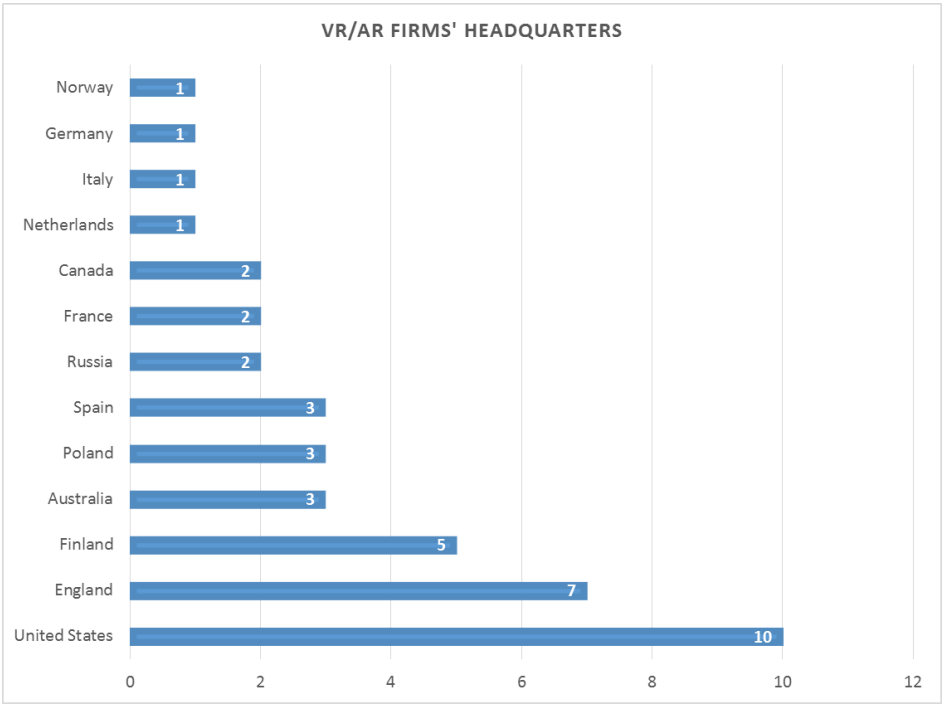

Figure 11. VR/AR firms' headquarters

Figure 12 shows what hardware platforms the analyzed firms develop content for. Out of the 41 analyzed firms, the majority (23) only developed PC VR solutions. Some did both PC VR and mobile VR (8), and a few did PC VR and mobile AR (4). The rest of the firms used other combinations of hardware platforms they develop on.

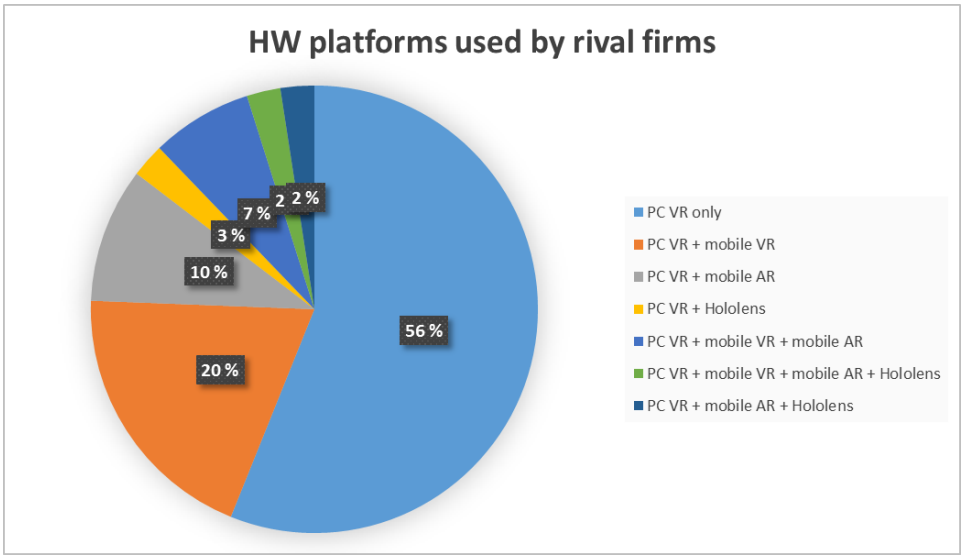

Figure 12. Hardware platforms used by rival firms

Data for the firm's headcount was captured from LinkedIn. The captured data shows the number of small (2-10 people), medium-sized (11-50 people) and larger (51-200 people) firms. Some firms did not have LinkedIn pages, nor was the headcount data available from other sources. The results of this data capture are shown in Figure 13.

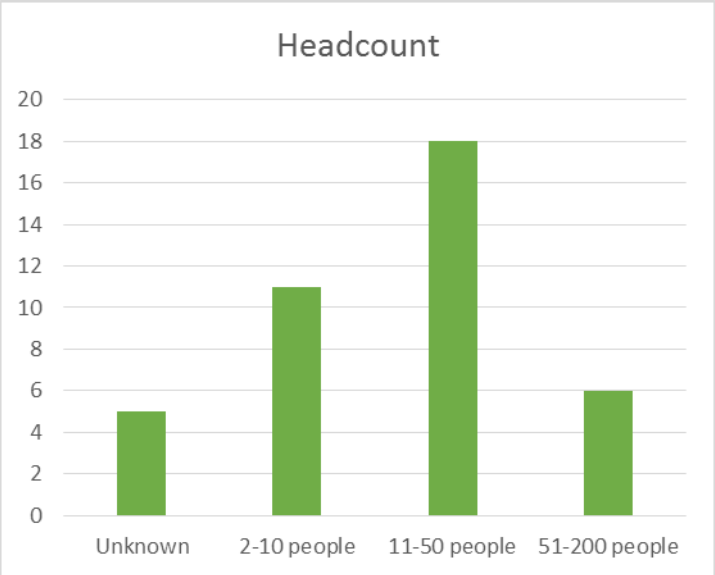

Figure 13. Headcount

The results show that the VR/AR enterprise solutions industry is mostly populated by small- and medium-sized firms, as is typical in fragmented industries.

Figure 14 shows the rival firms' year of establishment.

