Creating a market segment selection tool for tech-based businesses – A design-based approach

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Abstract

Aim. This thesis aims to create a market segment selection framework that considers the needs of tech-based businesses.

Methodology. The thesis follows the design-based research approach. Within this approach, a market segment selection framework for tech-based businesses will be developed based on theory and seven semi-structured interviews (and one unstructured interview). Furthermore, the created framework will be demonstrated as a case study at a tech-based business in the Netherlands.

Results. According to the interviews and existing theory, the market segment selection framework for tech-based businesses has to include four relevant aspects. It should first be able to determine the attractiveness of a market segment. Second, it should be able to decide on the suitability between organizations and segments. Third, the framework should include a step that entails a quick scan of a market segment to enhance flexibility in the market segment selection process. Finally, the rigidity of the framework should be minimized. After developing a framework that embeds these four aspects, it has been demonstrated at a tech-based firm, as mentioned. This demonstration proved that the four relevant elements were essential and adequately included within the framework.

Implications. From a theoretical perspective, this thesis has multiple implications. First, the research has provided a market segment selection framework that specifically considers the needs of tech-based businesses. As it is the first to do so, this thesis adds to the literature on market segment selection for tech-based firms. Second, the thesis also adds to the general market segment selection theory by creating a framework that is more flexible compared to existing models. Especially embedding a pre-screening step into the framework allows firms to face market segment selection problems flexibly. Finally, the thesis has added to the literature by validating specific existing attractiveness criteria used for market segment selection and also adding new ones. Moreover, the research also has implications for practice. First, tech-based businesses can deal with market segment selection problems by applying a framework that considers their needs. Second, as the main characteristic of the framework is flexibility, the model can also be implemented by non-tech-based organizations that desire flexibility within the market segment selection process. Finally, the created model can provide a basis for organizations' marketing strategy.

Limitations and future research. The thesis might be prone to some external validity issues due to a relatively low sample size of interviews conducted in the development stage of the framework and the fact that the model has only been tested at one organization. Moreover, the interviews and case study were conducted in a specific region of the Netherlands, which also affected the external validity. Furthermore, a minor issue with the inter-rater reliability of the coding of the interviews has been found, as tiny differences in codes existed among two researchers. For future research, longitudinal case studies and, if necessary, interviews are recommended to enhance the external validity of the created framework. Furthermore, extra research concerning the pre-screening step might be relevant.

Keywords: Market segment selection, Tech-based businesses, Target market selection, Market segment attractiveness, High-tech markets

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Glossary

Term:	Definition:
Case study	*"A comprehensive description of an individual case and its analysis; i.e., the characterization of the case and the events, as well as a description of the discovery process of these features that is the process of research itself" (Starman, 2013, p. 31).*
Competitive volatility	*"The rapid changes in the determinants of competition, the entrance and exit of firms, and the basic and applied technologies being used" (Lu & Sexton, 2009, p. 344)*
Design-based research	*"A systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually sensitive design principles and theories"* (Wang & Hannafin, 2005, pp. 6-7)
Design proposition	"A *general template for the creation of solutions for a particular class of field problems"* (Denyer et al., 2008, p. 395)
Field problem	*"A situation in reality that can or should be improved in the view of influential stakeholders"* (Van Aken & Berends, 2018, p. 17)
Market uncertainty	*"The ambiguity about the type and extent of customer needs that can be satisfied by a particular technology" (Mohr, 2000, p. 247)*
Technological capabilities	*"The skills that allow productive enterprises to utilize equipment and technological information efficiently" (Jonker et al., 2006, p. 121)*
Technological standards	*"A set of specifications to which all elements of products, processes, formats or procedures under its jurisdiction must conform"* (Tassey, 2000, p. 2)
Technological uncertainty	*"Uncertainty whether a product or the business providing it can fulfil its promise to meet certain market needs" (Mohr, 2000, p. 249)*

1. Introduction

1.1 Situation and complication

The selection of market segments is perceived to be one of the most critical decisions managers must make within organizations (Hlavacek & Mohan, 1986). First, it supports aligning an organization's resources and its competitive goals (Montoya-Weiss & Calantone, 1999). Second, deciding what market segments to target is crucial, as an organization's marketing strategy should align with a firm's selected market segments (Wind & Thomas, 1994). Finally, selecting suitable and promising target markets could increase the competitiveness of organizations (Weinstein, 2014). Consequently, it can be concluded that market segment selection is crucial for organizations.

For organizations, market segment selection entails the selection of attractive market segments that match an organization's internal environment (Clarke, 2009). However, to select attractive market segments, a comprehensive understanding of the characteristics of the market segments and the demands of effectively handling them is required (Clarke, 2009). Consequently, market segment selection also involves the evaluation of market segments based on relevant market segment evaluation criteria (Montoya-Weiss & Calantone, 1999). The evaluation of the market segments should result in an overview of segments that might be promising for an organization. Nevertheless, before an organization targets these attractive segments, it must also examine whether they align with its internal environment (Freytag & Clarke, 2001).

Market segment selection is perceived to be a complicated and time-consuming problem due to the many feasible alternatives and conflicting objectives (Zakeri et al., 2020). This finding is confirmed by Dat et al. (2015), who explain that market segment selection is a highly complex and messy problem. Market segment selection is complex because there are multiple different courses of action, numerous dimensions to a particular course of action and uncertainty regarding the outcome of any choice (Montoya-Weiss & Calantone, 1999). Furthermore, market segment selection is a messy problem in the sense that systematic integration of various evaluation criteria by multiple decision-makers is required (Montoya-Weiss & Calantone, 1999).

This thesis will examine a market segment selection problem of a tech-based business focusing on electronic applications, which will be named Business X. Therefore, this research will focus on market segment selection for tech-based firms. Business X wants to examine four market segments. Consequently, an analysis of these four segments will be conducted. The goal for the organization is to get a foundation for making well-considered decisions regarding these four market segments. Essential factors to consider include the attractiveness and suitability of the segments.

As the research will focus on tech-based businesses, it is vital to consider the characteristics of this type of organization. Therefore, these characteristics will be briefly discussed. First, tech-based companies rely heavily on technical and scientific knowledge (Rubera & Kirca, 2012). Consequently, the knowledge base of this type of organization is a critical asset. Second, tech-based businesses face more risks than non-tech-based businesses (Mason & Harrison, 2004). Examples of specific risks tech-based businesses face are market uncertainty, technological uncertainty and competitive volatility (Mohr, 2000). Third, to support innovation, tech-based firms spend considerable amounts of resources on research and development (Nieto & Quevedo, 2005). Fourth, tech-based businesses face technological standards. These are *"a set of specifications to which all elements of products, processes, formats or procedures under its jurisdiction must conform"* (Tassey, 2000, p. 2).

Furthermore, tech-based businesses mainly operate within high-tech markets. Therefore, the characteristics of these markets will also be discussed. First, compared to low-tech markets, high-tech markets are perceived to be turbulent and complex (Yang & Kang, 2008). Slater et al. (2007) give an example of this, mentioning the constantly changing customer needs and competitive landscape within high-tech markets. Second, high-tech markets provide many technological opportunities (Chaney et al., 1991). Due to this many technological opportunities, innovation is crucial for tech-based organizations to remain competitive (Chaney et al., 1991). Finally, compared to low-tech markets, high-tech markets have a relatively short life cycle (Yang & Kang, 2008). Consequently, the window of opportunity within high-tech markets is often relatively small (Moore, 2014).

1.2 Research problem/design question

As mentioned, Business X aims to get a foundation to make well-considered decisions regarding specific market segments. This entails that decisions concerning market segment selection should be made based on a thought-through analysis of the

market segments. A framework could provide proper guidelines for organizations regarding market segment selection, according to Freytag & Clarke (2001). Consequently, a market segment selection framework could also provide the mentioned organization with guidelines to create a foundation for making well-considered decisions regarding market segment selection. However, as previously discussed, tech-based businesses differ considerably from non-tech businesses. Therefore, it is essential to consider these differences while examining the market segment selection question. However, there is currently no market segment selection framework within the literature that focuses explicitly on the needs of tech-based businesses. Hence, when tech-based businesses apply existing frameworks, the assessment of a market segment might not be entirely complete/correct, or the framework might be too rigid to deal flexibly with the dynamic nature of high-tech markets.

Therefore, the research problem of this thesis, discussed extensively in chapter 2, is that currently, no market segment selection framework specifically considers the needs of tech-based businesses, especially regarding flexibility. Consequently, the research goal of this paper will be to create a market segment selection framework that specifically considers the needs of tech-based businesses to allow them to flexibly make well-considered decisions regarding the selection of attractive and suitable market segments. Based on the research problem, the following research question has been developed:

Design question: ***How can tech-based businesses create a foundation to make well-considered decisions regarding the selection of market segments by applying a market segment selection framework that specifically considers their needs?***

1.3 Implications

This thesis has multiple theoretical implications. First, the thesis adds to the literature on market segment selection for tech-based businesses. Some guidelines for tech-based enterprises have been provided by Slater et al. (2007) and Weinstein (2014). However, a complete framework concerning market segment selection has not been developed yet for this type of organization. Therefore, by providing this framework, this thesis adds to the market segment selection literature for tech-based businesses. Second, this thesis also adds to the general theory of market segment selection. The main characteristics of the framework created in this thesis are high flexibility and low rigidity. These characteristics can also be relevant for non-tech-based businesses that look for flexibility when facing a market segment selection problem. Both characteristics are strongly represented in the pre-screening step of the framework. Conducting a pre-screening during the market segment selection process is relatively untouched in theory. Partially resembling a pre-screening is the analysis of predetermined knock-out criteria mentioned by Dolnicar et al. (2018). However, this thesis extends this pre-screening step by adding an analysis of previous experiences in the relevant market segments to it. Finally, the research adds to the existing literature by validating specific market segment selection criteria already mentioned by theory and adding new criteria that businesses can apply to determine the attractiveness of market segments.

The thesis also provides several practical implications. First, the framework created in the thesis allows tech-based businesses to execute market segment selection with a framework that specifically considers their needs. The artifact provides tech-based enterprises with substantial flexibility during the market segment selection process, which is deemed pivotal for this type of business. Second, the framework is also expected to be helpful for non-tech-based enterprises. As mentioned, the main characteristic of the model is flexibility. Therefore, this framework might also be the most suitable one for non-tech-based firms that desire flexibility within the market segment selection process. Finally, the use of the framework allows businesses to obtain relevant insights that can be used to develop a marketing strategy that aligns with the market segments in which the organization wants to be active.

1.4 Research design/methodology

Within this thesis, a field problem will be examined. A field problem is *"a situation in reality that can or should be improved in the view of influential stakeholders"* (Van Aken & Berends, 2018, p.17). Common methodologies that can be utilized for field problems are mostly theory-based or design-based. A design-based method is most suitable for primarily technical-economic field problems (Van Aken & Berends, 2018). Consequently, design-based research might apply to the mentioned problem, as it is mainly a technical-economic problem. Furthermore, design-based research emphasizes breaching the gap between practice and theory, which is perceived to be a common weakness within educational research (Tinoca et al., 2022). Within this research, a framework for market segment selection will be derived from theory and practice and demonstrated in a real-life context. Consequently, this finding confirms that design-based research might be suitable for the research problem that

will be examined. Finally, there is already (a limited amount of) theory available regarding market segment selection. Through design-based research, it is possible to extend and improve these existing theories (Alghamdi & Li, 2013).

Now that the fit between the research problem and design-based research has been identified, it is necessary to define what design-based research means. Therefore, the following definition of design-based research will be applied within this thesis: *"a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually sensitive design principles and theories"* (Wang & Hannafin, 2005, pp. 6-7).

This thesis will utilize the framework of Peffers et al. (2007). This framework contains six steps that are required to conduct design-based research successfully. Figure 1 shows this model created by Peffers et al. (2007). As shown, the framework consists of the following six steps: (1) Identify problem and motivate, (2) Define objectives of a solution, (3) Design & development, (4) Demonstration, (5) Evaluation and (6) Communication.

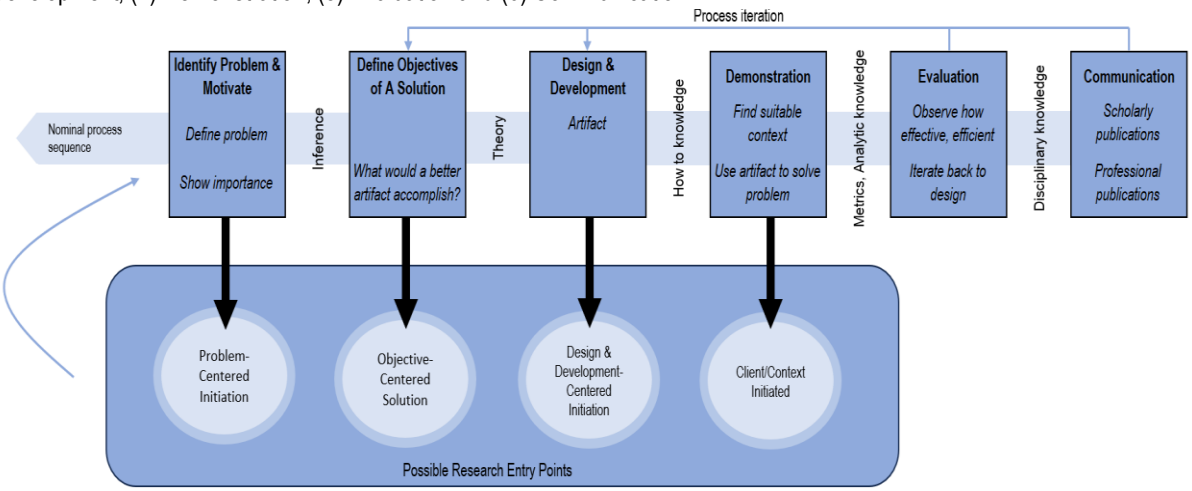

Figure 1: Design-based research framework (Peffers et al., 2007, p. 48)

The main reason the model suits the research is that the model focuses on continuous improvement (Gregorio et al., 2021). This is done by comparing the actual results obtained during the demonstration phase with the objectives of a solution during the evaluation phase. If objectives and results do not align, the model allows the researcher to iterate back to previous steps to improve the artifact (Vom Brocke et al., 2020). Consequently, the model emphasizes ensuring that the created framework delivers the needed solution (Lawrence et al., 2010). This is important because the model will be demonstrated at a tech-based business. To ensure that the firm properly deals with the market segment selection question, it is essential to keep improving the framework wherever possible. Providing the highest quality possible for the framework is also vital for other businesses that might apply the framework in the future. Furthermore, compared to most other available models regarding design-based research, this model provides a specific process that can be followed to conduct research (Peffers et al., 2007). Consequently, the model is relatively easy to apply. Finally, as the created framework is demonstrated in practice and evaluated, the model also considers the rigor of the research (Peffers et al., 2007).

The first step of the model, identify problem & motivate, entails the identification and justification of a specific research problem. The second step, which is define objectives of a solution, explains what a better artifact, so a solution to the research problem, would accomplish. Next, an artifact is created in the third step, design & development. In the fourth step, demonstration, the created artifact will be demonstrated in a specific research setting. The fifth step, evaluation, evaluates how well the demonstrated artifact provides a solution to the research problem. Within the final step, communication, relevant aspects of the research problem and artifact will be communicated to appropriate stakeholders (Peffers et al., 2007; Vom Brocke et al., 2020).

Relevant data was gathered in two ways for the analyses of the first three steps of the model. First, a literature review has been conducted to create the theoretical framework. Second, multiple interviews were conducted to gather relevant practical data.

1.4.1 Methodology literature review

The literature review examined academic literature, existing theories and frameworks and previous (case) studies regarding market segment selection. Multiple databases like Google Scholar, Scopus and Web of Science have been utilized to identify the relevant theory. The main objective of the literature review is to get a comprehensive overview of the current literature on market segment selection for tech- and non-tech-based businesses.

Even though the literature review was not conducted entirely systematically, most of the characteristics of this type of literature review were applied. First, some inclusion and exclusion criteria, which are relevant to systematic literature reviews, have been identified (Wolfswinkel et al., 2013). The inclusion criteria for the literature review are:

- Sources must be open access
- Sources must be relevant for market segment selection (especially for tech-based businesses)

Furthermore, the exclusion criteria are:

- Duplicate literature is excluded
- Non-English or non-Dutch sources are excluded
- All articles outside the top 50 most relevant articles per database per query are excluded. For Google Scholar, the function sort on relevance has been applied. Scopus and Web of Science articles were sorted based on the number of citations.

Second, multiple queries have been used within the mentioned databases to identify relevant articles. These queries are mainly combinations of the following keywords: “market segment selection,” “target market selection,” “market selection,” “framework,” “tech-based organization,” “technology-based organization,” “tech market,” and “high-tech market,” The formulation of specific search terms is also a characteristic of systematic literature reviews (Wolfswinkel et al., 2013). Finally, multiple sources were identified after applying inclusion and exclusion criteria and keywords. These sources are first analyzed based on whether they are duplicates or not. Next, the title and abstract are examined. Finally, the entire text is inspected. This method also aligns with techniques used in systematic literature reviews (Wolfswinkel et al., 2013; Moher et al., 2009).

1.4.2 Methodology interviews

As the model that will be created in the fourth chapter will be demonstrated at a tech-based organization facing a market segment selection issue, an interview discussing market segment selection will be conducted with this company. Furthermore, seven interviews concerning market segment selection were carried out among six other organizations. The interview at Business X was conducted in person with the business developer and took 24 minutes. For the other seven interviews, an overview of the characteristics of organizations, interviewees and interviews can be found in table 1.

Interviewee	Company	Tech/non-tech	Position interviewee	Interview length (in minutes)	In-person/online
#1	#1	Non-tech	General director	25	Online
#2	#2	Non-tech	Sales director	18	In-person
#3	#3	Tech	Managing director	16	In-person
#4	#3	Tech	Business developer	22	In-person
#5	#4	Tech	Business development manager	40	In-person
#6	#5	Tech	Proposition owner	28	Online
#7	#6	Tech	Accountmanager	39	In-person

Table 1: Characteristics interviews

Of the six companies interviewed, four are tech-based and two are non-tech-based. The choice to also interview non-tech-based organizations has been made to analyze whether significant differences occur regarding market segment selection between tech-based and non-tech-based organizations.

Five out of seven interviews were held in person. In-person interviews are preferable as they provide the most natural conversational setting, the most robust foundation for building report and an opportunity to recognize visual and emotional cues (Irvine et al., 2013). However, two out of seven interviews were conducted online via Teams because of the interviewees' preference or convenience regarding travel distance to a company. Online interviews are perceived as less favorable than in-person interviews as it is more challenging to detect emotional cues and are more likely to result in misunderstandings (Johnson et al., 2021). However, loss of data within online interviews due to missing non-verbal cues and misunderstandings can be dealt with through additional verbal cues and asking probing questions (Cachia & Millward, 2011).

There are three different types of interviews within research. These are structured, unstructured and semi-structured (Qu & Dumay, 2011). To gather data of the highest quality possible, it is essential to consider the type of interview most suitable for the research. Most interviews conducted within this thesis were semi-structured. However, one of the seven interviews was unstructured. This was because a person at one of the interviewed companies spontaneously offered to talk about market segment selection, as he specialized in this area. First, semi-structured interviews suit the research as they allow the researcher to obtain detailed and insightful information regarding a particular domain more easily than the structured interview, which is more rigid (Quieros et al., 2017). Consequently, if a structured interview had been used, the obtained data might have lacked the required richness due to the rigid nature of this type of interview (Queiros et al., 2017). As semi-structured interviews allow the interviewer to ask for elaboration of given answers, it is more likely that detailed data will be gathered. Second, using a predetermined interview structure, the semi-structured interview ensures that relevant topics and questions get discussed. When applying the unstructured interview, more pressure is put on the interviewer to ensure all relevant issues and questions are asked (Qu & Dumay, 2011). Besides, semi-structured interviews still allow the interviewer to seek clarification of answers and discuss spontaneously emerging issues (Doody & Noonan, 2013). To conclude, the semi-structured interview combines the structured and the unstructured interview, as it ensures that relevant topics and questions are discussed and allows the interviewer to be flexible regarding spontaneously emerging issues. Consequently, the semi-structured interview is expected to provide rich and detailed data regarding market segment selection within this research.

As mentioned, the semi-structured interview applies a predetermined interview structure. Consequently, it is recommended to create an interview guide before conducting the interview (Qu & Dumay, 2011). Therefore, an interview guide has been made to ensure that relevant data regarding market segment selection can be gathered. The interview guide applied in the interview with Business X can be found in appendix 1 (or appendix 2 for the translated version). The interview guide for the other interviews can be found in appendix 3 (or appendix 4 for the translated version). After conducting the interviews, a verbatim transcript of the interviews has been created. A verbatim transcript can be defined as the word-for-word reproduction of verbal data, where the written words are an exact replication of the audio-recorded words (Halcomb & Davidson, 2006). Using a verbatim transcript is crucial as it enhances the reliability and validity of the data (MacLean et al., 2004).

After the transcripts have been conducted, the transcripts of the interviews with the other organizations will be coded according to the method by Gioia et al. (2013). This method is suitable when making sense of large quantities of diverse information regarding a specific topic (Gioia et al., 2013). The first step of the model is to create codes and categories, also known as first-order concepts, based on what the interviewees have said during the interview (Gioia et al., 2013). Similarities among the previously created codes must be identified in the next step. Based on these similarities, the large number of codes after the first step are merged into a more manageable number of categories. These are called second-order concepts (Gioia et al., 2013). Finally, in the last step of the method, whether the second-order concepts can be distilled into aggregate dimensions is examined (Gioia et al., 2013). This coding process will then be visualized into a data structure, representing how raw data has been turned into themes and terms. This is crucial in demonstrating rigor within qualitative research (Pratt, 2008; Tracy, 2010). To examine the inter-rater reliability of the coding process, another researcher has also judged this process within this thesis. This researcher mentioned that around 90% of the codes would be similar, which strengthens the inter-rater reliability of the codes generated from the interview results. Nevertheless, a tiny part of the codes were different among the researchers.

1.4.3 Methodology case study

A single case study will be conducted in the fourth step of the Peffers model, which is the demonstration phase. This case study will demonstrate the artifact created in the design & development step. A case study has also been confirmed to be a suitable method for the demonstration phase, according to Peffers et al. (2007). A case study can be defined as *"a comprehensive description of an individual case and its analysis, i.e., the characterization of the case and the events, as well*

as a description of the discovery process of these features that is the process of research itself" (Starman, 2013, p. 31). The approach by Yin (2002) will be used in this case study. This approach has been selected as it first allows the researcher to use qualitative and quantitative data sources, which is expected to be necessary for this case study (Yin, 2002; Yazan, 2015). In contrast, qualitative sources are exclusively used in approaches by Stake or Merriam (Stake, 1995; Merriam, 1998; Yazan, 2015). Furthermore, the approach of Yin follows a positivist epistemological stance, while the approaches of Stake or Merriam follow constructivist epistemologies (Yin, 2002; Stake, 1995; Merriam, 1998; Yazan, 2015). Constructivism often entails a more subjective reality, while positivism is more objective of nature (Aliyu et al., 2014). A positivist approach suits this research better as an objective foundation to make decisions concerning market segment selection is desired.

The type of case study in this research is a single holistic case study. This entails a case study where one unit of analysis is studied within the case (Yin, 2002). For the design of the case study, five components are pivotal, which are: a study's question(s), its propositions, its unit(s) of analysis, the logic linking the data to the propositions and the criteria for interpreting the findings (Yin, 2002; Yazan, 2015). First, this study's central question has been mentioned previously in the introduction. This question focuses on how tech-based businesses can create a foundation to make well-considered decisions concerning market segment selection by using a framework that considers their needs. Second, four propositions have been developed in this thesis (further explanations of the propositions can be found in chapter 3.2.3). These are:

- *Design proposition 1: (C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) select the right market segments (M) by examining the attractiveness of the analyzed market segment(s).*
- *Design proposition 2: (C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) select the right market segments (M) by examining the suitability of the organization with the analyzed market segment(s).*
- *Design proposition 3: (C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) flexibly select the right market segments (M) by creating a quick scan of the analyzed market segment(s).*
- *Design proposition 4: (C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) flexibly select the right market segments (M) by limiting the rigidity of the market segment selection process.*

More information on how these design propositions have been developed can be found in paragraph 3.2.3. Third, as mentioned, the case study will be conducted at a tech-based business in the Netherlands that will remain anonymous and focuses on electronic applications. This organization will be the unit of analysis of the case study. Finally, the logic linking the data to the propositions and the criteria for interpreting the findings will be talked about in the evaluation step of the Peffers et al. (2007) model. To link the data to the propositions, relevant data obtained from the case study will be aligned with the propositions to examine whether the propositions concerning the framework are fulfilled. Ultimately, as the case study is not longitudinal, it is impossible to determine whether the right market segments were selected by applying the framework. Therefore, the criteria for interpreting the findings will discuss whether the results of demonstrating the framework can justify decisions made concerning the examined market segments.

An analysis of several market segments will be conducted during the actual demonstration of the created artifact at the case study company. The methodologies used to go through the steps of the artifact to analyze these segments can be found in the demonstration chapter itself, which is chapter 5.

1.5 Outline thesis

The outline of the rest of this paper will be based on the design-based research framework of Peffers et al. (2007). Therefore, the next chapter, chapter 2, will discuss the step identify problem & motivate. The third chapter will explain the objectives of a solution to the research problem. The fourth chapter entails the creation of the artifact. The fifth chapter discusses the demonstration of the created artifact at Business X. Within the sixth chapter; the artifact will be evaluated. Finally, the final chapter discusses the thesis' implications, limitations and avenues for future research.

2. Identify problem & motivate

This chapter will discuss the first step of the model by Peffers et al. (2007). This step entails the identification and motivation of the research problem. The chapter will start by explaining the goal of this step. Next, the results of the literature review and the interviews concerning the research problem will be discussed.

2.1 Goal

The first step of the applied framework is problem identification and motivation. Therefore, this step is initiated by defining a specific research problem. Furthermore, the research problem must be not only defined but also justified. Justifying the research problem first motivates the researcher and the research audience to pursue a solution. Second, it supports the understanding of the researcher's definition of the research problem by the research audience (Peffers et al., 2007; Vom Brocke et al., 2020). Consequently, the goal of this step is to examine the problem that tech-based organizations face regarding market segment selection. Therefore, this chapter answers the following question: *"What problems do tech-based businesses face regarding market segment selection?"*

2.2 Results

This results section will discuss the problems tech-based businesses face concerning market segment selection. First, the results derived from the literature review will be explained. Next, the results of the interviews will be discussed. Finally, the research problem will be mentioned.

2.2.1 Results literature review

As previously mentioned, market segment selection is a complex and messy problem (Montoya-Weiss & Calantone, 1999). When the issue of market segment selection is not dealt with correctly, it could have multiple consequences for businesses. First, selecting the wrong market segment might entail problems for a firm's competitive position (Cortez et al., 2021). A company might not be able to gain the desired market position when the wrong market segment has been selected, according to Freytag & Clarke (2001). Second, it is argued that tech-based businesses generally must make relatively significant R&D investments that cannot be recovered once made (Manez et al., 2009). Therefore, when a wrong market segment has been selected, the revenues will likely not outweigh the significant investments. Consequently, the return on the investment is expected to be insufficient when a wrong market segment is selected. Finally, besides wasting financial resources, it is argued that selecting target markets that are not suitable or attractive also leads to a wrong allocation of other resources (Sukoroto et al., 2020).

Multiple researchers have examined market segment selection problems. Consequently, various theories and frameworks regarding the subject have emerged. However, as mentioned in the introduction, tech-based organizations operate within dynamic environments with a relatively high number of opportunities (Yang & Kang, 2008; Chaney et al., 1991). Therefore, considering the flexibility of the existing frameworks is also vital for tech-based businesses.

For example, considerable research has been conducted about applying multi-criteria decision-making (MCDM) methods (or other mathematical models (Dolnicar et al., 2018)) within market segment selection. MCDM methods entail mathematical models supporting decision-making problems where multiple criteria must be examined (Taherdoost & Madanchian, 2023). Hence, in the context of market segment selection, these MCDM methods analyze relevant (weighted) market segment selection criteria to assess market segments. To apply the methods, the decision-maker(s) has to assign values to the selected criteria (by using scales, for example) (Ghorabaee et al., 2017). Next, the values will be entered into the mathematical model to calculate the expected best solution for the market segment selection problem (Ghorabaee et al., 2017). Multiple different MCDM methods have been applied within the market segment selection realm. For example, Dat et al. (2015) developed an MCDM model regarding market segment selection based on TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) and QFD (Quality Function Deployment). Aghdaie & Alimardani (2015) also applied TOPSIS. However, instead of combining it with QFD, a hybrid approach was created between TOPSIS and AHP (Analytic Hierarchy Process). Furthermore, Ghorabaee et al. (2017) applied the CODAS (COmbinative Distance-based ASsessment) method to solve decision-making problems regarding market segment selection. The main differences between the methods are based on the level of complexity of the algorithms, the weighting methods for criteria or the data aggregation type (Taherdoost & Madanchian,

2023). Furthermore, Aghdaie & Alimardani (2015) have developed a selection process representing how MCDM methods can help with market segment selection problems (see figure 2).

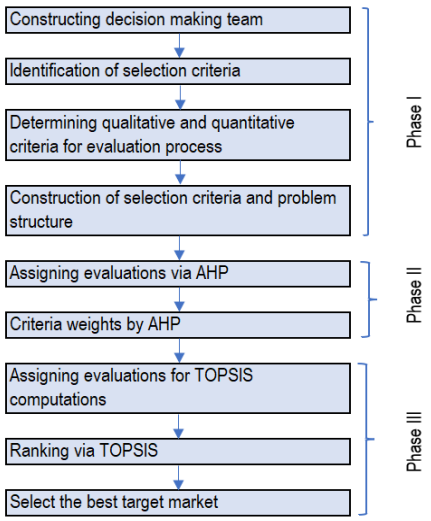

Figure 2: Market segment selection process including MCDM methods (Aghdaie & Alimardani, 2015, p. 269)

Even though MCDM methods and the abovementioned framework might help tech-based businesses select suitable and attractive market segments, there are multiple reasons why these methods and this framework do not fully align with their needs regarding market segment selection.

First, to be able to use mathematical models, all information should be quantified. Therefore, the qualitative criteria within market segment evaluation must be turned quantitative. Consequently, the data's meaning can be lost because the assignment of values might be arbitrary. Furthermore, context and information might be lost during the conversion process (Hochwald et al., 2023). At least half of the top ten market segment selection criteria for tech-based businesses are qualitative (Weinstein, 2014). Consequently, the likelihood of data loss is considerable to tech-based firms when applying MCDM methods. Second, MCDM methods focus mainly on a market segment's attractiveness, which is crucial within market segment selection. However, the extent to which a market segment matches a business seems slightly overlooked. Dat et al. (2015) are some of the few researchers who examine the match to a certain extent by embedding some of the organization's strengths within the research. However, this fit analysis is too premature to determine whether a market segment also suits an organization. Especially for tech-based organizations, it is critical to ensure that market segment and business have a match, as tech-based businesses face relatively high risk and must make rather significant investments generally when entering markets (for example, in R&D) (Mason & Harrison, 2004; Manez et al., 2009). Finally, MCDM models are somewhat rigid, as the user has to go through all process steps before something can be said about a segment.

A market segment selection framework that does not apply mathematical methods has been developed by Freytag & Clarke (2001) (see figure 3). Within this model, emphasis is put on the fit between the organization and the market segment. After the attractiveness of the segment has been determined, the model provides three steps that can be used to determine this fit. Again, even though the framework might support tech-based businesses regarding market segment selection, there are multiple reasons why this model and the design of the steps only partially suit the needs of tech-based enterprises, especially regarding the evaluation of the segment's attractiveness.

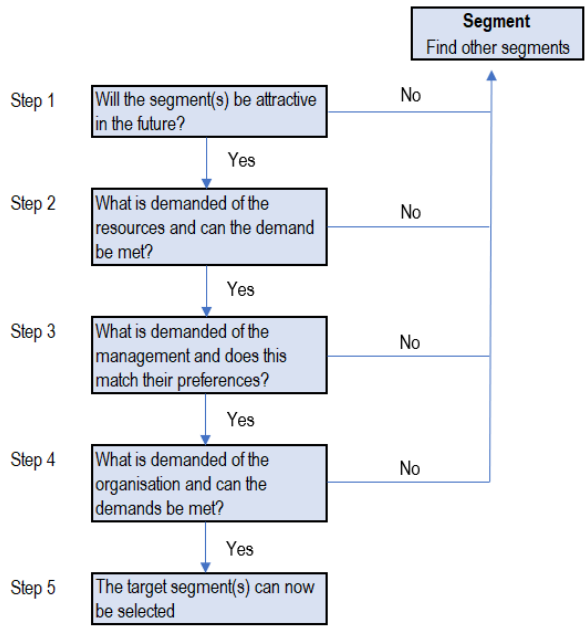

Figure 3: Market segment selection process (Freytag & Clarke, 2001, p. 482)

First, the model assesses the attractiveness of a market segment based on rigid general criteria (see figure 4). Consequently, these criteria are assumed to give a comprehensive market segment overview. However, as previously mentioned, tech-based businesses differ from non-tech-based businesses (and the market that these businesses mainly operate in). Therefore, just examining these general criteria for tech-based businesses may not be suitable. Furthermore, evaluating a market segment's attractiveness should be treated ad hoc, meaning it is an organization-specific activity (Montoya-Weiss & Calantone, 1999). Consequently, criteria to assess the attractiveness of a market segment differ among businesses. Second, not only might criteria vary among businesses, but the relative importance of these criteria might also be different for organizations (Sarabia, 1996). Because there are quite a few differences between tech-based and non-tech-based businesses, some selection criteria might have a different level of importance based on the organization applying them. This is not something that is considered within this model.

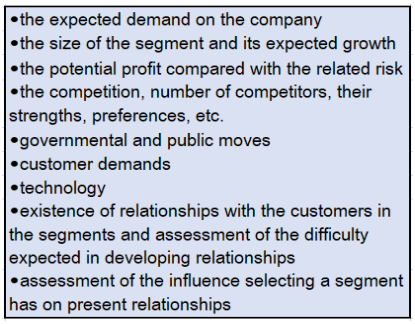

Figure 4: Market segment evaluation criteria (Freytag & Clarke, 2001, p. 483)

Besides general theory regarding market segment selection, there has also been some research on market segment selection for tech-based businesses. As mentioned, the most applied market segment selection criteria by tech-based businesses have been examined by Weinstein (2014) (see table 2). Furthermore, the importance of orientation toward customers, competition and technology regarding market segment selection for tech-based businesses has been reviewed by Slater et al. (2007). Moreover, the article also explains the differences between new and existing market segments, keeping the abovementioned orientations in mind. For example, the degree of competition is often lower in new markets, the degree of technology higher and the customer perspective concerning innovation also differs among new and existing markets (Slater et al., 2007). Nevertheless, the current literature regarding market segment selection for tech-based businesses (including the abovementioned theories) only forms some sparse guidelines for this type of organization. However, within theory, a market segment selection framework that specifically suits the needs of tech-based businesses regarding market segment selection is still unavailable (see chapter 3 for these needs). The main problem with the discussed frameworks is a lack of flexibility,

which is pivotal for tech-based organizations to deal with the complex and dynamic nature of high-tech markets (Yang & Kang, 2008).

Selection criteria	Count	Rated 1st	Rated 2nd	Rated 3rd	Overall measure	Attractiveness criteria (Simkin/Dibb)
1. Opportunities in the industry	32	9	13	10	63	Occasional
2. Sustainable differentiated advantage	29	13	8	8	63	Occasional
3. Profitability	30	12	6	12	60	Top
4. Product differentiation	22	8	9	5	47	Occasional
5. Customer satisfaction	19	9	8	2	45	Frequent
6. Market size	21	5	10	6	41	Frequent
7. Ease of access of business	18	6	4	8	34	Frequent
8. Market growth	18	5	3	10	31	Occasional
9. Sales volume	10	2	5	3	19	Frequent
10. Competitive rivalry	6	0	2	4	8	Occasional

Table 2: Market segment selection criteria for tech-based businesses (Weinstein, 2014, p. 64)

2.2.2 Results interviews

For this chapter, the purpose of the interviews was to gather information on the research problem. As previously mentioned, eight interviews among seven organizations were conducted—one with Business X itself and the others with various other organizations, both tech-based and non-tech-based.

According to Business X, improper market segment selection has multiple negative consequences. First, it was mentioned that when the wrong market segment is selected, the return on investment might be insufficient. The company invests money to enter a market segment, but the return on that investment is not enough. Second, it has also been explained that selecting market segments that are not suitable could decrease the ability to recruit engineers, who are crucial for tech-based businesses. Finally, it has been discussed that an organization's competitiveness might also be harmed when a wrong market segment is selected.

The absence of a market segment selection framework might also have negative implications for businesses, according to Business X. First, the absence of a market segment selection framework causes a lack of insight into the relevant market segments a firm has entered or is considering entering. Consequently, it was mentioned that without a framework, there is no clear foundation on why an organization's market segment might be right or wrong. Second, it was also said that it is more difficult to identify opportunities within a market segment without a helpful framework. Finally, without a framework, there is a bit of doubt regarding how market segment selection should be handled, according to the interviewee.

Six other organizations were also interviewed to obtain knowledge regarding market segment selection. During these interviews, what methods have been applied concerning the topic, if they would change the methods in the future and what problems were faced regarding market segment selection were examined. A summary of the interviews can be found in the data structure in appendix 5 (or 6 for translated version). The aggregate dimensions of this data structure form the recurring themes found among the organizations regarding market segment selection. The dimensions found are market segment selection criteria indirect environment, market segment selection criteria direct environment, pre-screening market segments, characteristics selection process and fit organization and market segment. The results found during the interviews are relevant for chapters 2, 3 and 4. Therefore, the results of these interviews will be spread over the three chapters.

The interviews have provided insights into the organizations' approaches regarding market segment selection. Something that stood out during this process is that mainly the relatively small organizations were less structured regarding market segment selection. For example, one of the smaller tech-based firms mentioned: *"It came on our path, so it just arose. Those customers came to us, and we thought, cool project, let's help them. But there was no market selection involved".* Another (relatively small) non-tech-based business explained the following: *"We do not have specific processes. We have a sales and marketing department that looks at actualities, so demand from the market. We are closely connected with our big clients and smaller clients to ask what their demands are and if they need new things".* However, the larger organizations had a bit more of a

process. For example, a large tech-based organization said that it first looks at whether the segments suit the company in terms of capabilities and technologies. Then, specific criteria, like market size and potential competitive position, are analyzed. Furthermore, besides the relatively small tech-based organization, the other tech-based firms also had kind of a process concerning market segment selection.

When the firms were asked if they would change their method of market segment selection in the future, most tech-based organizations mentioned wanting more structure. The data structure's aggregate dimension characteristics selection process (appendix 5 or 6) also discusses this finding. For example, the small tech-based organization explaining that no process was applied for market segment selection mentioned wanting more structure. The firm was currently facing a new market segment selection problem and said the following: *"That is the process where we find ourselves now. At those customers, why do they suit us, what are we good at, where should we focus on and what do we want to do".* Furthermore, another tech-based organization mentioned: "*I expect that we will actually keep following this route, so we will become even tighter and work more with the process."* Besides, Business X also desired more structure regarding market segment selection to create a foundation for their choices. Therefore, it can be concluded that there is a desire for a structured process concerning market segment selection for tech-based organizations.

Among the tech-based firms, it was also mentioned that structure should not be exaggerated and flexibility is necessary within the process. One of the tech-based firms said: *"Yes, we believe that you can be and flexible and very fast and still a bit more structured."* However, that same firm also mentioned the following: *"We want structure within borders, because there are also companies that have really formal and bureaucratic processes. That is also not exactly what we want".* Hence, there is a demand among tech-based businesses for structure concerning market segment selection; however, it should be a flexible structure.

2.2.3 Research problem

To summarize the data acquired from the results, both theory and practice pointed out that tech-based businesses mainly require flexibility in market segment selection. Moreover, it was also discovered that this type of business desires structure concerning market segment selection. Therefore, a framework that can flexibly support organizations in selecting the right market segments would be relevant for tech-based businesses. However, current frameworks in the literature do not provide a tool that perfectly aligns with the desire for flexibility of tech-based companies. Hence, it might be difficult for these businesses to flexibly create a complete and correct foundation that can be used to make decisions regarding selecting the right market segments when current frameworks are applied. Consequently, the research problem of this thesis is that currently, no market segment selection framework explicitly suits the needs of tech-based businesses concerning market segment selection.

3. Define objectives of a solution

This chapter will discuss the second step, define the objectives of a solution. This step will examine the objectives of a solution to the previously mentioned problem. The chapter will start by explaining the goal of this step. Next, the results derived from the literature review and interviews will be discussed. Finally, several design propositions will be presented.

3.1 Goal

The second step of the framework discusses the objectives of a solution to the research problem and answers the question, *"What would a better artifact accomplish?*". These objectives can be derived from the definition of the research problem and knowledge of what is possible and feasible. Objectives can either be quantitative or qualitative. Quantitative solutions mention desirable solutions that are superior compared to the current ones. Qualitative solutions involve the creation of artifacts that are expected to support solving problems that have not been previously addressed (Peffers et al., 2007; Vom Brocke et al., 2020). The goal of this step is to identify the objectives of a solution to the research problem by indeed answering the question, *"What would a better artifact accomplish?".* Therefore, the goal of this step is to find out what a market segment selection framework for tech-based organizations would accomplish.