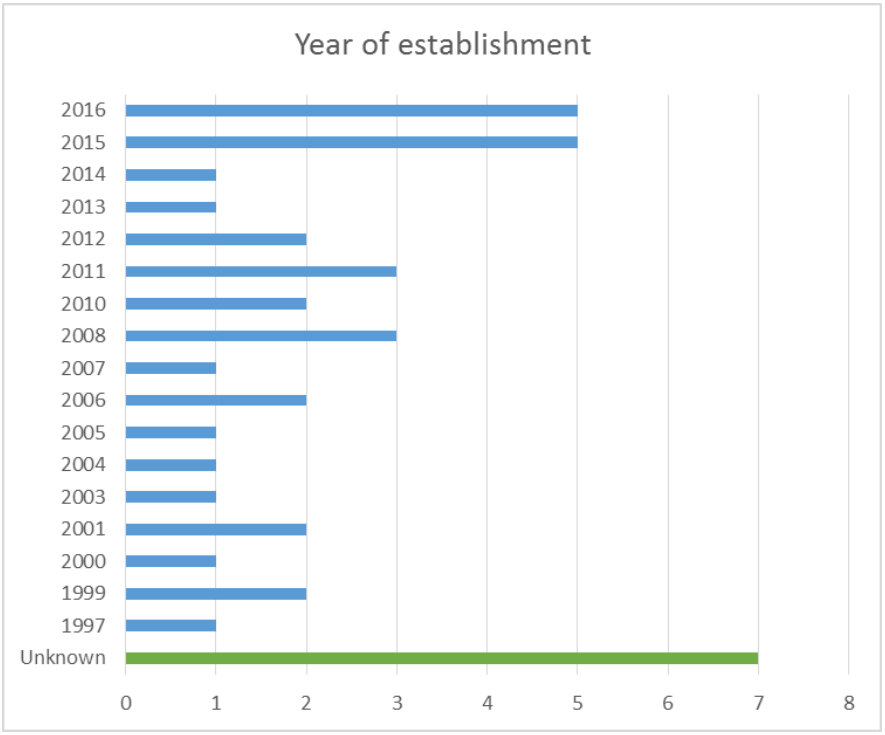

Figure 14. Year of establishment

As was expected, many of the firms are start-ups. In this context the author considers firms that have been established between 2014 – 2017 as being start-ups. There is a noticeable spike in 2015 and 2016, which is the time when the VR and AR hype truly began.

5.2 Categorizing and prioritizing known competitors

This section shows the results of categorizing the competitors on a strategic group map using the specialization and product leadership parameters. On specialization, the firms were evaluated on a scale from 0 (no apparent specialization) 10 (high vertical/horizontal specialization). On product leadership, the firms were evaluated on a scale of 0 (very simple VR/AR solutions and/or poor application use cases) to 10 (very advanced VR/AR solutions). A conscious attempt was made to disconnect product leadership assessment from product quality. Even very simple VR experiences may be very polished and graphically beautiful. They just don't really take advantage of all the possibilities of what VR and AR can be used for. Competitors were also graded on the other strategic information parameters.

After all 41 competitors had been analyzed the results were plotted to an Excel scatter chart to create a strategic group map. On this chart the X-axis display the firms' product leadership and the Y-axis displays the firms' specialization. This scatter chart is shown on the left side of Figure 15. The strategic group map shows that the firms are quite scattered and have high differentiation in the two chosen strategic parameters. This was somewhat expected based on this being an emerging, highly fragmented industry. However some grouping can be witnessed, on the opposing ends of the diagonal as well as on the bottom right corner. These groups are highlighted on the right side of Figure 15. It could be argued that a fourth group also exists towards the top left of the chart, but it is not included here as it is not as tightly bound as the other groups.

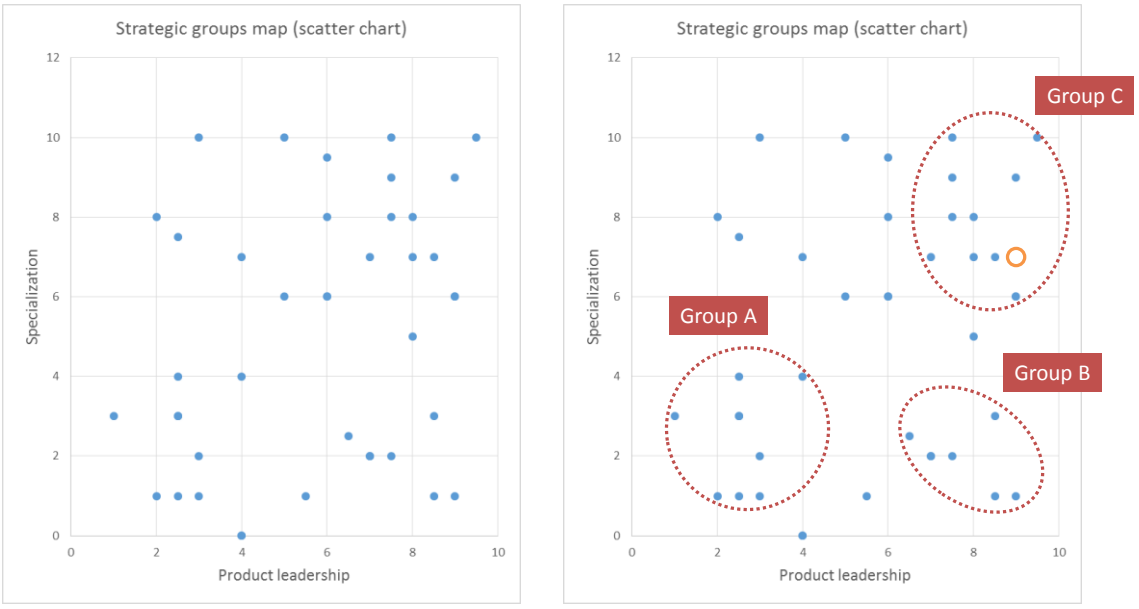

Figure 15. Strategic group map

The author notes that the grouping shown is fairly subjective, and if this task was given to someone else they might specify the groups differently. However, a decision on the groups needed to be made for the level 1 analysis presented in this thesis, and this grouping made the most sense to the author. Here Group A consists of firms with low specialization, and low product leadership. This group could be considered to offer the lowest customer value in their products. It could be that this group also contains those firms that are aiming for the low-cost position. Group B consists of firms with low specialization, but high product leadership. This group seems to offer advanced VR and AR solutions to a wide market, or customer base. Group C has high specialization and high

product leadership. This group seems to provide products with the highest customer value. And this value most likely comes with a premium price tag as well.