3.2 Results

Examining the literature and conducting interviews has identified multiple reasons for the relevance of a market segment selection framework for tech-based businesses. These results will be discussed in the upcoming paragraphs. Furthermore, based on these results, design propositions will be created.

3.2.1 Results literature review

Market segment selection is perceived as critical for organizations. First, selecting the right market segments allows businesses to align resources with their competitive goals (Montoya-Weiss & Calantone, 1999). This is also confirmed by Sukoroto et al. (2020), who mention that thoughtfully selecting target markets leads to a better allocation of resources, which will help increase the competitive edge of a business. Consequently, a company can increase its competitiveness by selecting suitable and attractive market segments. Second, market segment selection is critical as an organization's marketing strategy should align with the market segments that a firm selects (Wind & Thomas, 1994). Therefore, it is essential to focus on the right market segments. Furthermore, a process can provide valuable guidelines to deal with market segment selection problems (Freytag & Clarke, 2001). Therefore, previously mentioned benefits could be achieved for tech-based businesses with a proper framework that suits their specific characteristics.

The previous chapter's results can also help answer the question, *"What would a better artifact accomplish?".* First, the models mentioned in the last chapter all discussed that it is vital to examine the attractiveness of a market segment within market segment selection. Within MCDM methods, the attractiveness of market segments was usually determined by putting quantitative data in a mathematical model. However, as mentioned in the previous chapter, market segment selection criteria can also be qualitative. Therefore, this data must be quantified, but this could lead to a loss of data (Hochwald et al., 2023). Furthermore, rigid and predetermined criteria for assessing the attractiveness of market segments are discussed by Freytag & Clarke (2001). As mentioned, tech-based firms are active within dynamic environments where many opportunities emerge (Yang & Kang, 2008; Chaney et al., 1991). Hence, to deal with these circumstances, flexibility is required. Besides, there are substantial differences between organizations concerning the perception of how the attractiveness of market segments can be determined (Dolnicar et al., 2018). Therefore, applying predetermined rigid criteria to assess the attractiveness of a market segment is not recommended. To conclude, a proper framework should indeed be able to determine the attractiveness of market segments. However, for tech-based organizations, it is pivotal that this can happen flexibly. Current frameworks do not seem to consider this need for the flexibility of tech-based businesses.

The models mentioned in the previous chapter discussed that it is crucial to examine the fit between the organization and the market segment. For example, the fit between market segment and resources or management have been mentioned as factors that can be examined in this analysis of fit (Freytag & Clarke, 2001). Furthermore, some mathematical frameworks consider the fit analysis between market segment and organization (Dat et al., 2015). A central question in this analysis is *"How attractive are we to the segment?"* (Dolnicar et al., 2018). This step is also essential because tech-based businesses rely heavily on specific technical and scientific knowledge (Rubera & Kirca, 2012). Consequently, it is crucial to examine

whether this particular knowledge possessed by the organization also aligns with the required knowledge in the market segment.

As mentioned in the previous chapter, the current frameworks do not consider the needs of tech-based businesses, especially regarding flexibility. High-tech markets are competitive and dynamic (Yang & Kang, 2008; Slater et al., 2007). Consequently, high-tech markets are constantly evolving. Furthermore, many opportunities emerge for tech-based businesses (Chaney et al., 1991). Flexibility is critical to examine what opportunities out of many are interesting for a firm without getting lost. Moreover, the window of opportunity is also relatively small within high-tech markets (Moore, 2014). This is another reason why flexibility is pivotal for tech-based businesses. When a tech-based organization is stuck in analyzing an opportunity, it might be that the window has already closed. Hence, a better artifact concerning market segment selection, for, in this case, tech-based businesses, should have significant flexibility.

To conclude, based on relevant theory and the results of the previous chapter, the critical difference between the current frameworks and an optimal market segment selection framework for tech-based businesses should be flexibility. The new artifact should be able to determine the attractiveness of a market segment and whether the tech-based organization is attractive to the market segment, just like some of the current frameworks. However, it should be able to do it more swiftly and flexibly. Not only should the framework be more flexible, but the design of the steps must also be flexible.

3.2.2 Results interviews

The interview with Business X discussed what a market segment selection framework for tech-based businesses could accomplish. First, it has been mentioned that the framework is expected to provide a foundation for making well-considered decisions regarding market segment selection. Consequently, the framework is expected to provide a basis for selecting suitable and attractive market segments for tech-based businesses. Second, it has also been discussed that significant investments in time and money are necessary before a market segment can be entered. The interviewee mentioned that the market segment selection framework is expected to support decisions regarding what to invest in and what not. Third, it has also been discussed that the framework could help align strategy and market segments. Finally, it has been mentioned that the framework could help target the right clients, which aligns with the first point.

The seven interviews with the other organizations discussed what should be included in the market segment selection process. First, all interviewees referred to assessing the attractiveness of a market segment based on specific criteria. In appendix 5 (or 6), the aggregate dimensions market segment selection criteria indirect environment and market segment selection criteria direct environment display some of the criteria the interviewed organizations have applied. The criteria used to assess the market segments can range from financial factors to political factors or from expected competitive position to customer characteristics. To conclude, all organizations mentioned that determining the attractiveness of market segments is a pivotal part of market segment selection. However, as explained, the criteria used to assess the attractiveness can differ substantially among organizations.

All interviewed organizations mentioned that examining whether a fit between the organization and the market segment exists is pivotal. In the aggregate dimension fit organization and market segment (see appendix 5/6), factors used to assess whether organization and market segment are compatible can be found. These factors are strategy, resources, capabilities and human factors. To conclude, more than just judging the market segment itself is required regarding market segment selection. The fit between the organization and market segment must also be examined. Therefore, a market segment selection framework should include the analysis of this.

Some findings concerning market segment selection for tech-based organizations specifically have also been found. Almost all tech-based organizations specifically mentioned flexibility within market segment selection. However, non-tech-based organizations have not noted this factor. One of the interviewees from a tech-based organization said the following regarding their market segment selection process: *"Yes, we believe that you can be and flexible and very fast and still a bit more structured."* Another interviewee from a tech-based organization confirmed the importance of flexibility by explaining the following: *"They lack flexibility to fill in the changing circumstances and to generate an answer to it, because they are stuck in their planned structure."* Besides mentioning flexibility, both quotes also note structure. Both interviewees explained that both flexibility and structure are essential. However, the structure should not entail too much bureaucracy within the process of

market segment selection. The interviewee of the first quote explained this with the following quote: *"We want structure within borders because there are also companies that have really formal and bureaucratic processes. That is also not exactly what we want."*

Several tech-based businesses explained that a premature market segment analysis is carried out before extensive research is conducted. This finding is mentioned as the aggregate dimension "pre-screening market segments" in the data structure (appendix 5/6). The dimension mainly focuses on creating a preliminary overview of the fit between business and segment, especially based on (previous) experiences in the market. One tech-based firm, for example, said, "*What we currently do instead of immediately fully entering a market is we start market groups and it often starts with a research and a project. There are such projects where we then work with kind off a stage-gate method and then where we said in the third phase let's not do it, it doesn't fit".* Another company mentioned the following concerning a pre-screening: *"You try to guess what suits us, can we do it, so that is already the preselection."*

3.2.3 Design propositions

It is relevant to consider design propositions within the realm of design-based research. Design propositions can be perceived as "*a general template for the creation of solutions for a particular class of field problems"* (Denyer et al., 2008). Design propositions can be formulated using the CIMO logic, according to Van Aken & Berends (2018). The structure of design propositions when applying the CIMO logic is as follows: "*In a class of problematic **C**ontexts, use this **I**ntervention type to invoke these generative **M**echanisms to deliver these **O**utcomes"* (Denyer et al., 2008). To get an overview of the definitions of each component of the CIMO logic, table 3 can be viewed. The design propositions examined in this research will be explained in the following paragraphs.

Component	Explanation
Context (C)	The surrounding (external and internal environment) factors and the nature of the human actors that influence behavioural change. They include features such as age, experience, competency, organizational politics and power, the nature of the technical system, organizational stability, uncertainty and system independencies. Interventions are always embedded in a social system and, as noted by Pawson and Tilley (1997), will be affected by at least four contextual layers: the individual, the interpersonal relationships, institutional setting and the wider infrastructural system.
Interventions (I)	The interventions managers have at their disposal to influence behaviour. For example, leadership style, planning and control systems, training, performance management. It is important to note that it is necessary to examine not just the nature of the intervention but also how it is implemented. Furthermore, interventions carry with them hypotheses, which may or may not be shared. For example, 'financial incentives will lead to higher worker motivation'.
Mechanisms (M)	The mechanism that in a certain context is triggered by the intervention. For instance, empowerment offers employees the means to contribute to some activity beyond their normal tasks or outside their normal sphere of interest, which then prompts participation and responsibility, offering the potential of long-term benefits to them and/or to their organization
Outcome (O)	The outcome of the intervention in its various aspects, such as performance improvement, cost reduction or low error rates

Table 3: CIMO logic (Denyer et al., 2008, p. 397)

Both the results of theory and interviews explain that it is critical within market segment selection to examine the attractiveness of the relevant segments. Within this thesis, attractiveness entails the degree to which a market segment is desirable to pursue for a firm. As described, different organizations apply different criteria to assess the attractiveness. Determining the attractiveness of a market segment is essential because it allows organizations to determine what markets are likely to increase firm performance the most. Hence, assessing the attractiveness of a market segment is expected to be pivotal for selecting the best market segments. As determining the attractiveness of a market segment is perceived as crucial within market segment selection, the created framework should support firms in doing so. Hence, the following design proposition has been formulated:

Design proposition 1: (C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) select the right market segments (M) by examining the attractiveness of the analyzed market segment(s).

Several key terms can be found in this proposition. To ensure the clarity of the proposition, these terms will be discussed. First, a "*market segment selection question*" is a problem a business faces, requiring the firm to decide whether a segment should be selected to pursue or not. Second, a *"right market segment"* will be defined in this thesis as a segment that a firm can successfully exploit to (drastically) improve long-term business performance. Finally, as mentioned, "attractiveness" entails the degree to which a market segment is desirable for a firm to pursue.

Besides the attractiveness of market segments, the results of both theory and interviews also explain that the fit between the organization and a market segment should be studied. This degree of fit is known as *"suitability"* within this thesis. The fit analysis between the organization and the segment should indicate whether the organization can successfully exploit a market segment. This is essential for market segment selection as being unable to exploit a market segment might lead to wasting resources, for example. In contrast, successfully exploiting an (attractive) segment is expected to result in increased firm performance. Hence, determining the suitability between the organization and the market segment is critical for selecting the right market segments. Factors that might be relevant to the suitability analysis are strategy, product/service, resources and capabilities. As suitability is perceived as pivotal for market segment selection, the created framework supports analyzing the fit between the organization and the market segment. Therefore, the following design proposition has been formulated:

Design proposition 2: (C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) select the right market segments (M) by examining the suitability of the organization with the analyzed market segment(s).

Next, flexibility was often mentioned as a requirement for tech-based businesses within market segment selection. Tech-based businesses face opportunities more frequently. However, the life cycle of tech products is also relatively small. Therefore, it is pivotal for tech-based firms to reply swiftly to emerging opportunities, which are possible market segments within this thesis. Hence, it is not only crucial to select the right market segment for tech-based businesses, but it should also happen flexibly. During the interviews, multiple organizations mentioned that the potential of a market segment is estimated before more extensive research is conducted. This analysis of potential is often based on experience within the segment (for example, through a pilot project) or other information that is already known or can be easily acquired. Consequently, for tech-based businesses, it is relevant to create a quick scan of the appropriate market segment(s) to obtain a fast indication of the potential of a segment to increase the swiftness of the market segment selection process. Hence, the following design proposition has been created:

Design proposition 3: (C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) flexibly select the right market segments (M) by creating a quick scan of the analyzed market segment(s).

The key terms of this proposition are similar to the ones of the previous propositions. However, still some differences exist. First, the right market segments should be selected *"flexibly."* This means that the framework should support organizations in selecting the right market segments as efficiently as possible. Second, a *"quick scan"* means that organizations should first focus on examining the most essential parts of the market segment selection analysis before a segment is analyzed entirely.

Finally, it has been mentioned that structure could support organizations regarding market segment selection. However, the structure must be balanced to prevent bureaucracy from emerging. Besides, the theory explained that market segment selection should be treated ad hoc (so case specifically). Therefore, a completely rigid structure where, for example, attractiveness criteria are predetermined is not desired for tech-based organizations. Thus, the structure of the created framework should focus on providing guidelines concerning market segment selection for tech-based businesses rather than precisely predetermining how these guidelines should be filled in. Hence, the developed framework must focus on limiting the rigidity of the guidelines, which entails not exaggerating the degree of structure within the market segment selection process. Consequently, the following design proposition has been formulated:

Design proposition 4: (C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) flexibly select the right market segments (M) by limiting the rigidity of the market segment selection process.

4. Design & Development

As mentioned in the introduction, the design & development stage of the research entails the creation of the artifact. The artifact will be developed within this research as a framework that tech-based organizations can apply for market segment selection. Consequently, this chapter will begin with an overview of the designed artifact used in the research's demonstration phase. Next, the different stages of the created artifact will be explained.

4.1 Goal

Within the third step, design & development, an artifact is created. The created artifact could be developed in many different forms. Examples of what an artifact might look like are constructs, methods, models, etc. However, a research contribution must be embedded within the artifact's design. To summarize, this step involves creating an artifact and discussing its functionality and architecture (Peffers et al., 2007; Vom Brocke et al., 2020). Consequently, the goal of this step is to create an artifact that helps solve the research problem. In this case, a market segment selection framework should be developed that tech-based organizations can apply to select the right market segments properly.

4.2 Results

In figure 5, the developed market segment selection artifact is displayed. The framework explains a process that tech-based organizations can apply regarding market segment selection. As mentioned in the methodology section, this artifact is based on interviews and a literature review. The data structure, containing the relevant data obtained from the interviews, can be found in appendix 5 (or translated version in 6). During the interviews, especially tech-based businesses emphasized the importance of structure but also flexibility within the market segment selection process. Therefore, the created artifact tries to consider this finding as well as possible. Consequently, the framework consists of three overarching steps containing several smaller steps. Each overarching step ends with a decision on whether an analyzed segment can proceed to the next step or should already be rejected. Consequently, the framework's flexibility is enhanced and the rigidity lowered, as an organization can make the well-considered decision to stop examining a market segment when it has been discovered in the first or second step that a segment has no potential or attractiveness. This way, the fourth design proposition is already partially embedded within the framework, which is: ***(C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) flexibly select the right market segments (M) by limiting the rigidity of the market segment selection process.***

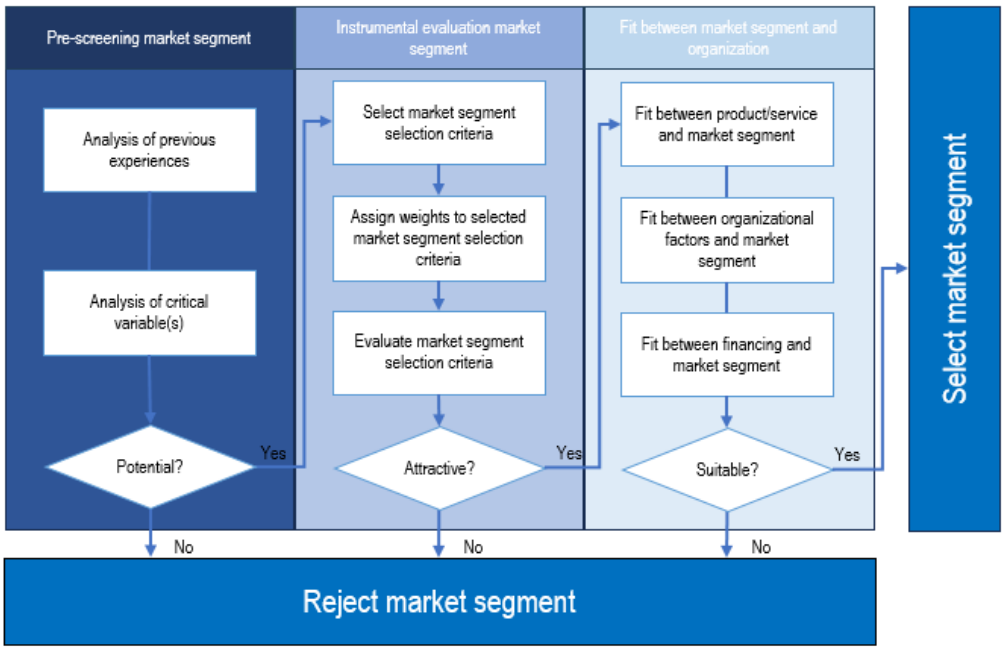

Figure 5: Tech-based market segment selection framework

The first step of the framework is the pre-screening of a market segment. This pre-screening can be based on a combination of data gathered from previous experiences and the analysis of critical variable(s). Afterwards, it will be decided whether the

segment has potential or not. Next, an instrumental evaluation of a market segment will be conducted. This evaluation step contains the selection of relevant market segment selection criteria, the assignment of weights to these criteria, and the actual evaluation of the selected criteria. After this evaluation, it will be decided whether the segment is attractive enough to go to the final step of the framework. This last step recommends examining the fit between the market segment and product/service, several organizational factors and financing. Hence, whether the market segment suits the business will be decided. If so, the market segment is perceived as attractive and suitable and can be selected.

4.2.1 Pre-screening of market segment

The first step of the created framework is conducting a pre-screening of the market segment(s). As mentioned, flexibility is pivotal for tech-based businesses within market segment selection. The pre-screening step, also an aggregate dimension in the data structure (see appendix 5 or 6), tries to enhance the flexibility of the segment selection process by creating a quick scan of the examined market segments. By conducting this quick scan, organizations can swiftly create a preliminary overview of whether a segment has the potential to be exciting or not. Therefore, the pre-screening step attempts to fulfill the third design proposition: ***(C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) flexibly select the right market segments (M) by creating a quick scan of the analyzed market segment(s).*** The pre-screening step of this framework contains the following sub-steps: analysis of previous experiences and analysis of critical criteria.

Analysis of previous experiences

During the interviews, most tech-based firms mentioned that experiences within a market segment were used to determine whether that segment was worth targeting. One of the organizations explained that previous experiences are critical concerning the decision to target particular markets with the following quote: *What has been the recurring theme in the big clients and projects that we currently or recently served, and what did we learn from it for prospects."* Furthermore, as mentioned, another tech-based organization said that it decided not to target a market segment based on experience during a project within that segment by saying the following: "*What we currently do instead of immediately fully entering a market is we start market groups, and it often starts with a research and a project. There are such projects where we then work with kind off a stage-gate method and then where we said in the third phase let's not do it, it doesn't fit".* Consequently, the first recommended step within the pre-screening phase is to examine previous experiences with a market segment. If no prior experience is available, it might be convenient to execute a pilot project.

Analysis of critical criteria

Next, it is recommended that critical criteria are examined. During the interviews, most (tech-based) organizations mentioned critical criteria in determining whether a market segment should be pursued. When these criteria are not met sufficiently, the market segment is no longer interesting for the companies. One of the interviewees mentioned the following regarding market size: "*We also look at a certain market size. That means that we are obviously not interested in really small markets. We are also not interested in a really big market".* Another interviewee mentioned risk profile as a critical criterion with the following quote: "*The risk profile should be acceptable."* Therefore, it can be concluded that some criteria can solely cause the elimination of a market segment when it comes to selection. Hence, it is relevant to consider these critical criteria during the pre-screening phase to enhance flexibility within the market segment selection process by preventing firms from thoroughly examining all criteria that influence the attractiveness of a market segment. This finding can also be confirmed by theory. One of the mathematical models concerning market segment selection explains that looking at so-called knock-out criteria is relevant before the entire segment is analyzed (Dolnicar et al., 2018). These knock-out criteria are essential or non-negotiable criteria that should be explored before more extensive research on a segment is conducted (Dolnicar et al., 2018). The knock-out criteria can differ among organizations and should, therefore, be determined by the firm itself.

4.2.2 Instrumental evaluation of market segment selection criteria

When an organization has discovered a market segment with potential, it is essential to evaluate the attractiveness of the segment. A market segment is perceived to be attractive for a firm when it is expected to generate long-term profitability (Cortez et al., 2021). The evaluation of the attractiveness of market segments is vital as tech-based businesses, as mentioned, generally must invest quite some financial resources in, for example, R&D before a market segment can be entered (Manez et al., 2009). Consequently, a selected market segment must be attractive enough for the business to get a proper return on

these relatively significant investments. Accordingly, by evaluating the attractiveness of a market segment, the decision to invest in a market segment can be partially justified (or not).

Two perspectives on evaluating opportunities, defined as potential target markets within this research, exist (Nielsen et al., 2017). These perspectives are the instrumental perspective and the legitimacy perspective. First, the instrumental perspective entails using rational and analytical tools and guidelines that provide entrepreneurs insight into whether an opportunity is attractive, given an organization's unique expertise, resources and context (Haynie et al., 2009). Consequently, the entrepreneur controls the evaluation process and can assess in advance whether an opportunity should be pursued before exploiting it (Nielsen et al., 2017). Second, the legitimacy perspective entails a process where the exploitation and evaluation of an opportunity are executed simultaneously (Nielsen et al., 2017). Within this perspective, the opportunity is exploited and the entrepreneur tries to create "legitimacy" in the environment of the organization by trying to show that the exploitation of the opportunity adds value to the relevant environment (Nielsen et al., 2017). Evaluation takes place by gathering feedback from the environment during the exploitation of the opportunity. Based on this feedback, the way that the opportunity is exploited will be evaluated and adapted to the needs of the environment (Nielsen et al., 2017). In table 4, an overview of the two perspectives is given.

	Instrumental	Legitimate
Evaluation perception	Tool to achieve a certain objective	Legitimacy creation
Evaluation objective	To state the direction for action	To convince the actors of the market of the idea
Evaluation criteria	They should be formulated before the process	They emerge during the entrepreneurial process
Evaluation process	Rational, systematic and analytic	Social, interactive, experimental and exploring
Evaluation character	Evaluation and entrepreneurial action are two separate activities	Evaluation and entrepreneurial action are two inseparable activities

Table 4: Instrumental vs Legitimacy (Nielsen et al., 2017, p. 80)

As mentioned, this research focuses on tech-based organizations. Regarding opportunity evaluation, the instrumental perspective seems more suitable for tech-based organizations than the legitimacy perspective. First, according to Mason & Harrison (2004), tech-based firms (especially in the early stages) are generally perceived as high risk. For example, new technologies entail technological risks, which means that technologies still need to be proven and have yet to be demonstrated in specific market segments (Mason & Harrison, 2004). As the instrumental perspective evaluates whether an opportunity is attractive before exploiting it, it is suitable for firms facing a relatively high level of risk. Furthermore, the rational/analytic nature of the instrumental perspective also suits companies that meet a relatively high risk level better than the social nature of the legitimacy perspective (Nielsen et al., 2017). Second, tech-based firms are generally perceived as rather complex. Consequently, it is expected that tech-based firms have a relatively high number of evaluation activities to assess opportunities compared to less complex firms. This finding confirms that the instrumental perspective seems more suitable for tech-based firms (Nielsen et al., 2017).

However, some research argues that placing low emphasis on predicting opportunities allows organizations to adapt faster to a rapidly changing environment (Wiltbank et al., 2006). These theorists explain that planning slows down adaptation in dynamic situations (in which tech-based organizations operate) and can blind firms to essential changes in their environment. Therefore, these theorists argue that firms should learn from feedback from their market and then try to adapt, which aligns more with the legitimacy theory (Wiltbank et al., 2006). However, as mentioned before, market segment selection is a critical decision for organizations. (Hlavacek & Mohan, 1986). It influences the competitiveness, allocation of resources and the strategy of organizations (Montoya-Weiss & Calantone, 1999; Thomas & Wind, 1994; Weinstein, 2014). Therefore, making a well-considered decision regarding what markets should be targeted is crucial. Furthermore, it is also argued that improvisation in the selection of opportunities leads to the pursuit of short-term behavior since it encourages firms to pursue opportunities immediately (Bingham, 2009). Paradoxically, hurriedness to capture immediate opportunities could even lead to firms not noticing connections between opportunities, which is vital for performance advantages (Bingham, 2009). To conclude, the research argues that little improvisation in opportunity selection leads to a focus on long-term behavior, fast learning and the

improvement of organizational learning (Bingham, 2009). However, low improvisation in opportunity execution could benefit firms as it leads to flexibility in dealing with unique situations (which is relevant for tech-based firms) (Bingham, 2009).

As mentioned, the instrumental perspective examines in advance if, in this case, market segments are attractive based on rational tools and guidelines. In this case, these tools and guidelines will contain criteria that can be used to assess the attractiveness of the specified market segments. As shown in the artifact, the criteria first must be determined. Next, weights must be assigned to the criteria. Finally, the criteria must be evaluated. As this step of the framework entails the analysis of the attractiveness of examined market segments, the first design proposition is embedded in this step, which is: ***(C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) select the right market segments (M) by examining the attractiveness of the analyzed market segment(s).***

4.2.3 Select market segment selection criteria

The first step of the instrumental evaluation of market segment selection criteria is to determine the relevant criteria that can be used to evaluate the market segments. Various theories have been developed regarding market segment selection criteria that can be applied to evaluate market segments. Porter's five forces model is a well-known model often used to assess target markets (Ghorabaee et al., 2017; Ou et al., 2009; Nielsen et al., 2017). This model examines a target market from a competition perspective and discusses the following aspects of market segments: threat of new entrants, bargaining power of suppliers, threat of substitute products, bargaining power of customers and intensity of competitive rivalry (Ghorabaee et al., 2017; Ou et al., 2009). Ou et al. (2009) also developed a list of sub-criteria regarding Porter's five forces model that can be used to assess the different aspects of the model (see table 5)

Criteria	Sub-criteria
The bargaining power of customers	Buyer concentration to firm concentration ratio
	Bargaining leverage
	Buyer volume
	Buyer switching costs relative to firm switching costs
	Buyer information availability
	Ability to backward integrate
	Buyer price sensitivity
	Price of total purchase
The bargaining power of suppliers	Supplier switching costs relative to firm switching costs
	Degree of differentiation inputs
	Presence of substitute inputs
	Supplier concentration to firm concentration ratio
	Threat of forward integration by suppliers relative to the threat of backward integration by firms
	Cost of inputs relative to selling price of the product
	Importance of volume to supplier
The threat of new entrants	The existence of barriers to entry
	Economies of product differences
	Brand equity
	Switching costs
	Capital requirements
	Expected retaliation
	Absolute cost advantages
	Learning curve advantages
	Government policies
The threat of substitute products	Buyer propensity to substitute
	Relative price performance of substitutes
	Buyer switching costs
	Perceived level of product differentiation
The intensity of competitive rivalry	Number of competitors
	Rate of industry growth
	Intermittent industry overcapacity
	Exit barriers
	Diversity of competitors
	Informational complexity and asymmetry
	Fixed cost allocation per value added
	Level of advertising expense

Table 5: Porter's five forces model including sub-criteria (Ou et al., 2009, p. 533)

Besides Porter's five forces model, research has also examined the most common market segment selection criteria in general. The most common market segment selection criteria are the ability to reach buyers in the market, competitive positioning, market size, compatibility of the market with the objectives and resources of the company, profitability and expected market growth (Cortez et al., 2021). Furthermore, as previously mentioned, the most important market segment

selection criteria for tech-based organizations were examined by Weinstein (2014). This research ranked ten generally accepted criteria technology marketers use to target market segments based on their importance (see table 2).

Two aggregate dimensions mention market segment selection criteria within the data structure. The aggregate dimension market segment selection criteria indirect environment contains market segment selection criteria arising from the indirect environment of an organization. This entails factors influencing the attractiveness of market segments from within the indirect environment of organizations. The indirect environment contains factors or actors from outside a market segment that affect the market segment (Stoner & Freeman, 1989). Among the market segment selection criteria indirect environment, the following sub-categories have been found: economic influences within the market segment, political influences within the market segment, ecological influences within the market segment, opportunities within the market segment, relevant developments within the market segment and general characteristics market segment. The aggregate dimension market segment selection criteria direct environment contains market segment selection criteria regarding the direct environment of an organization. The direct environment consists of key role players within an industry, such as rivals, suppliers, customers or the organization itself (Stoner & Freeman, 1989). The second-order concepts that form the aggregate dimension market segment selection criteria direct environment are competitive position within market segment and consumers within market segment.

To conclude, a wide variety of criteria can be identified through the literature and the interviews. However, market segment selection should be treated ad hoc (Montoya-Weiss & Calantone, 1999). Consequently, what criteria are relevant to assess the attractiveness of a market segment should be determined per organization specifically (Dolnicar et al., 2018). Besides, the framework's flexibility would be harmed when a rigid list of criteria would be provided. The above-mentioned criteria could, of course, serve as inspiration. However, the selection of criteria should be performed per organization. This limitation of rigidity also supports the fourth design proposition. Finally, the frameworks provided by theory especially do not consider that tech-based businesses often enter new markets. The criteria provided by theory mainly assume that a market already exists. Therefore, especially for tech-based companies, these criteria might not be suitable for assessing the attractiveness of a market segment.

4.2.4 Assign weights to selected market segment selection criteria

It is essential to assign weights to these selected criteria. The assignment of weights is important, as information provided by every criterion might not be equally important for the decision-making process regarding the selection of market segments (Sarabia, 1996). Consequently, by assigning weights to the selection criteria, organizations recognize the relative importance of specific selection criteria compared to others in defining a particular market segment as promising (McDonald & Dunbar, 2004). Furthermore, as mentioned in the pre-screening paragraph, the interviewees confirmed that some selected criteria are more relevant than others.

4.2.5 Evaluate market segment selection criteria

Within this step, the selected market segment selection criteria are evaluated. As mentioned, these criteria will assess the market segments in terms of attractiveness. The level of detail of the analysis of the criteria should depend on the reason for segmentation and the personal preference of the organization (Freytag & Clarke, 2001). After evaluating a market segment based on the selected criteria, it can be decided whether it is attractive enough. If a market segment is perceived as attractive, the fit between the segment and the organization can be examined within the next step. If the segment is not perceived as attractive, the market segment can be rejected.

4.2.6 Fit between market segment and organization

When a market segment is perceived as attractive, it might still occur that it does not suit the company. Therefore, focusing on the market segments' attractiveness and whether an organization can successfully exploit the promising market segments is essential. Hence, within this final step of the framework, whether the organization and market segment are a match will be analyzed. Consequently, the second design proposition will be embedded within this step: ***(C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) select the right market segments (M) by examining the suitability of the organization with the analyzed market segment(s).*** To explore the fit between the organization and market segment, Barringer & Ireland (2010) have suggested four areas that can determine this fit. These areas are product/service, market/industry, organization and

financing. The external dimension, market/industry, has already been discussed in the abovementioned paragraphs. Therefore, the focus within this paragraph will be on the remaining dimensions that can be used as a guideline to examine the relevant internal factors regarding the selection of market segments.

First, the dimension product/service focuses on whether the offered product/service is in demand in a particular market segment (Nielsen et al., 2017). Therefore, examining the fit between product/service and market segment is relevant. As previously mentioned, high-tech businesses quite often introduce new products. However, these newly introduced products are less likely to be in demand by existing markets, for example, immediately (Moore, 2014). A tech-based business also confirmed this during one of the interviews, who mentioned that they had a great product, but the market was not ready for it yet. Therefore, it did not work out. Furthermore, it is essential to consider that for tech-based businesses, customer needs change rapidly within high-tech markets (Slater et al., 2007). Consequently, a high-tech business must believe that its product will be able to adapt to these changing needs within a market segment.

Second, within the organization dimension, multiple organizational facets are discussed. Within this dimension, emphasis was placed on the human factor by Hindle et al. (2007). In this case, the human factor discusses people's skills and attributes within an organization (Nielsen et al., 2017). This aligns with the theory of Cortez et al. (2021), which mentions that an organization's capabilities should match a market segment. For tech-based businesses specifically, it is critical to consider the technological capabilities of a firm (Acosta-Prado et al., 2014). Technological capabilities are dynamic capabilities that support firms in exploiting technological opportunities (Teece, 2007). First, these capabilities allow organizations to search, recognize, organize, apply and commercialize innovative products and services (often found in tech-based businesses) (Chang et al., 2012). Second, these capabilities enable companies to use resources to obtain a competitive advantage (Bustinza et al., 2019). Third, technological capabilities leverage external resources to reduce risk within breakthrough innovations (Chen et al., 2014). An overview of relevant technological capabilities can be found in figure 6.

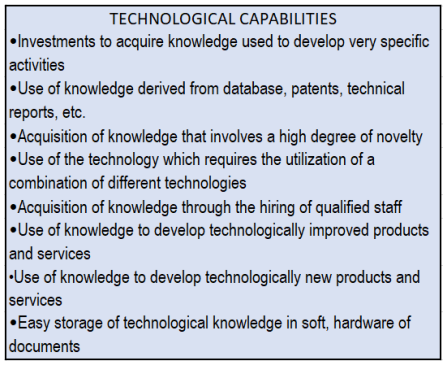

Figure 6: Technological capabilities (Acosta-Prado et al., 2014, p. 31)

Besides the human factor, an organization's assets (also intangible assets like relationships and image) could be considered when examining the fit between the market segment and the organization (Freytag & Clarke, 2001). Furthermore, the organization dimension also tries to answer how the entrepreneur should organize himself to reach customers, which aligns with the strategy being a factor within the organization dimension (Nielsen et al., 2017). To conclude, the human factor, the strategy and the assets can be analyzed within the organization dimension.

Finally, the financing dimension examines whether there is a fit between the required financial assets to enter a market segment and the available financial assets (Nielsen et al., 2017). It could be that a market segment is attractive and aligns with the organization and its product. However, if the financial assets required to enter the market are unavailable within the organization, selecting that particular market segment is still not recommended. As mentioned multiple times, investments in R&D before entering a market segment can be significant for tech businesses (Manez et al., 2009). Consequently, this could, for example, be a financial obstacle that considerably increases the financial assets required to enter a market segment.

Interview data generally confirms the abovementioned criteria to examine the fit between organization and market segments (see data structure in appendix 5 or 6). First, multiple organizations have emphasized studying the match between market segments and products, activities, or technologies. These findings confirm the importance of the product/service dimension mentioned by Nielsen et al. (2017). Second, within the aggregate dimension fit between the organization and market segment

(mentioned in the data structure), it is also said that there should be a match between market segment and resources, market segment and human factors and market segment and strategy. This resembles the organization dimension mentioned in the previous paragraph. Finally, multiple organizations have also said it is vital to examine whether there is a fit in financial resources and entering a market segment, which aligns with the financing dimension.

5. Demonstration

Within this chapter, the demonstration step will be discussed. This step entails the demonstration of the created market segment selection artifact within a research setting. First, the goal of this step will be explained. Next, the execution of each step will be discussed. This chapter discusses the following four market segments: Defense & Security, Test & Measurement, Medical and High-tech systems. Business X previously decided to focus on these segments and wants to examine whether these decisions can be justified. Therefore, the analysis within this chapter will form advice for the firm and will not contain the actual decision to target the segments or not.

5.1 Goal

The fourth step of the framework entails the demonstration of an artifact. Consequently, within this step, the use of the artifact is demonstrated to help solve (certain instances of) the research problem. The use of the artifact can be demonstrated in different research settings like an experiment, a case study, a simulation or other relevant activities (Peffers et al., 2007; Vom Brocke et al., 2020). Furthermore, the researcher must know how to use the artifact to solve a problem (Peffers et al., 2007). Consequently, the goal of this step is to demonstrate the practicality of the market segment selection artifact for tech-based organizations created in the previous chapter in a research setting, which in this case is at a tech-based organization.

5.2 Pre-screening of market segment

During the pre-screening, the analysis of previous experiences and the analysis of critical variable(s) will be conducted. For both sub-steps, the methodology will be discussed and the results will be formulated. After this step, it should be possible to get a preliminary indication of whether the market segments have potential.

5.2.1 Analysis of previous experiences

For the analysis of the previous experiences in the market segments, six semi-structured interviews were conducted with the competence officers of Business X. Semi-structured interviews were picked as a method for the same reasons as the ones mentioned for the other interviews conducted in previous chapters. These reasons were that this type of interview ensures that relevant topics and questions are discussed and allows the interviewer to be flexible about spontaneously emerging issues (Qu & Dumay, 2011; Doody & Noonan, 2013). The competence officers have been chosen to interview as these employees know at what projects the core competencies, that mainly form the services of Business X, have been applied (successfully or not). Furthermore, the firm emphasized the importance of matching capabilities/competencies with the market segments. Therefore, these interviews will also be relevant for the final step of the framework. Nevertheless, this step will focus on whether the experiences within the examined segments were positive. The interview guide can be found in appendix 7 (or 8 for translated version).

During the interviews, the first thing that stood out was that most competence officers mentioned that their competence had been applied in the High-tech systems segment (especially industrial High-tech systems). Furthermore, based on the interviews, the firm has much experience within the Test & Measurement segment. In contrast, it has some experience in the Medical and the Defense & Security segment. The competence officers were generally positive about the projects in the market segments. Most of the time, it was mentioned that the firm could successfully complete the projects within examined segments. According to the competence officers, when a competence has yet to be applied in a market segment, it is possible to do so in the future with the current competence base. Only one of the officers mentioned that it was difficult to determine whether the Defense & Security segment aligns with his competence. However, this was mainly because he was uncertain what is required for D&S projects regarding his competence.

Furthermore, it was also asked whether differences existed among the market segments concerning applying competencies during projects. One of the things that the competence officers mentioned is that more standards and requirements were involved, especially in the Medical and Defense & Security segments. These requirements and standards are necessary within these sectors as they are safety-critical segments (especially Medical). The competence officers explained that this does cause extra work for the firm. Furthermore, in the perception of most officers, demand for complex and specific electronics applications, which Business X provides, was primarily found in the High-tech systems segment compared to the other segments. To conclude, experiences in all four segments were positive in general. The company did not face any gaps within the segments that could not be bridged and customer cooperation was also experienced positively. Moreover, based on these

previous experiences, the organization expects to be able to serve all examined segments. However, most officers still expect the demand for their competencies to be highest within the High-tech systems market (and sometimes the Test & Measurement segment). Nevertheless, when projects in the remaining segments emerge, the firm is expected to be able to complete them successfully, according to the competence officers.

5.2.2 Analysis of critical variable(s)

To get a preliminary overview of the relevant market segments, Business X indicated that the R&D budgets are crucial to examine. For Business X, the R&D budgets of (potential) customers are critical. The company is highly involved in assisting organizations with the development of new products. Consequently, it tries to capture some of these R&D budgets to generate revenue. Therefore, Business X attempts to pursue market segments where customers have relatively large R&D budgets. As the company tries to generate revenue by supporting organizations regarding their research and development, it is crucial to determine what market segments contain relatively large R&D expenditures. Besides, R&D expenditure is also a relevant indicator of innovation (Dziallas & Blind, 2019). As Business X's core activity is supporting other organizations with developing new products and technologies, this could be relevant to consider.

Two methods have been applied to gather relevant data concerning R&D budgets within the market segments. First, multiple datasets from the OECD, Eurostat and domestic statistics agencies were applied. Within these datasets, data regarding business enterprise expenditures on R&D can be found per NACE code and country. NACE codes are used to distinguish economic activities (Eurostat, 2008). However, a problem during this analysis is that not all relevant countries provide the same amount of information concerning R&D expenditures. Therefore, it was challenging to compare countries with each other. Second, based on the annual reports of multiple organizations, an overview of the R&D intensity within the examined market segments has been created. The R&D intensity has been determined by dividing the R&D expenditures of an organization by their net sales. This method is limited because annual reports are mainly just shared by relatively large organizations. However, as Business X primarily targets rather large organizations, this limitation has less impact on the research.

Within the analysis based on data from the OECD, Eurostat and domestic statistics agencies, it was possible to examine all relevant NACE codes for all the analyzed segments in at least one year (between 2017-2021) for four relevant countries. A relevant country is a country in which Business X is currently active or might be in the future. Furthermore, exploring the NACE codes of at least one segment in at least one year also for four countries was possible. Due to this low data availability, it can be challenging to generalize statistics. Nevertheless, in the examined countries, High-tech systems generally seemed to be the market segment containing the most significant R&D expenditures and Medical and Defense & Security the smallest. However, differences existed between the countries regarding R&D expenditures, which makes it difficult to confirm these conclusions. The analyses can be found in appendix 9.

Table 6 displays the results of the R&D intensity analysis. In the first column, the examined segments are mentioned. In the following four columns, the average R&D intensity, the trimmed average R&D intensity, the average R&D intensity of only organizations with headquarters in Europe, and the trimmed average R&D intensity of only organizations with headquarters in Europe can be found for 2022 per market segment. The same calculations are displayed in the remaining four columns but for 2021. The trimmed averages are calculated to examine whether outliers influence the results. Furthermore, the trimmed average is calculated by excluding the maximum and minimum values during the average calculation. Finally, for each segment, a row containing the sample size has been added (N). The results per market segment can be found in appendix 10.