The case company was also evaluated on the chosen strategic parameters. This analysis was based on the results of the case company strategy interview (Data 1C). The case company scored 9 on product leadership and 7 on specialization (X9, Y7). The case company position is displayed as the orange circle on the right side of Figure 15. This places the case company to Group C on the strategic group map. The other evaluated parameters about the case company are not presented in this thesis due to confidentiality reasons.

Group C contains 11 firms (there are two data points on top of each other at X9, Y6). These firms are strategically closest to the case company and from strategic group analysis point of view and should be considered to be its main rivals. For this reason these main competitors were chosen for more detailed capability analysis. This analysis is explained in more detail in the next section.

Additionally, two bubble charts were also created to see if additional insights could be gained about the firms. In addition to plotting firms based on their product leadership and specialization, these bubble charts also indicate a third parameter as the size of the firm bubble. One noteworthy benefit from using a bubble chart is that it allows separate identification of firms that are plotted to the same coordinate on the X and Y axis. On the scatter chart these overlapping data points are not identifiable visually.

The bubble chart in Figure 16 indicates the firms' VR/AR focus (how much the firms' business in on VR and AR solutions). Larger bubble means a higher focus on VR and AR. There does not seem to be any clear correlation between a firm's VR/AR focus and its location on the chart.

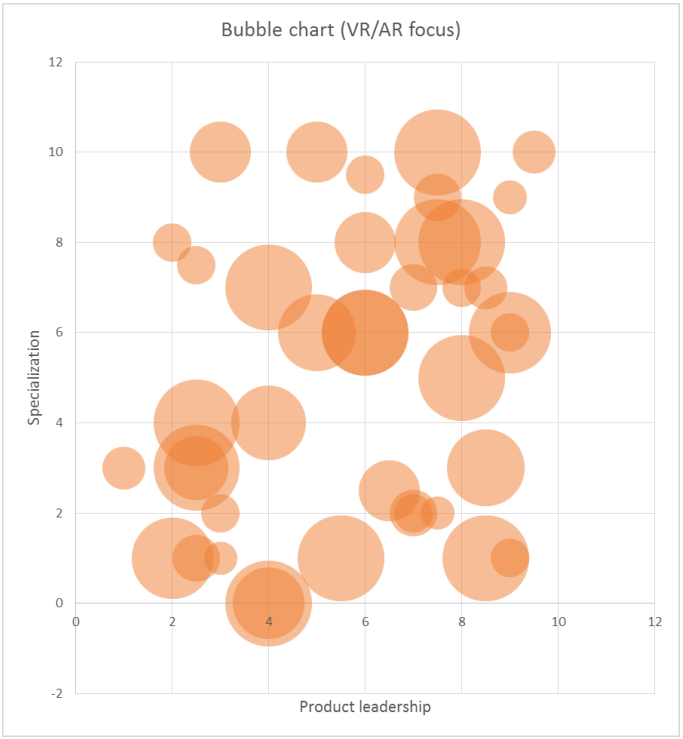

Figure 16. Bubble chart – VR/AR focus

The bubble chart in Figure 17 shows the firm's size as the bubble. Firms with unknown number of people are shown with the smallest bubble size. The small firms (2-10 people) are shown with the second smallest size, medium-sized (11-50 people) firms have are shown with medium sized bubble, and larger (51-200 people) firms are shown with the largest bubble. This chart also uses two different colors in the bubbles to further highlight the differences. The unknown and small sized firms are colored blue.

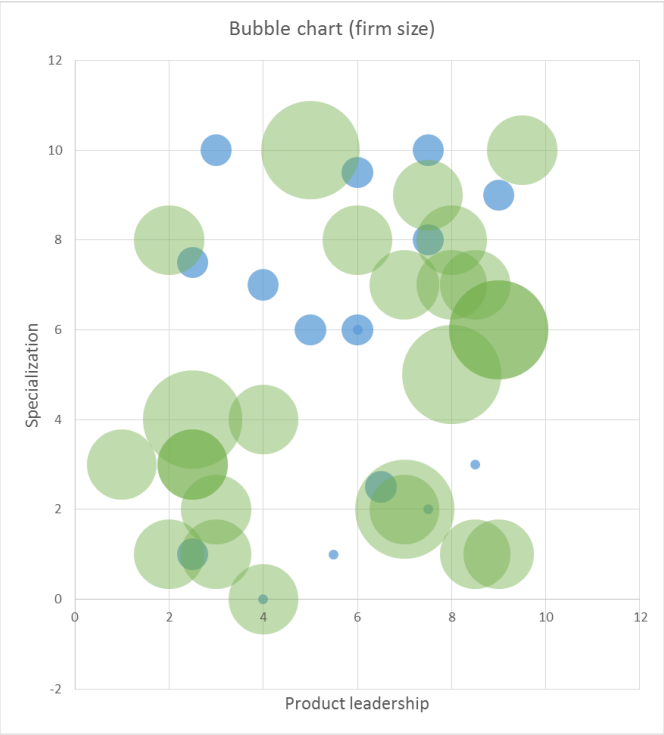

Figure 17. Bubble chart - firm size

From this chart it is clear that practically all small firms have high specialization. This is at the same time a meaningful discovery, and a result that the case company would expected to see in this business. In many industries small firms have to specialize heavily in order to stay competitive.

5.3 Comparison of key competitors

Following the strategic group analysis, the identified 11 key competitors were further analyzed on their capabilities. As already noted earlier, the capability information category contains five CSF parameters; product quality, number of VR/AR products, development competencies, innovation, and online marketing efforts. The key competitors were assessed against these parameters on a scale from 0-10. Additionally, each competitor was given an overall score. To calculate the overall score, each parameter was given a weight, relative to how competitively important the parameter was deemed to be.

Development competencies were deemed to be the most important ones and were given a weight of 35%, as they represent a firm's core competences. They provide high market mobility, make a significant contribution to the perceived customer benefits of the end products, and are difficult to imitate as they take a long time to develop. Current products'

quality was deemed the second most important with a weight of 25%. They represent the current reference on what a firm is capable of producing. The number of VR/AR solutions and innovation were deemed equally important and given a weight of 15% each. The number of completed VR and AR solutions give an indication on the amount of business the firm has had with their VR and AR solutions. And innovation gives an indication of possibly important competitive advantages. Online marketing efforts are given a weight of 10%. Their importance is mainly in generating interest with potential new customers. The results of this capability analysis are shown in Figure 18. The names of the competitors have been masked for confidentiality reasons.