R&D intensity per market segment								
	2022				2021			
Segment	Average R&D intensity	Trimmed average R&D intensity	Average R&D intensity Europe	Trimmed average R&D intensity Europe	Average R&D intensity	Trimmed average R&D intensity	Average R&D intensity Europe	Trimmed average R&D intensity Europe
D&S	8,5%	7,7%	9,8%	8,8%	7,9%	7,5%	8,7%	8,2%
N	27	25	20	18	27	25	20	18
S	9,7%	8,9%	12,1%	11,5%	10,6%	9,7%	12,7%	11,8%
N	11	9	7	5	11	9	7	5
D	7,7%	6,1%	9,3%	6,9%	6,1%	5,2%	7,0%	5,7%
N	16	14	13	11	16	14	13	11
T&M	10,4%	10,1%	-	-	10,5%	10,0%	-	-
N	13	11	-	-	13	11	-	-
MED	9,7%	9,4%	9,9%	9,6%	9,3%	9,1%	9,5%	9,2%
N	25	23	19	17	25	23	19	17
HTS	7,7%	7,6%	8,2%	8,1%	8,2%	7,8%	8,5%	8,1%
N	29	27	24	22	28	26	23	21

Table 6: Analysis R&D intensity

The table shows that the Test & Measurement segment has the highest R&D intensity among the analyzed segments. However, it should be considered that this segment also has the lowest sample size due to lower data availability. Nevertheless, organizations within the market segment mostly have a good R&D intensity. Furthermore, the Medical segment also has a high R&D intensity, with statistics ranging between 9% and 10%. The Defense & Security and High-tech systems have the lowest R&D intensity. Nevertheless, the results can still be perceived as high. However, within the Defense & Security segment, it is first essential to notice a substantial difference between the statistics of the Defense and the Security segment. The R&D intensity in the Security segment seems considerably higher than in the Defense segment. Second, the statistics of, especially the Defense segment contain significant differences between the average R&D intensity and the trimmed average R&D intensity. For example, the average R&D intensity in 2022 in the Defense segment is 7.7% and the trimmed average R&D intensity is 6.1%. Consequently, a difference of 1.6% in the average R&D intensity occurs when the minimum and maximum values are excluded in the calculation for the specific segment. Therefore, outliers influence the statistics of the segment. This finding can be confirmed when looking at the individual statistics of the segment (see appendix 10). The analysis shows two values remarkably higher than the other values (22.7% & 37.4%). When not only the minimum and maximum values are excluded but also the second largest and lowest values, the average in the segment would drop to 5%, which is 2.7% below the normal average. Consequently, it can be concluded that the Defense segment has a relatively low R&D intensity compared to the other segments.

Besides examining the R&D budgets, it is also essential to analyze what part of the R&D activities of organizations is (partially) outsourced. When organizations do not outsource R&D activities, no external parties are involved in developing the new product/technology by that organization. As Business X generates revenue by supporting organizations with R&D, some of the R&D activities must be at least partially outsourced (through co-development, for example). Specific data per segment regarding the outsourcing of R&D is unavailable. However, to still get an indication of the R&D outsourcing behavior of organizations, more general data obtained from scientific studies will be applied.

First, research has been conducted in Spain regarding the R&D outsourcing behavior of organizations considering the level of technology and the size of that organization (see table 7) (Anon Higon et al., 2018). Business X mainly tries to target large high-tech organizations. For this category, 16.95% of organizations have internal R&D, 10.43% only have external R&D, 63.03% have internal and external R&D, and 9.58% have no R&D activities. Consequently, around 73% of organizations within this category (at least) partially outsource R&D activities. Furthermore, the research also shows that larger firms are involved in R&D activities more often than smaller firms and that high-tech firms are more involved in R&D activities than low-tech firms (Higon et al., 2018). Second, in Germany, research has also been conducted regarding the R&D behavior of organizations. In this study, the R&D behavior of specifically innovative firms has been examined. Of the examined innovative firms, 66.4% apply joint development in R&D cooperations to create new products/technologies. Furthermore, 9.9% of firms fully outsource R&D projects (Kroll & Schnabl, 2014). Moreover, it has also been found that in Germany, company size and degree of technology affect the R&D outsourcing behavior of firms, as larger companies are more likely to outsource R&D compared to smaller organizations and high-tech firms are more likely to outsource R&D compared to low-tech firms (Rammer & Schubert, 2016).

Strategy	All firms	Low-tech	Med-tech	High-tech
All firms				
Only internal R&D	3360 10.95%	1261 7.76%	1277 13.35%	822 16.90%
Only external R&D	2220 7.23%	989 6.08%	826 8.63%	405 8.33%
Both internal and external R&D	6240 20.34%	1910 11.75%	2291 23.95%	2039 41.93%
None	18865 61.48%	12096 74.41%	5172 54.07%	1597 32.84%
Large firms				
Only internal R&D	1548 17.71%	532 16.07%	657 19.78%	359 16.95%
Only external R&D	1119 12.80%	427 12.90%	481 14.48%	221 10.43%
Both internal and external R&D	4066 46.52%	1136 34.31%	1595 48.01%	1335 63.03%
None	2008 22.97%	1216 36.73%	589 17.73%	203 9.58%
Small firms				
Only internal R&D	1812 8.26%	729 5.63%	620 9.93%	463 16.87%
Only external R&D	1101 5.02%	572 4.42%	345 5.53%	184 6.70%
Both internal and external R&D	2174 9.91%	774 5.97%	696 11.15%	704 25.65%
None	16857 76.82%	10880 83.98%	4593 73.40%	1394 50.78%

Table 7: R&D outsourcing in Spain (Anon Higon et al., 2018, p. 564)

To conclude, it is difficult to determine the outsourcing behavior per examined market segment, as no data per segment is available. However, almost every NACE code reviewed to analyze the market segment is classified as at least medium-high-tech, while only one NACE code is labeled as medium-tech (Eurostat, 2022). Therefore, the two studies discussed above can at least indicate that there will be a degree of outsourcing or collaboration regarding R&D within the examined market segments. Furthermore, multiple studies confirmed that large high-tech firms mainly apply (partial) R&D outsourcing. This is the primary type of organization that Business X tries to target.

5.2.3 Conclusion potential

Based on the pre-screening results, all four segments have enough potential to go to the next step of the framework. According to the competence officers, Business X had many positive experiences within the **High-tech systems** segment. Hence, it is expected that the firm can indeed serve the segment. This segment also scores high on the analysis of the R&D budgets. Therefore, this segment shows high potential. **Test & Measurement** also has good potential. The organization has a good number of positive experiences in this segment and it is expected that the firm can serve the segment in the future as well based on these previous experiences. Furthermore, the segment scores the highest on R&D intensity and R&D expenditures also are sufficiently present in the segment based on data from the statistics agencies. Hence, the segment has a good potential based on the pre-screening. In the **Medical** segment, Business X has some experience. In general, these experiences were positive and it was also expected that the firm could serve the segment with its competencies. The R&D intensity in the segment is also relatively high. However, the R&D expenditures within the segment differ per country and should be monitored. Nevertheless, the segment has enough potential to go to the next step of the framework. The **Defense & Security** segment has the least potential based on the pre-screening. The R&D intensity within, especially the Defense part of the segment, is relatively low compared to the others. However, the Security segment has a higher R&D intensity that is comparable to the other segments. Based on the data from the statistics agencies, the R&D expenditures in the segment are relatively low in most countries. However, as mentioned, only some countries could be analyzed due to a lack of data in some countries. The experiences with the projects in the segment were positive, though, and the firm expects to be able to execute projects in the segment in the future as well. To conclude, the potential of the Defense & Security segment is the lowest, but still acceptable enough to go the next step, as the R&D intensity of especially the Security segment has promise and the firm's experience within Defense & Security has also been good.

5.3 Evaluation of market segment

In this second step of the framework, the relevant market segments will be examined based on attractiveness. First, relevant criteria that can be used to assess the attractiveness of the market segments will be selected. Second, weights will be assigned to the criteria to indicate what criteria impact the attractiveness of a market segment the most. Finally, the criteria will be evaluated. After finishing this step, the organization should be able to determine whether the market segments are attractive.

5.3.1 Selection of market segment selection criteria

The first step of the instrumental evaluation phase entails the selection of market segment selection criteria. Based on the selected criteria, organizations should be able to get an overview of the attractiveness of a market segment. As all organizations face different situations, the attractiveness criteria must be decided by the organization itself (Dolnicar et al., 2018). Consequently, within this thesis, the applied market segment selection criteria have been selected in collaboration with Business X. First, the criteria have been selected together with a business developer of the organization. Second, the selected criteria were discussed with the management to ensure that the strategical layer of the firm agreed upon the selected criteria and that no criteria were missing.

The criteria that have been selected are R&D budgets (which has been examined in the pre-screening step as a critical variable), innovation rate, profit margins and company size. The criterium innovation rate entails the innovation frequency of the organizations within the examined market segment. Business X mentioned that this criterion is relevant as it is highly involved in supporting organizations with developing new products and technologies with its applications. Consequently, when there is much innovation in a market segment, organizations in that segment likely develop new products and technologies. This might lead to a higher availability of projects for Business X.

The profit margin of organizations within a market segment is also relevant. The company mentioned that it tends to focus on developing advanced applications that ensure high performance rather than on having the lowest prices. Consequently, it was explained that the firm occasionally collided with customers with relatively low profit margins because more emphasis was placed on getting lower prices instead of getting applications of the high-performance quality that Business X tries to provide. The theory also explains that a low gross profit margin could indicate that organizations cannot cover costs outside the cost of goods sold (Nariswari & Nugraha, 2020). As mentioned, the revenue of Business X is mainly generated by supporting organizations concerning the R&D of new products. Therefore, a considerable amount of revenue originates from customers' R&D expenditures. However, when an organization has a relatively low gross profit margin, it might indicate that the firm also has relatively low flexibility regarding R&D expenditures (as it are costs outside of the cost of goods sold). Consequently, these organizations might focus more on getting a low price than getting a product of a high quality. Therefore, organizations with a relatively high profit margin might be more attractive to Business X. Because of this, the profit margins within a market segment are relevant to determine the attractiveness of market segments for Business X.

Finally, company size has been selected as a criterion. Business X considers this criterion relevant as the firm's applications require substantial financial resources. Consequently, the organization discovered it was difficult to do business with relatively small organizations, as they possess fewer financial resources to buy the firm's applications. Hence, for Business X, the focus is on targeting organizations of similar size or larger with the resources to acquire the firm's applications. Besides, research has pointed out that large organizations spend more on research and development and apply outsourcing of R&D more often (Higon et al., 2018). As previously mentioned, R&D expenditures and R&D outsourcing are crucial for Business X. As the organization focuses on large organizations (or at least organizations of similar size), the size of businesses within the market segments also influences the market size in terms of the number of potential customers.

5.3.2 Assign weights to the selected criteria

After relevant market segment selection criteria have been identified and selected, it is essential to determine whether relative differences in importance exist among the variables. This is important because a criterium might have a relatively more significant impact on the attractiveness of a market segment than another criterium (Dolnicar et al., 2018). A discussion with the management has been organized to determine the relative importance of the selected criteria. During this meeting, it was debated whether there were any differences between the importance of the criteria selected in the previous step.

The criteria selected in the previous step and discussed with the management are innovation rate, R&D budgets, profit margins and company size. The selected criteria were all perceived as relevant and impactful on the attractiveness of the market segments. However, it was mentioned that the company size and R&D budgets (which has already been mentioned as a critical criterium) were a bit more essential than the others. It was said that doing business with small companies is challenging because of a lack of financial resources. Consequently, a lack of large organizations within a market segment would drastically decrease the attractiveness of a segment for Business X. Furthermore, R&D budgets in a market segment are also critical for Business X. As mentioned, a large share of the organization's revenue has its origins in R&D budgets of its customers.

Consequently, the R&D budgets within a market segment largely determine how much revenue can be generated in a segment for the organization. Therefore, the attractiveness of a market segment is heavily impacted by the R&D budgets of organizations within a segment for Business X.

5.3.3 Evaluation of selected market segment criteria

The final step of the evaluation of the market segments is the actual evaluation of the selected criteria. In this step, the attractiveness of each segment will be determined based on the evaluation of the selected criteria. Per criterium, the methodology for analysis will be discussed first. Next, the results per criteria will be addressed. Finally, a conclusion concerning the segments' attractiveness will be drawn based on the findings.

Innovation rate

Business X focuses on customers who possess a certain degree of innovation. Therefore, it is vital to get an indication of the innovation rate within examined market segments. An indicator that can be applied to measure innovation is exploring the intellectual property of, in this case, market segments (Dziallas & Blind, 2019; Adams et al., 2006). To examine the intellectual property within a market segment, data regarding patents can provide insights (Dziallas & Blind, 2019). Within this thesis, patents will also be utilized as an innovation measure. The main reason for this choice is the higher availability of relevant patent data compared to other intellectual property indicators like trademarks and copyrights.

Data from the OECD has been utilized to indicate the patent behavior of organizations within a market segment. The OECD has provided an overview of the number of patent applications to the European patent office per IPC per country. The IPC is the international patent classification used to distinguish patents based on the different areas of technology to which a patent can be assigned (WIPO, n.d.). Consequently, the first step of the analysis was to identify the relevant IPC codes per market segment. This has been executed by examining the (expected) activities of Business X within the analyzed market segments and comparing these with the activities mentioned in the IPC codes. Second, the patent applications to the EPO per relevant IPC code per country have been gathered to create an overview of the patent applications per market segment. Eleven countries have been analyzed within this step. These countries are again either selected based on previous experiences of Business X within the country or on willingness to enter the country in the future. Third, the percentage of applications to the EPO within a market segment compared to the total applications within a country has been calculated to compare the number of patent applications per market segment among the countries. Finally, to generalize the findings for Business X, the average and the trimmed average of the patent applications within a market segment per country as a percentage of the total patent applications within a country have been calculated. To generate this average, data from ten of the eleven countries has been included. One country has been excluded as the total number of patent applications was too small. Therefore, the percentages are likely to be less reliable. Table 8 displays the table with the (trimmed) average percentages.

Average % of total patent applications to EPO per segment in Europe					
Segment	2020	2019	2018	2017	2016
D&S	2,0%	1,9%	1,7%	1,5%	1,9%
T&M	6,7%	7,1%	7,0%	6,3%	6,3%
MED	5,7%	6,2%	6,9%	6,8%	6,2%
HTS	6,4%	5,5%	5,1%	5,1%	4,7%
Trimmed average % of total patent applications to EPO per segment in Europe					
Segment	2020	2019	2018	2017	2016
D&S	1,7%	1,8%	1,6%	1,4%	1,8%
T&M	6,2%	6,7%	6,6%	5,7%	5,7%
MED	5,3%	5,7%	6,2%	6,2%	5,8%
HTS	6,5%	5,4%	5,0%	5,0%	4,6%

Table 8: Analysis patent applications

As shown in the table, the average percentage of patent applications within a market segment compared to the total patent applications within a country is the lowest for the D&S segment and the highest in the other segments based on the type of average and the year. Furthermore, the average percentages of T&M, MED and HTS are relatively close. However, the average and trimmed average percentages of D&S are considerably lower than those of the other segments. The relatively low number of patent applications could indicate less innovation activity within the segment. However, not all innovations are patented and patenting behavior also depends on a company's strategy (Dziallas & Blind, 2019; Arundel & Kabla, 1998). For example, patents are applied to improve a company's competitiveness (Dziallas & Blind, 2019). However, the Defense & Security segment contains a larger share of public organizations than the others. Organizations within the public sector usually do not pursue the goal of profit maximization, which often is the goal set by organizations within the private sector. Consequently, public organizations might perceive the improvement in the competitive position obtained by applying for a patent as unnecessary.

Furthermore, the outliers found in the statistics per country might be quite insightful for Business X. An outlier in this analysis entails a value concerning a market segment in an individual country considerably different from the average percentage mentioned in the table above. An outlier substantially higher than the average percentages mentioned above might indicate an exciting market for the company. For example, the percentage of patent applications to the EPO within the Medical segment within the Netherlands is swerving between 13,1% and 15,8% between 2016 and 2020. This might indicate that the innovation rate within this segment is relatively more prominent in the Netherlands than the innovation rate of the segment in other analyzed countries, as the table displays that the average percentage of patent applications to the EPO in the Medical segment is swerving between 5.7% and 6.9%. An outlier for the Test & Measurement segment can be found in Switzerland, where the percentage of patent applications within the segment compared to the total applications in the country fluctuated between 12,8% and 14% between 2016 and 2020. For High-tech systems, the analyzed percentages are the highest in Austria, where a fluctuation between 8,5% and 9,6% can be found between 2016 and 2020. Finally, the highest percentages of Defense & Security can be found in Norway, with the values swerving between 2,7% and 4,9% in 2016-2020. The analyses of the innovation rates per country can be found in appendix 11.

Profit margins

As mentioned, Business X focuses on organizations with a relatively high profit margin. Therefore, examining the average profit margins within the studied market segments is relevant. Like one of the methods applied to the analysis of R&D budgets, the study of the gross profit margin is based on data acquired from annual reports of organizations operating within the analyzed market segments. Therefore, the same limitation as in the R&D budgets paragraph occurs: only large organizations are included. However, as mentioned, Business X mainly tries to target large organizations. Therefore, this limitation is not impeding the analysis too much. The analysis's first step is calculating the relevant organizations' gross profit. The formula for this calculation is net sales - cost of goods sold (Nariswari & Nugraha, 2020). Second, the gross profit margin of the organizations will be calculated by dividing the gross profit by the net sales (Naraswari & Nugraha, 2020). Third, the (trimmed) average gross profit margin per market segment will be calculated by taking the average gross profit margins of the examined organizations within a market segment.

As shown in table 9, the gross profit margin within Defense & Security seems relatively low compared to the other segments. However, the segment has been split into two subsegments, as the average gross profit margins between these subsegments seem different. When looking at the subsegment Security, it can be concluded that the calculated margins are more like the calculated margins of the other segments. However, the average margins of the subsegment Defense seem considerably lower than the other segments. Furthermore, T&M and MED have the highest profit margins. High-tech systems also still has an adequate average profit margin. When looking at the spread concerning the profit margins within the segments, the spread seems low in HTS and T&M. This means that most organizations generally have a profit margin relatively close to the average. The spread is the highest in the Medical sector. This means that, in general, the profit margin of the individual organizations is relatively a bit further away from the average compared to the other segments. Consequently, this could indicate that the profit margins of organizations within the segment differ more. The analyses of the different individual market segments can be found in appendix 12.

Gross profit margin per market segment								
	2022				2021			
Segment	Average gross profit margin	Trimmed average gross profit margin	Average gross profit margin Europe	Trimmed average gross profit margin Europe	Average gross profit margin	Trimmed average gross profit margin	Average gross profit margin Europe	Trimmed average gross profit margin Europe
D&S	29,9%	29,7%	28,6%	28,3%	32,2%	30,4%	31,6%	28,9%
N	23	21	17	15	23	21	17	15
S	48,4%	46,9%	50,0%	48,3%	49,6%	47,7%	51,1%	48,8%
N	10	8	7	5	10	8	7	5
D	15,6%	18,5%	12,8%	17,1%	18,9%	19,2%	17,5%	18,3%
N	13	11	10	8	13	11	10	8
T&M	53,9%	54,9%	-	-	54,1%	54,6%	-	-
N	13	11	-	-	13	11	-	-
MED	54,0%	54,4%	52,7%	53,1%	54,7%	55,2%	53,7%	54,1%
N	24	22	19	17	24	22	19	17
HTS	41,9%	42,0%	40,6%	40,9%	41,1%	41,1%	39,9%	40,1%
N	25	23	21	19	25	23	21	19

Table 9: Analysis profit margins

Customer size

As mentioned, Business X mainly targets organizations of comparable size or larger as customers. Consequently, an overview of businesses per market segment per size class might provide valuable insights for the company concerning market size.

Data from the OECD will be applied to create an overview of businesses per size class for each relevant market segment. The OECD provides an overview of businesses per size class per NACE code. As mentioned, NACE distinguishes economic activities (Eurostat, 2008). The first step of the analysis is assigning the relevant NACE codes to the examined market segments. Next, an overview of the number of businesses per size class will be created per country for each market segment. Finally, a conclusion will be drawn concerning the number of large organizations within the market segments.

In table 10, an overview of the businesses and corresponding size classes can be found. The table indicates per market segment how many companies can be found per size class. The columns containing absolute numbers explain the number of businesses per size class per market segment. The size classes in the table are businesses with more than 250 employees, between 50 and 249 employees, between 20 and 49 employees, between 10 and 19 employees and between 0 and 9 employees. As Business X prefers to target large organizations, the number of businesses within a market segment containing 250+ employees or between 50 and 249 employees is most relevant. Furthermore, the percentages columns explain what percentage of companies within a market segment have more than a certain number of employees.