Firm's name	Product quality	Number of VR/AR solutions	Development competencies	Innovation	Online marketing efforts	Overall score
Competitor A	8	3	7	6	8	**6,6**
Competitor B	7	2	10	9	4	**7,3**
Competitor C	10	3	3	8	3	**5,5**
Competitor D	9	1	7	7	9	**6,8**
Competitor E	6	10	4	2	8	**5,5**
Competitor F	7	9	6	7	7	**6,95**
Competitor H	4	1	9	2	3	**4,9**
Competitor I	9	4	8	6	2	**6,75**
Competitor J	4	3	3	6	5	**3,9**
Competitor K	9	1	9	9	1	**7**
Competitor L	8	2	10	9	1	**7,25**

Parameter	Weight
Product quality	0,25
Number of VR solutions	0,15
Development competencies	0,35
Innovation	0,15
Online marketing efforts	0,10

Figure 18. Capability analysis results

Looking at the results, there isn't a huge spread in the overall score. Practically all the firms have weaknesses in certain parameters, but they make up on those by being stronger in the other parameters. The low scores across the board in the number of VR/AR solutions stems from the fact that this is an emerging industry, and even the most successful firms have completed only a small number of projects. The exception to this rule is 'Competitor E' who has completed a large number of projects. Actually on their website they claim that they have successfully shipped more b2b and non-game virtual reality applications than any other studio in the world.

6 Lessons learned from using the tool

This section summarizes the key findings that were learned from using the competitor analysis tool for analyzing known competitors. This section also explains what feedback was gathered from company stakeholders about the results.

6.1 Key findings from using tool

Using the tool for analyzing known competitors provided a number of insights to the industry as a whole. The majority of rival firms are located in different countries in Europe, with England having the most firms. Also, many rival firms are located United States, and only a few come from Russia. Over half of all analyzed competitors develop only for the PC VR platforms (HTC Vive and Oculus Rift). The second largest group develops for both PC VR and mobile VR, and the third largest group for PC VR and mobile AR. Firms that develop on more than two of the platforms are in the minority. As the VR/AR enterprise solutions industry is a very young industry, it was assumed that many of the firms are start-ups. The captured data proved this assumption right, showing a large spike of new firms entering the industry in 2015 and 2016.

When viewed through the lens of the chosen strategic parameters, it could be seen that there is a high degree of differentiation in the firms' specialization and product leadership. It must be noted that some firms may not actively choose to focus on simple VR and AR solutions (low product leadership), but they simply don't have the product know-how to create the more advanced solutions and are therefore stuck in the low product leadership category. The firm's level of focus on VR/AR did not show any correlation to their position on specialization and product leadership, which came as a bit of a surprise to the author. Practically all small firms had high specialization, which was an expected result.

The main competitors also showed relatively high differentiation on the chosen critical success factor parameters. Almost all the firms had both weaknesses and strengths in in some of the captured parameters. And all but one had a low score in the number of VR/AR solutions the firm has developed. This result was expected, as this is an emerging industry and many firms have not yet had time to complete many customer projects.

6.2 Company stakeholder feedback on the results

After completing the analysis, the author arranged an interview with the company stakeholder (1h). In this interview the author presented the results and captured the stakeholder's feedback on the completed work. The captured feedback became Data 3B in this thesis. The interview meeting notes are presented in Appendix 7.

Overall, the company stakeholder was pleased with the completed work. The structure for the competitor profiles, and the extensiveness of the complete competitor analysis tool (including all the 100+ parameters) received praise. Captured data on competitor's headquarters, headcount, year of establishment, the HW platforms the firms develop for, and the firms overall focus on VR and AR development was all deemed very useful.

The stakeholder did present constructive criticism on the meaningfulness of the chosen strategic parameters used in the strategic group map. The author conceded that the selection of these parameters was a subjective choice. The stakeholder reasoned that this type of a strategic group map can oversimplify a complex topic, such as firms' chosen strategies. The author agreed on this assessment, as such a map is limited to two dimensions, and only uses two parameters. This fact did come up in the literature as well. In real life every firm is unique, and therefore classifying them into strategic groups can raise questions of judgement about what degree of strategic difference is important. However, this choice of strategic parameters was made with purpose and reasoning.

As has been mentioned several times before, the VR/AR enterprise solutions industry is very complicated, with many different types of firms, using different hardware platforms to create content for different vertical and horizontal markets, with a very high degree of product differentiation. Constructing a full view of the industry structure and boundaries has to start from somewhere, and within the scope of this thesis the choice was made to start this work with a top-down approach. The created strategic group map provides one view to this complex environment. The analysis can then continue into more details from this big picture. The author used the same reasoning when presenting the results of the competency analysis. The stakeholder stated that they thought those results were also a good start, but that they would like to see more detailed analysis on this front as well. Overall, the stakeholder was content with this line of reasoning from the author, and said that they would next want to proceed to continuing the analysis with the stage 2 parameters that were already created to the tool. As the practical next step the company stakeholder suggested that the exact horizontal and vertical markets that the rival firms operate on should be analyzed.

In the initial project plan the idea was to fine-tune the tool based on the received results and company stakeholder feedback. However, as the tool was created with a future looking stance from the start, this fine-tuning was not needed in the end. Future work will continue using the stage 2 parameters that are already included in the tool. The tool will continue to evolve in the future together with identified needs to capture new types of data on competitors.

7 Discussion and conclusions

This section discusses and summarizes the thesis, evaluates its validity and reliability, and suggests further steps for future competitor analysis.

7.1 Summary

The objective of this thesis was to create and test an easy to use competitor analysis tool for the case company. With this tool the case company could better assess the competitive landscape in the VR/AR enterprise solutions industry. The existing method used for gathering competitive information in the case company did not provide any real structure for captured data, which greatly limited its usefulness in assessing and comparing competitors against each other.

To achieve the research objective, data on the topic was collected from multiple sources, including competitors' websites, industry journals, reports, and periodicals, existing competitive data in case company database, and from interviews and a workshop with a key company stakeholder. This data was analyzed based on several well-known frameworks and analysis tools specifically created for competitor analysis purposes by experts on this field of study.

First the current status of competitor analysis in the case company was clarified with a key company stakeholder and the existing competitive information was examined. The case company's strategy within the industry was also clarified by interviewing the key company stakeholder. This improved the author's understanding of the present situation in the case company, and was important in guiding the direction of the research.

Following this internal analysis, the external VR/AR environment was analyzed to gain better insights to the driving forces in the industry, and to the different types of firms occupying the competitive space. Based on the results of the external analysis a candidate list of parameters to use for analyzing competitors was created. The candidate list was presented to the company stakeholder and another project manager in a workshop. The output of this workshop was the final set of parameters. These parameters where then used to create the competitor analysis tool. The tool was created with a future looking stance, and included different set of parameters for two different stages of analysis. Stage 1 parameters were designed for higher-level analysis. This stage 1 analysis was reported in this thesis. Stage 2 parameters were designed for a detailed level of analysis, and they will be used when continuing competitor analysis in the future. These stage 2 parameters were not used within the scope of this thesis.

The carried out competitor analysis gave the case company a better understanding of the overall competitive landscape and the different types of firms in the industry. First competitors' strategic positioning was analyzed. These results identified those rival firms that are strategically closest to the case company. The tool was then used to further analyze the capabilities of these main competitors.

The results of the analysis were presented to the company stakeholders and their feedback was captured. The initial idea was to fine-tune the competitor analysis tool based on the received results and the feedback. But since the tool was already initially created with the additional stage 2 parameters, it did not need fine-tuning in the end. The received results provide a good first step for gaining insights about competitors, and future work with the created tool will undoubtedly reveal even more insights.

This thesis research gave me (the author) a considerably better understanding on the complexities involved in carrying out analysis of competitors, as well as how to acquire information for that analysis. The competitive environment surrounding the VR/AR enterprise solutions industry is changing and evolving all the time, and predicting the competitors' motives and moves is very challenging. The research done within this thesis gave me a clearer view on the competitors' operations and experience in analyzing firms. The process taught me a lot on independent problem solving skills and data mining. Overall I am very pleased with the results of the research, and am looking forward to doing more detailed competitor analysis in the future.

7.2 Validity and reliability of this thesis

The validity in this thesis was ensured by basing the research on well-established frameworks and tools created for competitor analysis, and by applying multiple different tools for the data analysis phase. The thesis used several data collection points, and data was gathered from multiple sources to avoid mistakes in the analysis. Bias was avoided whenever possible by listening to the opinions of coworkers, and by presenting intermediate results to a key company stakeholder and capturing their feedback on the topic.

Efforts were taken to ensure reliability by describing the process of data collection and analysis in detail, so that the thesis results could be repeated if needed. However, due to the nature of the research and the subjective assessment in grading competitors against the analysis parameters, the end results would vary if the research would be done again by another person. In this area the reliability of the assessment relies on the industry-relevant experience that the author has on this topic. Understanding the capabilities and limits of the current hardware and software by first-hand experience, and understanding what works and doesn't work in VR and AR enabled fairly reliable assessment of other firm's VR and AR products.

Even though a large part of the captured data came from Internet resources it can be considered to be reliable. Most of this data was gathered directly from the rival firms' websites, so it should be rather accurate. One possible reliability risk is that the information on the firms' websites was not up to date. However, considering how new the technology and the whole industry is, the data is not expected to be too old in the majority of the cases. Furthermore, whenever possible the time when the content was made available online was verified. This was used especially when examining the firms' product videos from YouTube and Vimeo, as the video upload date is shown. Some challenges with data reliability were formed with firms that did not provide much information on their websites and therefore could not be analyzed properly. A conscious effort was made to filter out such firms from the analysis.

7.3 Next practical steps

By no means is this competitor analysis tool considered to be perfect. For example it does not currently capture any financial information. However it allows the case company to get a better understanding of the industry and the players in it. It also allows making

some useful generic comparisons of strengths and weaknesses between the case company and main rival firms in the same strategic group. Additionally, as the tool already contains the stage 2 parameters, a more detailed analysis of the competitors can be started with relative ease.

Due to the fast pace of technological development in the VR/AR industry, the results of this research are expected to be valid only for a relatively short time period. If the same analysis would have been carried out six months to a year from now, the results would probably be greatly different. New VR and AR hardware platforms are coming to the market, and new firms will continue to enter the industry. Therefore, a continuous update process is needed to keep the competitive information fresh and relevant. The case company must vigorously keep an eye out for new competitors, new hardware releases, and new enterprise solutions from rivals in the industry.

The next practical steps for the case company are to start the stage 2 analysis using the created competitor analysis tool. Most importantly, the exact horizontal and vertical markets that the competitors operate on should be analyzed. Following this, a more detailed analysis of the different types of product categories on the market could provide meaningful insights for the case company. Additionally, any financial information and product pricing should be captured whenever possible.

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Current status of competitor analysis interview – meeting notes

Interview topic	Meeting notes
Why is this project needed and what is its purpose?	o Case company does not currently have a good system for gathering information about competitors o Discovered firms that create VR or AR solutions are recorded to a company internal database, but the stored information does not have a clear and easy-to-use structure o Each firm recorded on a separate page to a list in the database, but current data is very high-level o Only a single competitor page can be viewed at once, difficult to see a full view of what is happening in the industry, or make comparisons between different firms
What expectations do the clients have on the project outcome?	o Company stakeholders want a more structured method for gathering and displaying competitor information o Information not to be collected to large volumes of written reports, will not be read by anyone o Instead place key information about all identified competitors in a numerical format, or on a graph o Enables viewing a large amount of information of the whole competitive environment, as well as enable competitor comparisons o Build a full situational picture of the VR/AR enterprise solutions industry
What is the scope of the analysis?	o All relevant known rival firms should be included o Need to filter out 'non-relevant' firms not really competing with us o Need to develop filtering criteria o Create a competitor profile on each relevant competitor o Profile to contain the key information as a list of parameters o Score each competitor on each parameter. o Show scored values of all competitors graphically
What resources are available for the project?	o Author does most of work o Key company stakeholder acts in supporting role o Other case company employees not involved in project o Use existing info in company database, and search for new relevant competitors o Use publicly available online data
How quickly are results expected?	o As soon as possible o Reserve time also for finding new competitors o Keep company stakeholders updated on progress
What data or information has already been gathered on this topic?	o Identified VR/AR firms stored on a list in company database o Collected data is fairly general, only contains basic information (typically firm's name, website, high-level overview of what the firm does) o Known VR and AR websites, journals and white papers
What barriers may exist for completing the project?	o Vast number of firms and limited time and resources available o May limit the depth of the initial analysis o Rely on available online information, limited amount of data made public
What should be the next project steps?	o Create a candidate list of suitable parameters for evaluation o Lock down final set of parameters with company stakeholders o Analyze competitors against these parameters