Segment	>250 employees	%>250 employees	50-249 employees	%>50 employees	20-49 employees	%>20 employees	10-19 employees	%>10 employees	0-9 employees	%>0 employees	N
D&S	**177**	**2,3%**	**416**	**7,8%**	**410**	**13,7%**	**497**	**20,2%**	**5615**	**100,0%**	**7114**
Manufacture of communication equipment	37	2,5%	99	8,4%	87	14,2%	120	21,3%	1270	100,0%	1613
Manufacture of electrical equipment*	41	2,1%	138	9,7%	118	17,6%	124	24,7%	1047	100,0%	1467
Building of ships and boats	41	1,3%	99	4,6%	144	9,9%	200	16,8%	2886	100,0%	3370
Manufacture of air and spacecraft and related machinery	54	6,0%	78	15,1%	56	22,6%	52	29,2%	410	100,0%	650
Manufacture of military fighting vehicles	4	25,0%	2	50,0%	5	72,2%	1	77,8%	2	100,0%	14
T&M	**165**	**2,3%**	**535**	**9,9%**	**584**	**19,5%**	**681**	**29,8%**	**3276**	**100,0%**	**5241**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	165	2,3%	535	9,9%	584	19,5%	681	29,8%	3276	100,0%	5241
MED	**161**	**0,8%**	**592**	**2,9%**	**1206**	**6,8%**	**4071**	**16,0%**	**17197**	**100,0%**	**23227**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	24	3,8%	35	9,2%	54	16,4%	103	25,3%	477	100,0%	693
Manufacture of medical and dental instruments and supplies	137	0,6%	557	2,5%	1152	6,1%	3968	15,3%	16720	100,0%	22534
HTS	**1208**	**3,0%**	**3640**	**12,8%**	**3789**	**23,5%**	**4210**	**34,2%**	**19559**	**100,0%**	**32405**
Manufacture of electrical equipment*	41	2,1%	138	9,7%	118	17,6%	124	24,7%	1047	100,0%	1467
Manufacture of machinery and equipment n.e.c.	1167	3,1%	3502	12,9%	3671	23,8%	4086	34,7%	18512	100,0%	30938

Table 10: Analysis customer size

As displayed in the table, High-tech systems contains by far the most businesses with more than 250 employees. The other segments have a relatively similar number of companies with more than 250 employees. However, the column *"%>250 employees"* explains that the number of firms with more than 250 employees is a relatively small percentage of the total number of businesses within the Medical segment compared to the other segments. The column "*50-249 employees"* shows that the number of enterprises within D&S, T&M and MED containing between 50 and 249 employees are also quite similar. Again, the High-tech systems segment has by far the most companies between 50 and 249 employees. Also, HTS has the highest density of businesses with more than 50 employees according to the column "*%>50 employees".* The Medical segment relatively also (by far) has the lowest percentage of businesses with more than 50 employees compared to the other segments. This indicates that the volume of SMEs is likely to be relatively high compared to the other segments. However, the absolute

numbers are likely to be more interesting for Business X, as these numbers give a broad indication of the availability of potential customers within the market segments. To conclude, High-tech systems seems to be the most attractive segment regarding the criterium company size. The analyses per country can be found in appendix 13.

5.3.4 Conclusion attractiveness

For the analysis of the attractiveness of the market segments, conclusions will be drawn per market segment. These conclusions will be drawn based on the results of the evaluated criteria. The results of the R&D budgets, which already have been identified in the pre-screening step, will also be included.

D&S

The Defense & Security segment seems to be the least attractive market segment based on the selected criteria. The segment scores the lowest of the four segments on innovation rate, R&D budgets and profit margins. When the results of the criterium company size, which resembles the market size in number of organizations, are examined, the segment shows similar numbers to the other segments (besides HTS). Within this analysis, a fair number of large organizations are present in the segment, which is positive for Business X. However, when the other criteria are also considered, many of these organizations likely do not fit the firm. As mentioned, the segment scores relatively low on profit margins. Consequently, many businesses within the segment probably have low profit margins. As mentioned, Business X explained that it is more difficult to do business with firms with low profit margins. Furthermore, R&D budgets are also relatively low in the segment. As the R&D budgets indicate revenue that Business X can generate in a segment, the relatively low R&D budgets in Defense & Security will likely decrease the segment's attractiveness. Finally, the low innovation rate in the segment might indicate that the frequency of organizations introducing new products might be relatively low. Nevertheless, it should be considered that the Defense subsegment heavily influences profit margins and R&D intensity. When the D&S segment is split into Defense and Security separately, the Security segment shows statistics similar to the other segments concerning profit margins and R&D intensity, for example.

To conclude, the attractiveness of the D&S segment is not very high, especially when compared to the other segments. Therefore, there might be reason to decide not to focus on the segment. There might still be some interesting projects available for the organization, but the analysis indicates that it is unlikely that the segment will provide large numbers of projects. However, as mentioned, Business X is already active within the segment. Therefore, this thesis should advise Business X on whether targeting this market segment makes sense. Based on the advice, the firm's management will decide whether strategic actions will be taken. Therefore, even though the attractiveness of the segment is debatable, the segment will go to the next and final step of the framework.

T&M

The Test & Measurement segment is a pretty attractive segment based on the selected criteria. When looking at the company size criterium, the segment shows a fair number of (large) organizations. Furthermore, the segment scores relatively well on the R&D budget criterium. In most countries, the R&D expenditures are decent concerning Test & Measurement and the segment scores the highest on R&D intensity. Moreover, T&M and the Medical segment score the highest on profit margins. For Business X, this is pivotal as the firm's applications focus on quality rather than providing the lowest price possible. Consequently, a relatively high profit margin will cause less friction between customers and Business X and smoother cooperation. Finally, the segment also scores high on innovation rate. This could indicate that new products are introduced quite frequently within the segment. As Business X supports organizations developing new products, this will likely positively impact the segment's attractiveness.

To conclude, the Test & Measurement segment seems quite attractive. Based on the analysis, a fair number of exciting projects and customers are expected to be found within the segment. Therefore, Business X could achieve success in Test & Measurement. Thus, analyzing the fit between this segment and Business X and proceeding to the final step of the framework would make sense.

MED

The Medical segment is decently attractive based on the selected criteria. The company size criterium shows a good number of (large) organizations. Furthermore, the average profit margin within the segment is high. This is relevant as the applications

of Business X focus on quality rather than providing a low price. Consequently, a relatively high average profit margin is expected to reduce the friction between Business X and customers concerning price agreements. Furthermore, the segment scores well on innovation rate. This might indicate that innovative products are introduced frequently within the market segment. As Business X supports organizations in developing new products, this positively impacts the segment's attractiveness. Moreover, the R&D intensity of the Medical segment is also relatively high, which indicates a high degree of innovation within the segment. However, as mentioned in the pre-screening step as well, the R&D expenditures in the segment are relatively low. For Business X, the R&D expenditures/budgets of organizations within a market segment are pivotal, as these expenditures are a crucial source of revenue for the firm. Therefore, the low R&D expenditures will likely negatively impact the segment's attractiveness. Nevertheless, it should be considered that the R&D expenditures were only thoroughly examined for four countries and the segment scores relatively well on the other criteria.

To conclude, the Medical segment is decently attractive. It scores high on most criteria besides R&D expenditures. However, the R&D expenditures/budgets are pivotal for Business X, as mentioned in the assignment of weights and pre-screening. Therefore, the relatively low R&D expenditures will likely impact the segment's attractiveness. Nevertheless, as the segment scores well on the other criteria, it is expected that at least some success can be achieved within the segment. Therefore, the segment is certainly attractive enough to go to the final step of the framework.

HTS

Based on the selected criteria, the High-tech systems segment is attractive for Business X. The criterium company size, which is critical for Business X, shows many (large) organizations within the segment (compared to the other segments). Furthermore, when looking at the R&D budgets, which are also critical to Business X, the segment scores high as well. Regarding R&D expenditures, the segment scores the highest. Furthermore, the segment scores well on the R&D intensity as well. Therefore, the segment scores great on the criteria perceived as most crucial within the assign weights step. The large availability of large organizations and relatively high R&D expenditures within the segment indicate a high potential for large revenues within High-tech systems. Moreover, the segment also scores high on innovation rate, meaning new products are introduced frequently within the market. Finally, a good profit margin can also be found within the segment, with an average gross profit margin of about 40%.

To conclude, the High-tech systems segment is the most attractive market segment for Business X. The segment scores excellent on the most important criteria and good on the remaining ones. Therefore, many exciting customers and projects are expected within the segment. Consequently, the High-tech systems segment can proceed to the framework's final step.

5.4 Fit between market segment and organization

In the final step of the framework, the fit between the organization and the market segments will be examined. The framework explains that three relevant areas can be analyzed to study this fit. These areas are fit between product/service and segment, fit between organizational factors and segment and fit between financing and segment. However, Business X indicated that it is most important to focus on whether the product/service (in the case of Business X applications) aligns with the segments and the capabilities/competencies (which is a part of the area fit between organizational factors and market segment) align with the segments. The financing part is perceived as less relevant by the organization and will not be mentioned in this analysis.

5.4.1 Fit product/service and market segment

Business X is an electronic design house focusing on customer-specific electronics and embedded systems. Within these services, emphasis is placed on advanced applications for developing high-performance and reliable products. Furthermore, the solutions created by Business X tend to focus on mission-critical applications. Mission-critical applications entail systems *"that in the presence of failures or degradation, can lead to property damage, reputation damage as well as to prevent the main task from being completed"* (Mattos et al., 2021, p. 2). Consequently, it can be concluded that the organization focuses on creating mission-critical advanced electronic applications.

Thus, to match the applications of Business X with the examined market segments, it is relevant that products within the analyzed segments possess the following requirements:

- Mission-critical applications

- Advanced applications
- Electronics involved

To examine if the products/services of Business X align with the relevant market segments, it will be analyzed whether the products within the segments match the abovementioned requirements. The NACE code classification will be applied again to get an overview of what products/services can be found within the market segments. Therefore, what products can be found per NACE code per segment will be studied. A list of the products per NACE code is provided by Eurostat. Next, whether these products/services require electronics, are mission-critical and advanced will be indicated.

D&S

For the analysis of the Defense & Security segment, the following NACE codes have been examined*: "Manufacture of communication equipment," "Manufacture of electrical equipment," "Building of ships and boats," "Manufacture of air and spacecraft and related machinery" and "Manufacture of military fighting vehicles."* Business X has a relatively low fit with the NACE codes *"Manufacture of military fighting vehicles"* and *"Building of ships and boats"* as only a low degree of electronic applications are required in these codes (Eurostat, 2008). Next, there is a partial fit with the codes "*Manufacture of communication equipment"* and *"Manufacture of electrical equipment."* A large part of these codes focuses on consumer electronics, which mainly contain less advanced applications (Eurostat, 2008). However, some relevant applications are present in both codes. The code concerning the manufacture of communication equipment contains relevant products like access control systems or other alarm systems, which are suitable for the Security segment (Eurostat, 2008). Furthermore, the code regarding electrical equipment contains relevant products for traffic control systems, which are also appropriate for the Security market (Eurostat, 2008). The code regarding the manufacture of space and aircraft and related machinery contains many relevant products. Products concerning avionics, space, and guided munitions seem relevant (Eurostat, 2008). Finally, a small part of a NACE code of the Test & Measurement segment can also be assigned to the Defense & Security segment instead of the Test & Measurement market. Relevant products in this code mainly focus on radar systems (Eurostat, 2008).

The limited fit between the applications of Business X and the NACE codes also has some consequences for the market size of the segment. When looking at the company size analysis of the attractiveness step (see table 10), it can be seen that the number of companies per NACE code is quite evenly spread for the 250+ and the 50-249 categories (besides the code *"Manufacture of military fighting vehicles"*). However, due to the low fit with the codes "*building of ships and boats*" and *"Manufacture of military fighting vehicles"* and the partial fit with the codes "*Manufacture of communication equipment"* and *"Manufacture of electrical equipment,"* it is expected that the number of relevant organizations in these codes will drastically decrease. Therefore, the market size of the Defense & Security segment seems to be affected by this analysis of the fit between applications of Business X and the market segment.

T&M

Within the Test & Measurement segment, the NACE code *"Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks"* has been examined. This code contains various products relevant to Business X in both the Test and the Measurement part of the segment. For the Test segment, test equipment is mainly appropriate (Eurostat, 2008). For the Measurement segment, a wide variety of products that require advanced electronics that are mission-critical can be found (Eurostat, 2008). Examples of relevant products are systems for building automation or motion detection. As a good fit between the applications of Business X and the NACE code has been identified, the firm's applications are expected to align with the Test & Measurement segment. However, some of the products found in the code might be more relevant to other segments. For example, radar systems might be more appropriate for the Defense & Security segment and laboratory analysis equipment might be more suitable for the Medical segment.

MED

Within the Medical segment, two NACE codes were examined. These NACE codes are *"Manufacture of irradiation, electromedical and electrotherapeutic equipment"* and the NACE code *"Manufacture of medical and dental instruments and supplies."* The applications of Business X fit well with the products of the first code. The products in this code contain products that require advanced electronics that are mission-critical (Eurostat, 2008). However, the fit with the other code is relatively low. Most products in this code do not require much electronics and are also mainly not very advanced (Eurostat, 2008).

Therefore, Business X's applications only partially fit with the Medical segment. Finally, as mentioned in the Test & Measurement segment analysis, some products like laboratory analysis equipment, mentioned in the NACE code of the test & Measurement market, might suit the Medical segment better.

The limited fit with the code *"Manufacture of medical and dental instruments and supplies*" is expected to have detrimental consequences for the market size of the Medical segment. Again, when looking at the analysis of the company size in the attractiveness step, it can be seen that most of the companies in the Medical segment can be found in this NACE code. As Business X has a low fit with the products of this code, it is expected that the market size of the Medical segment will be drastically lower than mentioned in table 10.

HTS

The NACE codes examined within the High-tech systems segment are *"Manufacture of machinery and equipment n.e.c."* and "*Manufacture of electrical equipment."* The first NACE code consists of many different types of machinery and equipment (Eurostat, 2008). Within the attractiveness analysis of the previous chapter (where NACE codes have been applied for the criteria company size and R&D budgets), no distinction in data has been made for the different types of machinery and equipment by the statistical agencies. However, as machinery and equipment are pretty broad terms, it is critical to examine what types of machinery and equipment are included in the NACE code. First, the subsegments "Manufacture of metal forming machinery and machine tools" and "Manufacture of other special-purpose machinery" seem to be quite compatible with the applications of Business X (Eurostat, 2008). The subsegments contain the development of complex, specialized, mission-critical industrial machinery requiring electronics. Second, the subsegments "Manufacture of general-purpose machinery" and "Manufacture of other general-purpose machinery" only seem to have a low fit as most products are less complex and mission-critical (Eurostat, 2008). Finally, the subsegment "Manufacture of agricultural and forestry machinery" primarily contains the development of agricultural vehicles. Therefore, these activities require less electronics and are less relevant for Business X (Eurostat, 2008). However, the subsegment also contains some activities regarding manufacturing more industrial agricultural and forestry machinery, which suits the organization well. For the code *"Manufacture of electrical equipment,"* a small part concerning power control is relevant for Business X, as the products relating to power control fulfill the criteria of being advanced electronics that are mission-critical (Eurostat, 2008)

For the High-tech systems segment, the fit between the applications of Business X and the products of the NACE codes of the segment also has consequences. Business X appears to have a good fit with a large part of the NACE code *"Machinery and equipment n.e.c."* (and also a low fit with a substantial part of the code) and a partial fit with the code *"Manufacture of electrical equipment."* When looking at the market size mentioned in the company size analysis in the attractiveness step, only a few companies can be found in the code concerning electrical equipment. Therefore, the partial fit with this code does not affect the market size too much. With the other code, a substantial part suits the applications of Business X and a considerable part does not suit the firm very well. However, as the number of organizations in the code is high, it is expected that there will still be a considerable market size available in the High-tech systems segment.

5.4.2 Fit organizational factors and market segment

Within the analysis of the fit between organizational factors and the market segments, focus will be placed on whether the competencies/capabilities of Business X align with the required competencies/capabilities of the market segments. These competencies and capabilities represent the knowledge and skills that the organization's workforce possesses. Competencies can be defined as *"the capacity of the human being to meet complex demands, going beyond cognitive elements and functional aspects to include interpersonal attributes and ethical values (including skill, knowledge and attitude)"* (Kipper et al., 2021, p. 2). The competencies that will be analyzed are FPGA, test systems, model-driven development, analog & mixed signal design, power & motion control and embedded software. Whether the competencies/capabilities of Business X align with the examined segments will be studied based on an analysis of suppliers providing relevant components for the competencies and interviews. As these are the same interviews as the ones in the pre-screening step, the characteristics of the interviews can be found in paragraph 5.2.1.

Methodology analysis suppliers

Within the analysis of suppliers, firms that provide relevant components used for applying the competencies will be studied. For each competence, five suitable companies will be analyzed (test systems four). The analysis aims to discover in what

segments specific components are applied per organization. As five organizations are examined per competence, trends might be found regarding where components relevant for executing a particular competence are applied. Consequently, as Business X also uses these components to develop their applications, an indication of the fit between the firm's competencies and the studied market segments can be found when it is known where the parts are used. Moreover, the analysis will not solely focus on the segment level but will also consider the sub-segment level or sometimes even the product level. Hence, the analysis will also indicate the relevant subsegments per competence. For each match between the organization and the segment, the specific applications mentioned by the organization were examined in that segment. This way, it was possible to identify trends in applications within the segment on the sub-segment level or sometimes even on the product level.

Results analysis organizations

A general overview of the analysis results can be found in table 11. This table displays per competence in what segments specific relevant components are applied according to the studied firms. Furthermore, for every organization, it has also been examined in which subsegments (or for what products specifically) the competence has been applied. In the upcoming paragraphs, the results of these analyses (segment, subsegment and product level) will be discussed per competence.

FPGA					
Organization	**D&S**	**T&M**	**MED**	**HTS**	**Source**
AMD (Xilinx)	X	X	X	X	AMD | together we advance_ AI
Microchip technology	X	X	X	X	FPGAs and PLDs | Microchip Technology
Intel	X	X	X	X	Intel® FPGAs and Programmable Devices-Intel® FPGA
Lattice	X		X	X	Lattice Semiconductor | The Low Power FPGA Leader
Logic Fruit	X	X		X	FPGA Design Services | FPGA Prototyping | FPGA Acceleration (logic-fruit.com)
Test systems					
Organization	**D&S**	**T&M**	**MED**	**HTS**	**Source**
National Instruments	X		X	X	Test and Measurement Systems, a part of Emerson - NI
Keysight	X		X	X	Industries | Keysight
Tektronix	X		X	X	Electrical Engineering Solutions and Applications | Tektronix
Averna	X		X	X	Test Engineering Services Tailored to Your Industry | Averna
Model-driven development					
Organization	**D&S**	**T&M**	**MED**	**HTS**	**Source**
Mathworks	X	X	X	X	MathWorks - Solutions - MATLAB & Simulink
Ansys	X		X	X	Accelerating the Digital Transformation of Industry with Simulation | Ansys
Wolfram Mathematica	X		X	X	Wolfram Technical Computing Solutions for Innovation
Solidworks	X		X	X	SOLIDWORKS | 3D CAD Design Software & PDM Systems
Maplesoft	X		X	X	Engineering - Maplesoft
Analog & mixed signal design					
Organization	**D&S**	**T&M**	**MED**	**HTS**	**Source**
Analog devices	X	X	X	X	Markets | Analog Devices
Texas instruments	X	X	X	X	Industrial design resources | TI.com
Skyworks	X		X	X	Skyworks | Home (skyworksinc.com)
Rohm semiconductor	X	X	X	X	ROHM Semiconductor - ROHM Co., Ltd.
ON Semiconductors	X	X	X	X	Intelligent Power and Sensing Technologies | onsemi
Power & motion control					
Organization	**D&S**	**T&M**	**MED**	**HTS**	**Source**
Texas instruments	X	X	X	X	Industrial design resources | TI.com
NXP	X	X	X	X	Automotive, IoT & Industrial Solutions | NXP Semiconductors
Kollmorgen	X		X	X	Motion Control Solutions | Kollmorgen |
Infineon	X	X	X	X	Applications & Design - Infineon Technologies
Advanced motion controls	X	X	X	X	Industries Experience - ADVANCED Motion Controls (a-m-c.com)
Embedded software					
Organization	**D&S**	**T&M**	**MED**	**HTS**	**Source**
NXP	X	X	X	X	Automotive, IoT & Industrial Solutions | NXP Semiconductors
Microchip technology	X	X	X	X	FPGAs and PLDs | Microchip Technology
Texas instruments	X	X	X	X	Industrial design resources | TI.com
Renesas	X	X	X	X	Supercharge Your Application Design with Renesas Winning Combinations: Analog, Power, Embedded & Connectivity | Renesas
ST Microelectronics	X	X	X	X	STMicroelectronics: Our technology starts with you

Table 11: Analysis fit competencies and market segments (segment level)

FPGA

Five organizations have been analyzed for FPGA to determine whether (and how) the competence is applied within the four relevant market segments. Table 11 shows that competence is frequently applied in all segments. When examining the

Defense & Security segment, all organizations use FPGA for Defense communication systems (like Milcom, Satcom, software-defined radio). Furthermore, most of the studied firms apply the competence for radars, electronic warfare, various avionics, satellites and surveillance (which belongs more to the security segment). Within the Test & Measurement, four out of five organizations apply FPGAs. The main applications of these firms include solutions concerning automated test equipment, especially automated test equipment for semiconductors. Four organizations within the Medical segment also apply FPGA. All these organizations use FPGA for medical imaging. Furthermore, solutions for medical equipment concerning diagnostics, cardiac management and medical ventilators frequently occur among the firms. Finally, the entire studied sample utilizes FPGA in the High-tech systems. Among the organizations, a clear trend in applications can be found. Almost all firms apply FPGAs for industrial automation/smart manufacturing. Moreover, within this domain, a clear emphasis is put on PLCs, robotics, and machine vision.