List of VR/AR –related websites and reports

VR/AR related websites	URL
VR Focus	http://www.vrfocus.com/
Road to VR	http://www.roadtovr.com/
UploadVR	http://uploadvr.com/
virtualrealityreporter	www.virtualrealityreporter.com
virtualrealitytimes	www.virtualrealitytimes.com
Reports	**URL**
Goldman Sachs report	http://www.goldmansachs.com/our-thinking/pages/virtual-and-augmented-reality-report.html
VRDC report	http://reg.vrdconf.com/VRDC-2017-Innovation-Report?kcode=VRREM6B2&elq_mid=79003&elq_cid=14933012
SuperData Research report	https://www.superdataresearch.com/market-data/virtual-reality-industry-report/
Perkins Coie report	https://www.perkinscoie.com/en/21626/ar-vr-survey-results.html
MLB Financial Group report	https://vrarmiddleeast.iqpc.ae/ar-and-vr-booming-worldwide
WCP report	http://www.woodsidecap.com/wp-content/uploads/2016/06/Augmented-Reality-Report-FINAL.pdf
Cognizant report	https://www.cognizant.com/whitepapers/disrupting-reality-taking-virtual-augmented-reality-to-the-enterprise-codex2124.pdf
iab report	https://www.iab.com/wp-content/uploads/2016/09/IAB_VR_Report-Sep-2016.pdf
Mindshare Trends report	https://www.mindshareworld.com/sites/default/files/HUDDLE_TRENDS_17_ONSCREEN_V1.pdf
Scetchfab report	https://sketchfab.com/trends/q2-2017
The Farm 51 report	http://thefarm51.com/ripress/VR_market_report_2015_The_Farm51.pdf
Kallidus report	https://comms.kallidus.com/virtual-reality
Oppenheimer report	http://pdf.zacks.com/pdf/FA/H4846439.PDF
PitchBook report	https://pitchbook.com/news/reports/2015-virtual-reality-analyst-report

Case company strategy interview – meeting notes

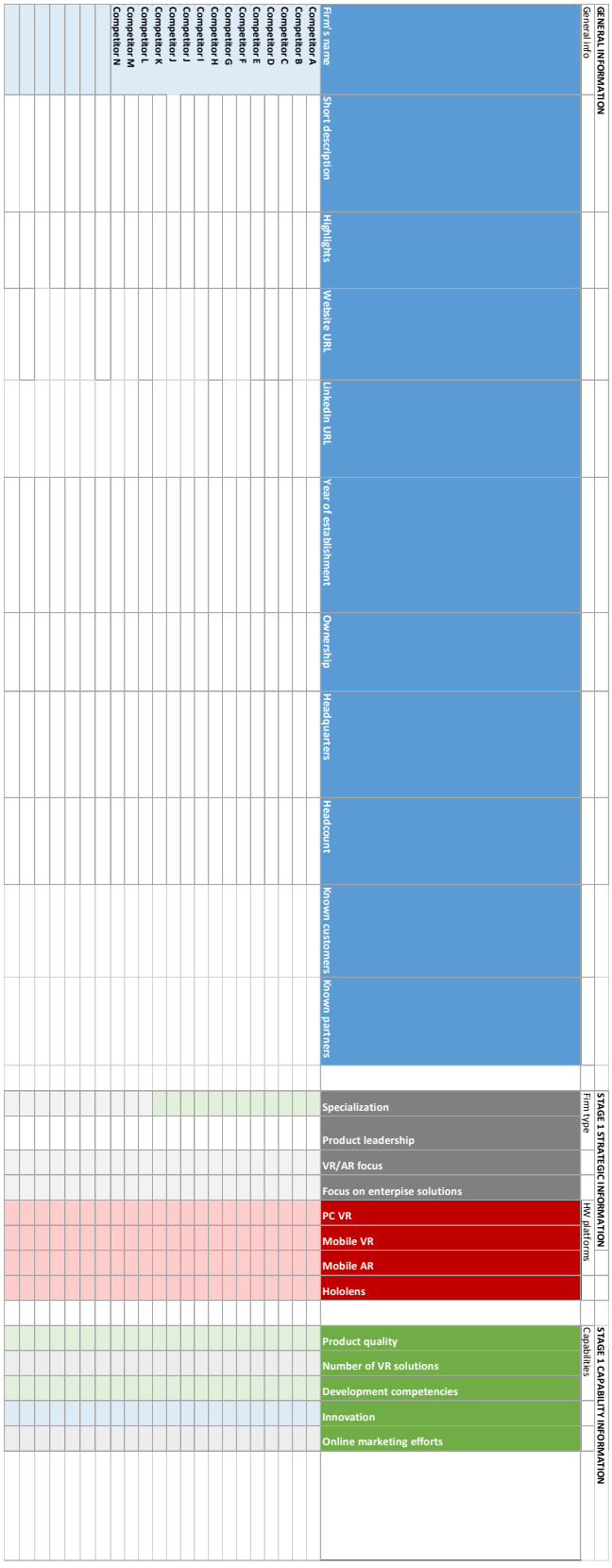
- Case company focuses on producing very high quality VR (and AR) solutions based completely on commercially available hardware
    - No custom hardware such as controllers or operator panels
- Markets of interest are those industries where VR systems have not been feasible before due to their high price, but which could now benefit greatly from VR solutions using cheaper commercial hardware
- Industries that use very expensive real equipment and that have already used custom simulators earlier are not the primary focus
    - existing simulator companies may have strong market positions
- 360 video solutions not currently in scope
    - Expensive equipment that becomes obsolete quickly
    - Very large number of firms competing on this market
- Mobile AR solutions on the table, but not primary focus
    - Huge number of firms creating mobile AR content
    - Cheap or even free AR apps available in online stores
    - Basically forms its own app ecosystem
    - Apple and Google provide extensive support for AR developers to create content to their platforms
    - Hard to maintain competitive advantage from having better than average development competencies
    - Many existing AR firms' products have already been made obsolete by free apps with similar functionality
- Main focus on training solutions
    - Topics where the VR firm must first learn the content area in-depth before can implement the VR solution
- Best markets would be those that have large user bases, and extensive needs for various types of training
- However, don't keep solution scope too narrow, ready to implement practically anything what customers want and that makes sense from a business point of view
    - Marketing and promotional content, VR walk-around, configurator products, etc.
- Competitive advantage from product leadership, take advantage of extensive company internal knowledge on what works in VR and what doesn't