Test systems

Four firms have been examined for test systems to decide whether (and how) the competence is applied within the relevant market segments. The organizations are active within the Defense and Security, Medical and High-tech systems markets. Table 11 shows that test systems are not applied in the Test & Measurement segment. However, this can be explained by the fact that there is considerable overlap between the competence test systems and the Test part of the Test & Measurement segment. In this case, test systems are not applied for test equipment. Nevertheless, test systems are also not used in the Measurement part of Test & Measurement (for example, for building automation). All four organizations studied have applied the competence test systems in the Defense & Security segment. All these organizations have used test systems for communication systems (e.g., Satcom, Milcom), satellites and radar systems. Furthermore, the competence has also been utilized by multiple firms for electromagnetic spectrum operations and electronic warfare. In the Medical segment, the examined sample all apply test systems for various medical devices. Most firms use the competence to test EMI/EMR/EMC, PCB and battery life within the medical devices domain. Finally, all organizations use the competence for semiconductor testing in the High-tech systems market. Examples of applications for semiconductor test systems include wafer tests, double pulse testing and I-V characterization. Moreover, most analyzed organizations also apply test systems for industrial machinery. A wide variety of applications are mentioned in this area, but data acquisition/management and asset monitoring are the most prominent.

Model-driven development

The competence model-driven development is widely applied among the segments Defense & Security, Medical and High-tech systems. Furthermore, only one organization utilizes the competence in the Test & Measurement segment. Various applications exist within the Defense & Security segment for model-driven development among the organizations. The most common application of the competence in the segment is unmanned vehicles (especially UAVs). Furthermore, similar applications mentioned by at least two out of five organizations are avionics, landing gear, and guidance and navigation systems. The organization applying model-driven development in Test & Measurement uses the competence for automated test equipment and HVAC systems. Next, a trend concerning diagnostic devices exists in the Medical segment, as all the examined organizations apply model-driven development for this type of medical equipment. Moreover, most organizations also use the competence for medical imaging and surgical robots. Finally, the High-tech systems segment also contains many model-driven development applications. Most of the solutions mentioned in the analyzed sample are robotics and the design/engineering of industrial equipment (predominantly mechanical and electrical engineering). Furthermore, industrial automation also has a prominent role in model-driven development for High-tech systems. Some organizations mention industrial automation as a separate domain, while others explain it as a step of machine design.

Analog & mixed signal design

For analog & mixed signal design, five organizations have been examined. The competence is widely applied in all market segments. When looking at the Defense & Security segment, a clear trend exists in the Security part. All organizations have used analog & mixed signal design for surveillance applications. Furthermore, within the Defense market, the competence has been applied to various avionics, space and radar solutions. Analog and mixed signal design has also been applied in the Test & Measurement segment by four out of five organizations. All four organizations have used the competence for building automation. HVAC systems, gas sensors, and smart lighting are recurring solutions concerning building automation. Furthermore, two out of four organizations also mentioned applying analog and mixed signal design for various test equipment like automated test equipment, electronic test equipment and battery formation and test. In the Medical segment, a clear

pattern can be discovered. A large majority of the studied sample uses the competence for medical imaging. Furthermore, most organizations also use analog and mixed signal design for diagnostics devices and patient monitoring. Finally, in the High-tech systems segment, the application of the competence is evident. All organizations use analog and mixed signal design for industrial automation. Recurring topics within industrial automation among the organizations are PLCs, industrial LiDAR, condition monitoring, machine vision and motor control.

Power & motion control

The competence power & motion control is also widely applied among the four segments. When looking at the Defense & Security segment, applications that occur the most among the organizations are satellites (space), radar, communications and surveillance (security). Furthermore, solutions concerning guided munitions, UAVs, and military robotics have been applied by multiple studied organizations. In the Test & Measurement segment, four out of five firms have used power and motion control. The main application found among these organizations is building automation concerning HVAC systems. Furthermore, smart lighting applications were mentioned by two organizations, while test equipment and coordinate measuring machines were only mentioned by a single firm. Within the Medical segment, a variety of common applications can be found. First, power and motion control is applied by most studied organizations for medical/laboratory automation (surgical robots, medical machinery). Second, at least two organizations mention solutions that use the competence for medical imaging, patient monitoring and in-vitro diagnostic devices. Finally, all the organizations have discussed that power & motion control is applied for medical ventilators. A clear pattern of power & motion control applications exists in the High-tech systems. All examined organizations mention that the competence has been used for robotics and industrial automation (or robotics supporting automation). Solutions concerning PLCs, machine vision, industrial PCs, human machine interface and motor drives are common within industrial automation among the organizations, while industrial robots, cobots and mobile robots are recurrent solutions within the robotics domain. Moreover, most organizations also apply power & motion control for industrial machine tools and metalworking machinery.

Embedded software

Finally, the competence embedded software has been examined. This competence has also been extensively applied among the segments. Specific trends regarding embedded software can be recognized within the Defense and Security segment. First, all the organizations discuss embedded software solutions for surveillance and access control, representing the security part of the D&S segment. Furthermore, most organizations also apply the competence in the space domain for payload and satellites, the aviation domain for avionics (like flight control units, for example) and the defense domain for radars. Within the Test & Measurement segment, embedded software is also widely applied. Most of the studied sample applies the competence for building automation (especially HVAC systems). Furthermore, multiple organizations also use embedded software for automated test equipment and metering (water, gas, electricity, heat). Embedded software also has numerous applications in the Medical segment. Most organizations use the competence for medical imaging, therapeutic equipment and patient monitoring solutions. Patient monitoring and medical ventilators, which are therapeutic equipment, are embedded software applications mentioned by all organizations. Within the High-tech systems segment, a clear trend can be identified concerning embedded software applications. All organizations apply the competence for factory automation. Within factory automation, PLCs and robotics are also discussed by all organizations, while condition/monitoring/predictive maintenance, human machine interface and safety are mentioned frequently.

Summary

To summarize the data concerning the level of fit between competencies and especially subsegments, table 12 has been created. This table displays what competencies will likely be the most relevant for what subsegment. The rating applied is based on the number of organizations that have mentioned that their components have been used in a certain subsegment. Suppose no organizations note applications in a subsegment. In that case, it will be rated as "N.A.", one organization mentioning applications will be rated as "+," two or three organizations mentioning applications will be rated as "++," and four or five organizations mentioning applications in a subsegment will be rated as "+++." Consequently, this overview can be used by Business X to view where the firm is most likely to be able to apply its competencies. Something that stands out when looking at the identified subsegments is a significant overlap between them and the NACE codes (or parts of it), which Business X has a good fit with according to the fit analysis between applications and market segments.

	FPGA	Test systems	Model-driven development	Analog & mixed signal	Power & motion control	Embedded software
Defense & Security						
Defense						
Avionics	++	++	++	++	++	++
Space	++	++	+++	+++	++	++
Radar/electronic warfare	++	+++	+	++	++	++
UAV/drones	++	N.A.	++	+	++	++
Guided munitions	++	N.A.	N.A.	++	++	++
Communications	+++	+++	+	++	+++	++
Security						
Surveillance	+++	N.A.	N.A.	+++	++	+++
Access control	N.A.	N.A.	N.A.	+	++	+++
Test & Measurement						
Test						
Automated test equipment	++	N.A.	+	++	+	++
Remaining test equipment	+++	N.A.	+	++	+	++
Measurement						
Building automation	N.A.	N.A.	+	+++	++	+++
Medical						
Medical		+++*				
Medical imaging	+++	++	++	+++	++	++
Diagnostic devices	++		+++	++	++	++
Patient monitoring	++		++	++	++	+++
Surgical devices/robotics	+		++	+	++	+
Therapeutic equipment	++		++	++	+++	+++
High-tech systems						
Industrial automation/Smart industry		++*				
Predictive maintenance/condition monitoring	+		++	++	+	++
PLC	+++		++	++	+++	+++
Human machine interface	++		+	+	+++	+++
Machine learning/machine vision	+++		++	++	++	++
Motor and drive control	++		+++	++	+++	++
Robotics	+++		++	++	+++	+++
Semiconductor devices		+++*				
*Within the Medical and High-tech systems segment, test systems applies a distinction different from the subsegments mentioned						

Table 12: Analysis fit competencies and market segments (subsegment level)

Interviews

As mentioned in the pre-screening step, the six competence officers of Business X were interviewed. During these interviews, it was asked whether these officers perceived that the firm's competencies/capabilities allowed them to serve the examined segments successfully and whether improvements concerning the competencies/capabilities were necessary to serve the relevant segments.

FPGA applications

The first competence that has been discussed is FPGA applications. Business X has a substantial amount of experience with this competence. The interviewee mentioned that FPGA has been applied frequently within the High-tech systems and Test & Measurement segments. Furthermore, a project has also been executed in the Defense & Security segment. The interviewee mentioned that the firm's FPGA techniques were successfully applied in all three segments. However, FPGA has yet to be used in the Medical segment by Business X. Nevertheless, the competence officer mentioned that the FPGA competence of Business X would be able to serve the segment. According to the competence officer, the competence is best applied in High-tech systems and Test & Measurement. However, this is mainly because Business X has the most experience regarding FPGA in these segments. Hence, the competence can be applied in all four segments. Nevertheless, if the firm wants to grow, especially in the Defense & Security and Medical segments, more experience would be pivotal.

Test systems

The second competence that has been examined is test systems. Business X has been working with this competence for years now. Therefore, the organization has experience with test systems. During the interview, the competence officer mentioned that Business X has applied the competence the most within the High-tech systems market. Furthermore, the organization has also used test systems within the Defense & Security and the Test & Measurement segments. Projects concerning the competence have yet to be executed within the Medical segment. Nevertheless, the competence officer expects that the firm can serve this segment. According to the interviewee, the biggest difference/impediment within this sector compared to the others is the strict standards within the Medical market. The competence has been applied successfully within High-tech systems, Defense & Security and Test & Measurement. No insurmountable problems were identified by Business X while using the test systems competence. Nevertheless, the interviewee mentioned that the firm's knowledge and capabilities best suit the Test & Measurement segment. Therefore, it is preferred that Business X acquires more projects

within this segment, according to the competence officer. Moreover, the interviewee also thinks more projects within this segment are available in the market.

Model-driven development

The third competence that will be discussed is model-driven development. During the interview with the competence officer of model-driven development, it was explained that the competence is a method of working that provides support for the other competencies. Model-driven development is a new competence of Business X. Consequently, it has not yet been applied in many projects. However, it has been used within three out of four market segments (D&S, Med, HTS). Within these projects, the application of the competence was successful. Furthermore, it was explained that the competence could also be used for Test & Measurement, as model-driven development is a method of working and, therefore, broadly applicable. Moreover, it was explained that the competence has significant advantages for highly regulated sectors (like D&S and Medical, for example). Within these segments, standards are often relevant. Codes that comply with these standards can be retrieved when applying model-driven development tools. Therefore, time spent on compliance with specific standards and regulations can be decreased.

Analog & mixed signal design

The fourth competence that has been examined is analog & mixed signal design. This competence has been applied since the start of the company. Therefore, Business X has a substantial amount of experience with the competence. Analog & mixed signal design has been used in all the examined segments. Especially within Test & Measurement, the firm had many projects concerning Analog & mixed signal design. Furthermore, Business X also had quite some projects in the High-tech systems segment and a few in the remaining segments. However, projects in the Medical segment have mainly been executed in the past. Nevertheless, the interviewee mentioned that the competence suits all mentioned segments and no significant differences exist between projects among the four examined markets. However, as analog & mixed signal design includes a lot of working with sensors and measuring, it is explained that the Test & Measurement segment aligns the best with the competence.

Power & Motion control

The fifth competence that will be discussed is power & motion control. It was explained that Business X has quite some experience with this competence. However, it has mainly been applied in projects concerning the High-tech systems segment. For the Test & Measurement segment, power & motion control has been used for an internal project. At the same time, the firm has no experience concerning the competence in the Defense & Security and Medical segments. The competence officer explained that the organization has the capabilities to serve these market segments as well. Nevertheless, the competence has yet to be applied in the other segments due to a lack of demand for application-specific power & motion control projects within the segments besides High-tech systems, according to the interviewee. The competence officer explained that power and motion control for Business X focuses explicitly on creating application-specific projects. However, if interesting application-specific projects emerge in T&M, D&S or Medical concerning power & motion control, Business X is expected to be able to execute them.

Embedded software

The final competence that has been examined is embedded software. Business X has a good amount of experience concerning this competence. However, this experience is mainly received within the High-tech systems segment (especially industrial automation). Nevertheless, the firm also has experience within the Medical and Test & Measurement segment. According to the competence officer, the competence has been applied successfully within these segments. However, specific requirements and standards regarding embedded software should be considered within the medical segment. These requirements and standards entail extra work for the organization. However, Business X has yet to gain experience concerning embedded software within the D&S segment. According to the competence officer, it is difficult to estimate whether the competence and segment align as it is hard to determine what embedded software projects might look like in the segment.

5.4.3. Conclusion suitability

D&S

After examining the fit between Business X and the Defense & Security segment, it can be concluded that there is a good match between Business X and a decent part of the segment. The analysis of fit between product/service (or, in this case,

applications) and market segment and the analysis of fit between capabilities and market segment have pointed out that multiple subsegments of Defense & Security suit the company. According to the analyses, subsegments that align with Business X are aircraft, space, radar/electronic warfare, guided munitions and communications. However, the analyses also discovered that the market size of the D&S segment is likely to be substantially lower than displayed in the attractiveness analysis of the company size. Consequently, the segment's attractiveness is likely to be even lower than previously expected. To conclude, selecting the market based on suitability can be justified, as a fit between Business X and certain subsegments of the D&S segment can be found. However, as the attractiveness is even worse than expected, it is questionable how many projects are available for Business X in these relevant subsegments. Therefore, rejecting the Defense & Security segment can also definitely be justified.

T&M

When the results of the fit between Business X and the Test & Measurement segment are analyzed, it can be concluded that a proper match between the firm and the segment can be identified. Based on both analyses, the applications and capabilities of Business X are relevant for developing various products within Test & Measurement. In the Test segment, diverse (automated) test equipment seems appropriate for Business X, while equipment for building automation seems especially suitable in the Measurement segment. However, it should be considered that the fit analysis between the product/service and market segments also impacts the attractiveness analysis. Some of the products included in the NACE code of Test & Measurement (like radar or laboratory equipment) have been assigned to other segments. Nevertheless, what part of the NACE code is covered by these products is unknown. Therefore, the exact impact of this assignment cannot be determined. In closing, selecting the Test & Measurement segment would be justified based on the suitability analysis. Also, the assignment of radar and laboratory equipment to other segments is not expected to reduce the segment's attractiveness in a way that makes selecting the segment unjustifiable.

MED

Only a partial match can be found after studying the fit between Business X and the Medical segment. The analysis between product/service and market segment has pointed out that the products found in the NACE code *"Manufacture of medical and dental instruments and supplies"* have low suitability with Business X. Only a tiny part of the products in the code fulfills the requirements of being sophisticated, mission-critical and needing electronics. Consequently, the segment's attractiveness is also likely to be drastically reduced, as the vast majority of companies in the Medical segment can be found in this code (see analysis company size). However, the analysis between product/service and segment also indicates that the fit with the other NACE code is quite good. This code contains products similar to the subsegments mentioned in the analysis between capabilities and market segments (Medical imaging, diagnostic devices, therapeutic equipment, patient monitoring and medical robotics). Consequently, Business X also possesses the relevant capabilities to serve these subsegments. Moreover, laboratory equipment was mentioned within the NACE code of Test & Measurement. These products can also be assigned to the Medical segment. In closing, selecting the Medical segment might be debatable based on the suitability analysis. As mentioned, the market size of the segment might be drastically reduced because of the low suitability between Business X and the NACE code *"Manufacture of medical and dental instruments and supplies."* Consequently, there seems to be justification for rejecting the segment. However, as mentioned, some subsegments do suit the firm. When Business X believes it can find enough potential projects in these subsegments (even though there is a relatively low market size), selecting the segment can be justified.

HTS

The analysis results between Business X and the High-tech systems segment explain that a good match can be identified. The analysis regarding the fit of product/service and market segment shows that a wide variety of industrial machinery fulfilling the requirements of needing electronics and being mission-critical/advanced can be recognized. The analysis between capabilities and market segment points out that the capabilities of Business X are very relevant for supporting various aspects of the industrial automation of industrial machinery. Furthermore, during the interviews with the competence officers, it was also discussed that the company already has quite some (positive) experience within the segment. In closing, selecting the High-tech systems segment would make much sense based on the suitability analysis. Moreover, as mentioned in the attractiveness segment, High-tech systems also has the highest level of attractiveness. Hence, it is even recommended that the segment is considered as their main segment.

6. Evaluation

Within this chapter, the evaluation step will be discussed. This step entails the evaluation of the demonstrated artifact. First, the goal of this step will be explained. Next, the question of whether the design propositions were fulfilled will be addressed based on the results of the demonstration of the created market segment selection framework.

6.1 Goal

The fifth step, evaluation, examines how well the demonstrated artifact supports a solution to the research problem. Therefore, the objectives of a solution (as mentioned in step 2) are compared to the observed results obtained by using the artifact in the research context. After the evaluation, the researcher decides if the artifact sufficiently supports a solution to the problem or whether it is necessary to iterate back to step 3 to improve the effectiveness of the artifact (Peffers et al., 2007; Vom Brocke et al., 2020). Consequently, the goal of this step is to find out whether the demonstrated artifact, concerning market segment selection in this case, indeed provides a solution to the research problem within this paper, which is the lack of a proper framework concerning market segment selection for tech-based organizations. Whether the research problem has been solved will be examined by comparing the data from demonstrating the framework to the design propositions.

6.2 Evaluation results

The goal of this thesis was to answer the following design question: "***How can tech-based businesses create a foundation to make well-considered decisions regarding the selection of market segments by applying a market segment selection framework that specifically considers their needs?"***. To answer this question, a market segment selection framework for tech-based businesses has been developed and demonstrated in this thesis. Design propositions have been developed to determine whether the framework can create a foundation for tech-based firms to make well-considered decisions regarding selecting suitable and attractive market segments. These propositions resemble the criteria that the framework must fulfill to prove its worth. Based on a discussion of the results of the demonstration of the artifact, it will be explained whether the created framework indeed met the propositions.

In chapter 3.2.3, the different propositions are mentioned. Three out of four propositions are represented in the framework as a step. The first proposition focuses on examining the attractiveness of the segments, which is resembled in the second step of the framework. The second proposition focuses on analyzing the suitability, which is represented in the artifact's third step. The third proposition mentions the creation of a quick scan of the segment, described in the framework's first step. The final proposition focuses on limiting the rigidity of the market segment selection process and is embedded within the entire model and its separate steps. The discussion concerning the propositions will follow the chronological order of the created framework. Hence, the results concerning the third proposition will be discussed first. Next, the discussion concerning the first and second propositions will follow, respectively. Finally, the fourth proposition will be talked about.

Design proposition 3: Quick scan

The design proposition resembling the first step of the created artifact (the pre-screening step) is: ***(C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) flexibly select the right market segments (M) by creating a quick scan of the analyzed market segment(s).*** Hence, this step should provide organizations with flexibility in the market segment selection process by making an overview that can swiftly determine the potential of market segments. The framework suggests two relevant steps for creating this overview in the pre-screening: an analysis of previous experiences and an analysis of critical variable(s).

During the demonstration phase, the analysis of previous experiences was conducted through interviews with the competence officers of Business X. Throughout these interviews, it became evident that the firm could execute projects within all four examined segments successfully. Nevertheless, it was mentioned that within the Medical and Defense & Security segments, standards and regulations were present that entailed some extra difficulties. However, these were manageable. To analyze the critical variable(s), the R&D budgets of companies active in the examined segments were studied. This variable is pivotal for Business X as these R&D budgets primarily form the organization's revenue. Based on this analysis, much information relevant to determining the potential of the segments became evident. The Defense & Security segment, especially the Defense part of it, scored (relatively) low on the R&D budgets criterium. Consequently, the segment's potential was also a bit debatable. In this case, there was still enough potential to examine the segment more extensively. However, in case the R&D

score, and thus the potential, would have been even lower, the pre-screening would have provided a foundation to reject the segment to prevent the organization from wasting time extensively examining it further. Moreover, the pre-screening results also created a good foundation for determining the potential of the remaining segments, especially by gathering relevant insights regarding the critical variable R&D budgets. Hence, assuming that the design proposition is fulfilled and that a quick scan can support organizations in flexibly selecting the right market segments seems justified.