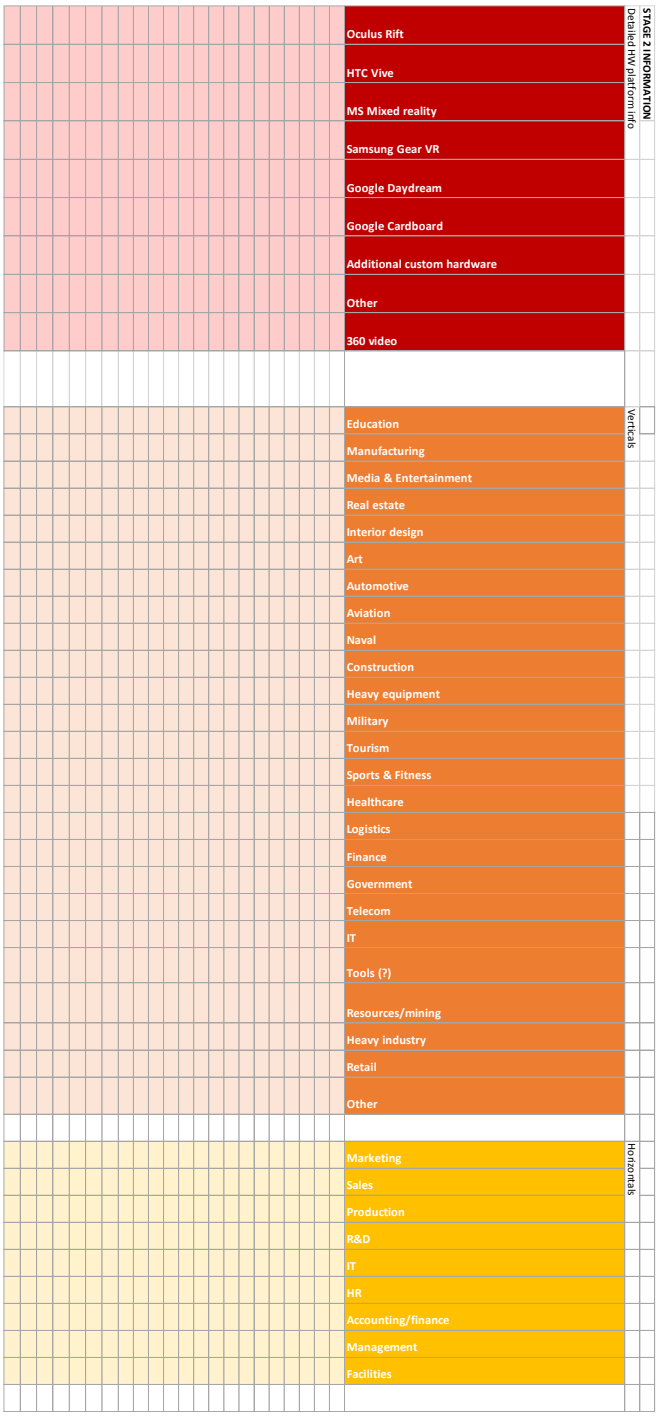
List of known competitors

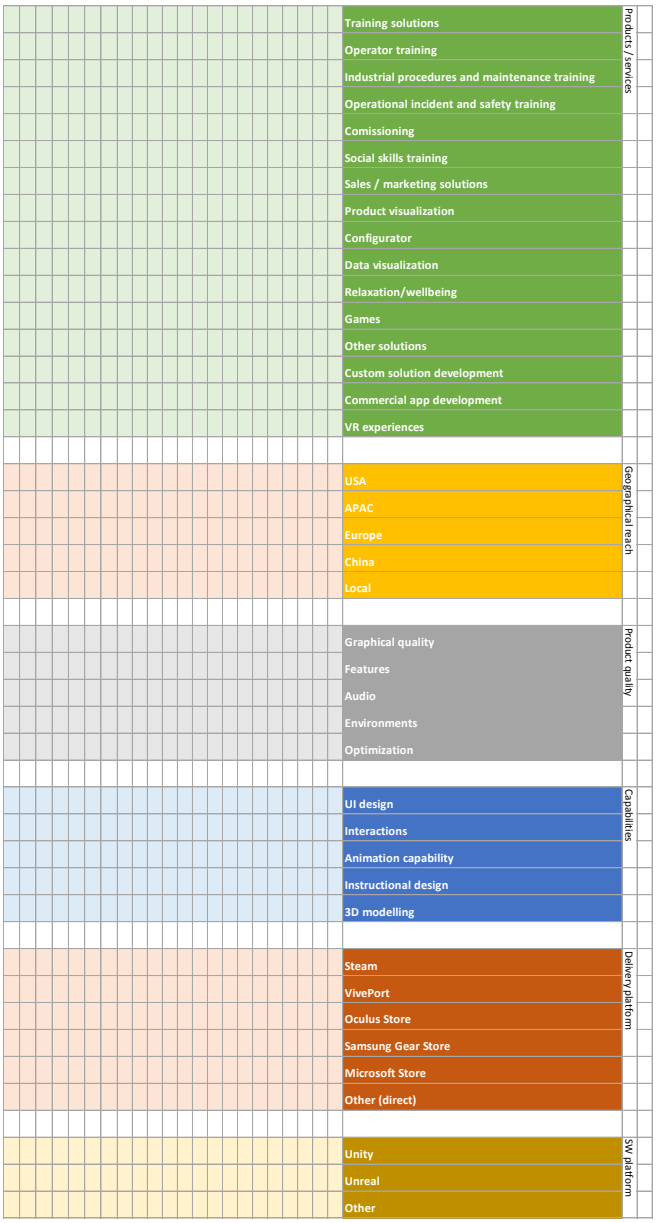
The data has been removed for confidentiality reasons. The material has been available for review for the instructors.

Firm name	Website URL	Firm name	Website URL

Competitor analysis tool




STAGE 2 INFORMATION
Detailed HW platform info
Oculus Rift
HTC Vive
MS Mixed reality
Samsung Gear VR
Google Daydream
Google Cardboard
Additional custom hardware
Other
360 video
Verticals
Education
Manufacturing
Media & Entertainment
Real estate
Interior design
Art
Automotive
Aviation
Naval
Construction
Heavy equipment
Military
Tourism
Sports & Fitness
Healthcare
Logistics
Finance
Government
Telecom
IT
Tools (?)
Resources/mining
Heavy industry
Retail
Other
Horizontals
Marketing
Sales
Production
R&D
IT
HR
Accounting/finance
Management
Facilities


Training solutions
Operator training
Industrial procedures and maintenance training
Operational incident and safety training
Comissioning
Social skills training
Sales / marketing solutions
Product visualization
Configurator
Data visualization
Relaxation/wellbeing
Games
Other solutions
Custom solution development
Commercial app development
VR experiences
Products / services
USA
APAC
Europe
China
Local
Geographical reach
Graphical quality
Features
Audio
Environments
Optimization
Product quality
UI design
Interactions
Animation capability
Instructional design
3D modelling
Capabilities
Steam
VivePort
Oculus Store
Samsung Gear Store
Microsoft Store
Other (direct)
Delivery platform
Unity
Unreal
Other
SW platform

Collected data from competitors

All identifiable data has been redacted for confidentiality reasons. The material has been available for review for the instructors.

GENERAL INFORMATION														STAGE 1 STRATEGIC INFORMATION					
Firm's name	Short description	Highlights	Website URL	LinkedIn URL	Year of establishment	Ownership	Headquarters	Headcount	Known customers	Known partners				Focus on enterprise solutions	PC VR	Mobile VR	Mobile AR	Hololens	
Competitor 1					2016	Privately Held	Netherlands	a 2-10						100	Yes	No	No	No	
Competitor 2						Privately Held	United States	a 2-10						80	Yes	No	No	No	
Competitor 3						Public compa	United States	a 11-50						20	Yes	No	No	No	
Competitor 4					2001	Privately Held	Australia	a 11-50						30	Yes	No	No	No	
Competitor 5					2008	Public compa	Russia	a 11-50						25	Yes	Yes	No	No	
Competitor 6					1999	Privately Held	United States	a 51-200						20	Yes	No	No	No	
Competitor 7					2005	Privately Held	England	a 51-200						100	Yes	No	No	No	
Competitor 8					2016	Privately Held	Finland	a 2-10						30	Yes	Yes	No	No	
Competitor 9					2011	Privately Held	France	a 2-10						15	Yes	No	No	No	
Competitor 10					2016		Canada	Unknown						100	Yes	Yes	Yes	No	
Competitor 11					2015	Privately Held	United States	a 2-10						20	Yes	Yes	No	No	
Competitor 12					2010		Russia	Unknown						80	Yes	Yes	No	No	
Competitor 13					1999	Privately Held	Canada	a 11-50						20	Yes	No	No	No	
Competitor 14					2008	Partnership	United States	a 11-50						70	No	Yes	Yes	Yes	
Competitor 15						Public compa	Poland	a 11-50						90	Yes	No	No	No	
Competitor 16					2012	Privately Held	England	a 11-50						50	Yes	Yes	Yes	Yes	
Competitor 17					2015	Public compa	Italy	a 2-10						100	Yes	No	No	No	
Competitor 18							Finland	Unknown						100	Yes	No	No	No	
Competitor 19					2011	Privately Held	Finland	a 2-10						50	Yes	Yes	No	No	
Competitor 20					2016	Privately Held	Spain	a 2-10						100	Yes	No	No	No	
Competitor 21					2015	Privately Held	United States	a 2-10						100	Yes	Yes	No	No	
Competitor 22					2012	Privately Held	England	a 51-200						50	Yes	No	Yes	No	
Competitor 23							Poland	Unknown						100	Yes	Yes	No	No	
Competitor 24					2004	Privately Held	Finland	a 20						30	Yes	No	Yes	No	
Competitor 25						Privately Held	United States	a 11-50						15	Yes	No	Yes	No	
Competitor 26					2006	Sole Proprietorship	United States	a 11-50						100	Yes	No	No	No	
Competitor 27					2010	Privately Held	Spain	a 51-200						90	Yes	No	No	No	
Competitor 28					2001	Privately Held	Australia	a 11-50						55	Yes	Yes	Yes	No	
Competitor 29					2015	Partnership	United States	a 2-10						50	Yes	No	No	No	
Competitor 30					2014	Public compa	Poland	a 11-50						75	Yes	Yes	No	No	
Competitor 31					2003	Privately Held	Spain	a 11-50						100	Yes	No	No	No	
Competitor 32					2013	Public compa	Germany	a 11-50						20	Yes	No	No	No	
Competitor 33					2016	Public Compa	Norway	a 11-50						100	Yes	No	No	No	
Competitor 34							England	Unknown						15	Yes	No	No	No	
Competitor 35					2015	Privately Held	Australia	a 2-10						20	Yes	No	No	No	
Competitor 36					2011	Privately Held	England	a 51-200						100	Yes	No	No	Yes	
Competitor 37					2007	Public Compa	Finland	a 11-50						20	Yes	No	No	No	
Competitor 38					2000	Privately Held	England	a 11-50						25	Yes	No	Yes	Yes	
Competitor 39					2006	Privately Held	England	a 11-50						30	Yes	No	No	No	
Competitor 40					2008	Privately Held	France	a 11-50						25	Yes	No	No	No	
Competitor 41					1997	Privately Held	United States	a 51-200						20	Yes	No	No	No	

Stakeholder feedback interview – meeting notes

- Good info gathered on competitors in general
    - headquarters, HW platform, headcount, year of establishment
- Complete competitor analysis tool shows great potential for future work
    - Continue adding fields to the tool as needed
    - Keep assessment values as objective as possible
    - Adding data from new competitors should not cause re-evaluation of data from existing competitors
- Received some criticism on strategic group map concept
    - Selection of parameters is always a subjective choice, this fact can't be changed
    - Must have good justification for the choice of parameters to use
    - 2D map may easily oversimplify a complex topic
- In reality every firm is unique, but we also need to come up with some meaningful ways of grouping them
    - Compromise between data usability and absolute accuracy
- VR/AR is a very difficult industry to analyze, so many different approaches being used
- Competency parameters show a good start
    - More detailed analysis would be desired
- Continue work with the specified stage 2 parameters
    - Next should detail the exact horizontal and vertical markets that the firms operate on