Design proposition 1 Examination of attractiveness

The design proposition representing the second step of the created artifact is*: **(C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) select the right market segments (M) by examining the attractiveness of the analyzed market segment(s).*** This step should support organizations in selecting the right market segments by evaluating the attractiveness of the segments. The framework recommends applying the following sequence for this step: select attractiveness criteria, assign weights to selected attractiveness criteria, evaluate attractiveness criteria.

Four criteria were selected when adding the R&D budgets criterium from the pre-screening step. These are R&D budgets, company size, profit margins and innovation rate. After a discussion with the management of Business X, it was determined that the criteria R&D budgets (which is evident as it has been applied as a critical variable in the pre-screening step) and company size were the most important for the firm. After analyzing the criteria, it was possible to identify the attractiveness of the market segments. The High-tech systems segment was the most attractive, the Test & Measurement market also scored well on attractiveness and the Medical segment had a decent attractiveness. However, for the Defense & Security segment, there would have been a foundation to reject the segment as it did have a questionable attractiveness based on the analysis. To conclude, based on the demonstration results, examining the attractiveness helps organizations select the right market segments, as the analysis has provided a substantiated foundation of what segments are (most) interesting for the firm and what segments are not. For example, the results of the attractiveness analysis provided a proper foundation on why High-tech systems is likely to be the most attractive segment and why the Defense & Security segment is the least attractive and might even be rejected.

Design proposition 2 Examination of suitability

The design proposition resembling the final step of the framework is: ***(C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) select the right market segments (M) by examining the suitability of the organization with the analyzed market segment(s).*** This step should help select the right market segments by studying their suitability with a firm. For this step, three relevant areas that can determine the fit between a company and a market segment are mentioned: fit between product/service and market segment, fit between organizational factors and market segment and fit between financing and market segment.

Within the execution of this step, the fit between product/service, or in the case of Business X application and market segment and the fit between some organizational factors and market segment have been analyzed. The fit between financing and market segment was deemed less relevant by Business X, which is why this has not been examined in this thesis's case study. The analysis of the fit between the application and the segment has had some consequences, especially for the Medical segment. A substantial part of the products that are relevant in the segment do not align with the applications of Business X. Consequently, the market size of the Medical segment was severely decreased after this analysis, which proves the importance of conducting this step as this might be a reason to reject the segment. Furthermore, during the fit analysis between organizational factors and market segments, emphasis was placed on the fit between competencies and market segments. This analysis displayed a good fit between Business X and the segments in general and also provided insights on the subsegment level. To conclude, analyzing the suitability of a segment helps organizations select the right markets, as the analysis identifies what market segments align with Business X and what do not. The alignment between organization and segment can form a foundation to select a segment if present and reject a market segment if not present.

Design proposition 4 Minimization of rigidity

The final proposition focuses on the design of the entire framework and its separate steps. This proposition is: ***(C) In order for tech-based businesses to overcome market segment selection questions, (I) the created market segment selection artifact should be used to (O) flexibly select the right market segments (M) by limiting the rigidity of the***

market segment selection process. This proposition entails that the framework's structure should provide organizations with flexibility and a low degree of rigidity within the market segment selection process.

As mentioned, this proposition focuses on the design of the entire framework and its separate steps. First, the minimization of rigidity can be found in the decision part of each step. After each step, a decision should be made whether it is justified to go to the next step of the framework. Consequently, when, for example, a market segment should be rejected after the pre-screening step, an organization does not have to waste time examining the market segment more extensively. This is an improvement in minimizing the rigidity compared to mathematical frameworks, especially. These frameworks require the user to go through all process steps before a segment can be selected or rejected. However, the framework provided by Freytag & Clarke (2001) also allows users to reject the wrong market segments during the process. Within the case study of this thesis, it might have been justified to reject the Defense & Security segment after the second step of the model. Hence, if the decision to reject the segment were indeed made, the suitability of Business X with the segment would not have to be examined.

Second, most frameworks mentioned by theory bring up a rigid list of criteria that should be used to examine the attractiveness of a market segment. As explained in the Design & Development chapter (paragraph 4.3.3), multiple research mentions that, for example, a selection of (sub)criteria from Porter's five forces model should be applied to determine the attractiveness of a market. Moreover, a list of rigid criteria was also mentioned by Freytag & Clarke (2001). Even though these criteria might be relevant for organizations to determine a segment's attractiveness, a "golden" list containing the perfect criteria that apply to each firm does not exist. Therefore, using these frameworks might limit organizations when determining the attractiveness in this case. Within this thesis's case study, the profit margins or innovation rate within the segments were relevant criteria. Theorists in the market segment selection literature did not explicitly mention these criteria. However, for Business X, these were relevant criteria. Therefore, within the framework of the thesis, it is recommended that each organization determines the relevant criteria themselves instead of applying rigid lists mentioned in theory, for example. This also applies to the pre-screening step, where Dolnicar et al. (2018) note that a strict list of knock-out criteria should be applied. Nevertheless, the criteria mentioned in this thesis or by theory can be used as inspiration.

Finally, embedding a pre-screening step into the framework minimizes the rigidity of the framework as well. Almost all models mention examining a segment's attractiveness and a substantial amount also studies the suitability. Therefore, within theory, these two factors are crucial for market segment selection. In the pre-screening step, parts of these factors are already examined. The analysis of previous experiences already gives a premature insight into the suitability of a segment. In contrast, the analysis of critical variable(s) already grasps the most important criteria of the attractiveness study. Therefore, when a market segment can be rejected in the pre-screening phase, the attractiveness and suitability only have to be partially studied, reducing the framework's rigidity as organizations only have to analyze the attractiveness and suitability partially. Within the case study of the thesis, all segments were accepted in the pre-screening phase. Still, if it happened, this would thus mean that not the entire analysis of attractiveness and suitability would have been conducted.

Based on the abovementioned arguments derived from the demonstration results, minimizing the rigidity of the market segment selection process helps organizations flexibly select the right market segments.

7. Implications, limitations and future research

This final chapter of the thesis will discuss the implications, limitations, and potential future research options. First, the theoretical implications will be explained. This section will discuss how this thesis adds to the existing literature on market segment selection. Next, the practical implications will be debated. Finally, this research's limitations will be discussed, followed by the avenues for future research.

7.1 Theoretical implications

The results of this thesis contain some relevant contributions to the literature on market segment selection. First, the thesis provides a market segment selection framework that focuses on the needs of tech-based businesses. This is an essential theoretical implication for market segment selection for tech-based firms, as existing literature does not yet provide a framework specifically focusing on this type of firm. Nevertheless, some guidelines concerning market segment selection for tech-based businesses have been developed by Weinstein (2014), who produced a list of the most applied market segment criteria and Slater et al. (2007), who discussed the importance of customers, competition and technology in market segment selection for tech-based businesses. However, a complete framework focusing on tech-based businesses' needs has not yet been developed. Hence, this thesis adds to the literature on market segment selection for tech-based companies by providing this complete framework that especially focuses on the needs of tech-based businesses.

Second, this thesis extends the existing literature on general market segment selection. The primary needs identified for tech-based businesses are maximizing the framework's flexibility and minimizing its rigidity. However, increased flexibility and low rigidity within market segment selection might also be relevant for non-tech-based organizations. Especially the pre-screening step is one of the central representations of flexibility within the created framework. However, using a pre-screening step is relatively untouched within market segment selection theory. A theory that does explain something similar to a pre-screening step comes from Dolnicar et al. (2018), who discuss a list of knock-out criteria. Consequently, the pre-screening step of this thesis adds to that theory by Dolnicar et al. (2018). These knock-out criteria are essential or non-negotiable criteria that should be analyzed before more extensive research on a segment is conducted (Dolnicar et al., 2018). These criteria align with the critical criteria analysis found in the pre-screening step of the artifact created in this thesis. However, multiple organizations that were interviewed in the process of developing the framework also mentioned that before extensively researching a market, the experiences within that market would be examined (or a pilot project(s)) would be conducted to get this experience). This preliminary analysis of experiences can quickly provide insights into whether a segment should be rejected or more extensively examined. Therefore, including this step in a pre-screening contributes to the current market segment selection literature.

Finally, this thesis also adds to market segment selection theory by providing an overview of criteria organizations have used to determine the attractiveness of a market segment. This overview adds to the theory in two ways. First, the criteria mentioned in the overview and theory validate the criteria found in existing market segment selection literature. Second, attractiveness criteria that have not yet been mentioned in theory add to the literature by providing new insights into what criteria organizations can apply to determine the attractiveness of a market segment. Most of the attractiveness criteria found in the overview align with criteria mentioned in existing literature (see also figure 4 and table 2 and 5). Therefore, these criteria validate the criteria mentioned in the market segment selection theory. Nevertheless, multiple of the interviewed organizations mentioned certain ecological factors as selection criteria. However, within theory, this type of criteria is not yet mentioned. Therefore, this thesis also extends the literature by providing new attractiveness criteria that organizations could consider during market segment selection.

7.2 Practical implications

This thesis contains multiple practical implications. First, tech-based businesses can now face market segment selection problems with the support of a framework that specifically considers their needs. This framework provides the user with a tool that can flexibly create a foundation for organizations to determine what market segments should be selected. With the created artifact, tech-based firms can swiftly determine the attractiveness and suitability of the examined market segment(s). Furthermore, especially the pre-screening step might prevent organizations from wasting time extensively exploring a market segment by creating a quick scan that can be used to rapidly determine a market's potential.

Additionally, even though the framework focuses on tech-based businesses, it can also be helpful in practice for other organizations. The main desire of tech-based businesses regarding market segment selection is flexibility. Hence, flexibility is

the main characteristic distinguishing the thesis framework from other market segment selection frameworks. Therefore, this framework can also add value to non-tech-based organizations that value flexibility when facing market segment selection problems.

Finally, as previously mentioned, it is pivotal that marketing strategy and market segments align perfectly. Applying the artifact of this thesis allows organizations to obtain relevant insights that can be used as a foundation to develop a marketing strategy and ensure that this strategy aligns with the market segment(s). For example, for Business X, in this case, an overview has been created that displays what competencies align well with particular (attractive) (sub)segments. This overview can be embedded in the marketing strategy by pinpointing what competencies should likely be exploited for what specific (sub)segments. Consequently, organizations can also use the results of applying the framework as a foundation for their marketing strategy.

7.3 Limitations and future research

Like most studies, this study also has its limitations. To begin, there are some limitations concerning the interviews conducted to develop the framework created in this thesis. First, a total of eight interviews have been conducted for the development of the framework. Even though the final interview did not provide new insights, which might suggest data saturation, this sample size might be relatively low. The causes of this relatively low sample size are primarily based on time constraints. Nevertheless, the created framework is not solely based on the interviews, as theory has provided many relevant insights for building the framework. Second, the interviewed organizations are all based in the same province of the Netherlands. Hence, the external validity might be slightly affected. The similar context of the organizations was coincidental, as many organizations outside of the province have been contacted. However, no responses were obtained in these regions. Nevertheless, the theory provided insights concerning market segment selection in different countries/regions, enhancing the research's external validity. Third, as mentioned before, some of the interviews were held online. Detecting emotional cues within online interviews could be more challenging, and misunderstandings might occur more frequently. However, this limitation has been minimized by asking probing questions and adding extra verbal cues.

A minor limitation concerning the inter-rater reliability of the coding process of the data obtained through the abovementioned interviews is also found. The researcher of this thesis executed the coding process of the interviews. Next, another researcher judged this process and mentioned that about 90% of the codes would align with the ones found by the thesis' researcher. Even though this is quite a high percentage, there is still a small difference between the codes among the researchers. Nevertheless, a high percentage of similarity between researchers usually entails a good score on Cohen's Kappa, a measure that can be used to assess the inter-rater reliability of research (Byrt et al., 1993). Hence, this can indeed be seen as a minor limitation only.

Finally, some limitations regarding the demonstration of the artifact exist. First, the demonstration of the framework has been executed by applying a single case study. One of the most significant problems with a single case study is that it often limits the external validity of research. Even though the artifact proved its worth at the case organization, it is unknown whether the framework also works for other tech-based businesses. Second, the context of the case organization is quite specific. The organization is based in the Netherlands and focuses on electronic applications. However, it has yet to be demonstrated that the framework also works in a different context in terms of, for example, countries or other types of tech-based businesses besides a vendor of electronic applications.

Future research could contribute to this thesis in several ways. First and foremost, there are multiple recommendations for future research concerning applying the created framework in more case studies. To start, it is recommended that case studies are conducted to test the developed framework in different contexts. These case studies can provide real-world experiences of how the framework functions in circumstances different from the ones in this thesis. Hence, these case studies can enhance the external validity of the framework. Next, due to time restrictions, it has not been possible to examine whether the conclusions concerning the analyzed market segments within this thesis were indeed correct. Hence, it is recommended for future research to apply the framework in a longitudinal case study. Consequently, it can be examined whether the right segments were selected. If so, the validity of the framework will be enhanced. Second, embedding a pre-screening step in the market segment selection process is quite an untouched phenomenon within theory. However, during the interviews

concerning market segment selection with the various organizations, it was a theme that recurred multiple times. Therefore, future research could examine this step further and, for example, try to identify the most common critical variables.

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Appendix 1: Interview guide Business X (original)

Interview handleiding: Probleemstelling

Introductie

- Het selecteren van marktsegmenten wordt gezien als een van de belangrijkste beslissingen die gemaakt moet worden door een organisatie.
- Echter is er geen framework beschikbaar met betrekking tot marktsegment selectie voor tech-bedrijven. Om deze reden is het doel van dit interview om te achterhalen wat het probleem hiervan is en wat eventuele oplossingen van dit probleem inhouden.
- Binnen dit interview wordt marktsegment selectie gezien als de selectie van marktsegmenten, waarbij een marktsegment wordt gedefinieerd als een groep (potentiële) consumenten waarvan wordt verwacht dat ze soortgelijk koopgedrag vertonen
- Begin opname

Algemeen

- In hoeverre zien jullie het selecteren van passende marktsegmenten als een belangrijke beslissing?
    - Waarom wel of niet?
- Wat zijn de voordelen van het correct selecteren van passende marktsegmenten?

Probleem

- Welke problemen ontstaan er volgens jullie als niet passende marktsegmenten worden geselecteerd?
- Welke problemen brengt het ontbreken van een proces/framework met betrekking tot marktsegment selectie voor tech-bedrijven met zich mee?
    - Efficiëntie?
    - Geen structuur binnen marktsegment selectie?
- Wat zijn problemen die jullie bij eerdere marktsegment selectie vraagstukken zijn tegengekomen?
    - Geleid tot verkeerde marktsegmenten?
- In hoeverre denken jullie dat er verschillen zijn met betrekking tot marktsegment selectie tussen tech-bedrijven en non-tech-bedrijven?
    - Meer of minder cruciaal voor tech-bedrijven?
    - Lastiger voor tech-bedrijven?

Oplossing van het probleem

- Wat is het belang van het oplossen van bovengenoemde problemen?
    - Welke voordelen ontstaan?
- In hoeverre kan een framework met betrekking tot marktsegment selectie voor tech-bedrijven bijdragen aan het oplossen van eerdergenoemd probleem?
    - Waarom wel of niet?
- Welke andere voordelen zien jullie in een framework met betrekking tot marktsegment selectie voor tech-bedrijven?

Conclusie

- Wat is het grootste probleem voor uw bedrijf met betrekking tot marktsegment selectie?
- Ben ik nog iets belangrijks vergeten te vragen dat u nog graag zou willen toevoegen met betrekking tot het onderwerp?

Appendix 2: Interview guide Business X (translated)

Interview guide: Problem statement

Introduction

- The selection of market segments is perceived to be one of the most important decisions organizations have to make.
- However, no framework is available with regard to market segment selection for tech-based companies. Therefore, the goal of this interview is to find out what the problem with this problem is and what possible solutions of this problem entail.
- Within this interview market segment selection is perceived as the selection of market segments, where a market segment is defined as a group (potential) consumers of whom is expected that they show similar consuming behavior.
- Start recording

General

- To what extent do you perceive the selection of suitable market segments as an important decision?
    - Why yes or no?
- What are the advantages of correctly selecting suitable market segments?

Problem

- What problems do you think occur when not suitable market segments are selected?
- What problems are caused by the absence of a process/framework with regard to market segment selection for tech-based companies?
    - Efficiency?
    - No structure within market segment selection?
- What are problems that you have faced during previous market segment selection questions?
    - Did it lead to wrong market segments?
- To what extent do you think that there are differences regarding market segment selection between tech-based companies and non-tech-based companies?
    - More or less important for tech-based companies?
    - More difficult for tech-based companies?

Solution of the problem

- What is the importance of solving abovementioned problems?
    - What advantages occur?
- To what extent do you think that a framework regarding market segment selection for tech-based companies can provide support for solving previously mentioned problems?
    - Why yes or no?
- What other advantages do you perceive a market segment selection framework can entail?

Conclusion

- What is the biggest problem for your company regarding market segment selection?
- Did I forget to ask something important that you would like to tell regarding this topic?

Appendix 3: Interview guide market segment selection (original)

Interview handleiding: Marktsegment selectie

Introductie

- Het selecteren van marktsegmenten wordt gezien als een van de belangrijkste beslissingen die gemaakt moet worden door een organisatie
- Daarom is het doel van dit interview om te achterhalen hoe bedrijven deze keuze (succesvol) kunnen maken
- Binnen dit interview wordt marktsegment selectie gezien als de selectie van marktsegmenten, waarbij een marktsegment wordt gedefinieerd als een groep (potentiële) consumenten waarvan wordt verwacht dat ze soortgelijk koopgedrag vertonen
- Begin opname

Algemene vragen

- Wat zijn de kernactiviteiten van uw bedrijf?
    - Tech-based of niet?
    - Gericht op B2B of B2C (of allebei)?
- In welke marktsegmenten is uw bedrijf momenteel werkzaam?
    - Belangrijkste segmenten?
    - Tijdlijn segmenten?

Gehanteerde selectiemethoden

- Hoe zijn de huidige marktsegmenten geselecteerd door uw bedrijf?
    - Proces?
    - Meerdere segmenten tegelijk betreden?
    - Meerdere selectieprocessen doorstaan? (indien het geval, waren er verschillen tussen de processen)
    - Belangrijkste factoren voor selectie?
- Wie zijn er betrokken bij het selectieproces van de marktsegmenten?
    - Uiteindelijke beslissing tot intrede marktsegment?
    - Adviesrol voor bepaalde werknemers?
- In hoeverre hebben de gehanteerde selectieprocessen altijd geleid tot de meest passende marktsegmenten?
    - Indien passend, hoe kan dit gelinkt worden aan het gehanteerde selectieproces?
    - Mislukte intrede van marktsegmenten? (indien het geval, is het te herleiden naar (stap binnen) het selectieproces?)
- In hoeverre wordt er gereflecteerd op gehanteerde selectieprocessen?
    - Toegevoegde waarde?
    - Eventuele bevindingen?

Toekomstige selectiemethoden

- In hoeverre zou u bij een toekomstig marktsegment selectie vraagstuk eerder gehanteerde selectiemethode(n) blijven hanteren?
    - Andere methoden?
    - Potentiele veranderingen binnen proces?
    - Potentiele veranderingen binnen specifieke stappen?
- In hoeverre vindt u dat er bij toekomstige marktsegment selectie vraagstukken veranderingen plaats moeten vinden bij wie er betrokken zijn bij het selectieproces ten opzichte van eerdere selectieprocessen?
    - Waarom wel of niet?

Conclusie

- Wat kan er volgens u niet ontbreken in het selectieproces voor het correct selecteren van passende marktsegmenten?

- Ben ik nog iets belangrijks vergeten te vragen dat u nog graag zou willen toevoegen met betrekking tot het onderwerp?

Appendix 4: Interview guide market segment selection (translated)

Introduction

- The selection of market segments is perceived to be one of the most important decisions organizations have to make.
- Consequently, the goal of this interview is to find out how companies (successfully) make this choice
- Within this interview market segment selection is perceived as the selection of market segments, where a market segment is defined as a group (potential) consumers of whom is expected that they show similar consuming behavior.
- Start recording

General questions

- What are the core activities of your company?
    - Tech-based or not?
    - Focused on B2B or B2C (or both)?
- In what market segments is your company currently active?
    - Most important segments?
    - Timeline segments?

Used selection methods

- How have the current market segment of your company been selected?
    - Process?
    - Multiple segments entered simultaneously?
    - Multiple selections processes experiences? (if so, were there any differences between the processes)
    - Most important factors for selection?
- Who are concerned with the selection process of market segments?
    - Final decision of entering a market segment?
    - Consultancy role for certain employees?
- To what extent have the used selection methods always led to the most suitable market segments?
    - If suitable, how can this be linked to the used methods?
    - Failed entrance of market segments? (if so can it be derived from (step within) the selection process?)
- To what extent does your company reflect on used selection methods?
    - Added value?
    - Findings?

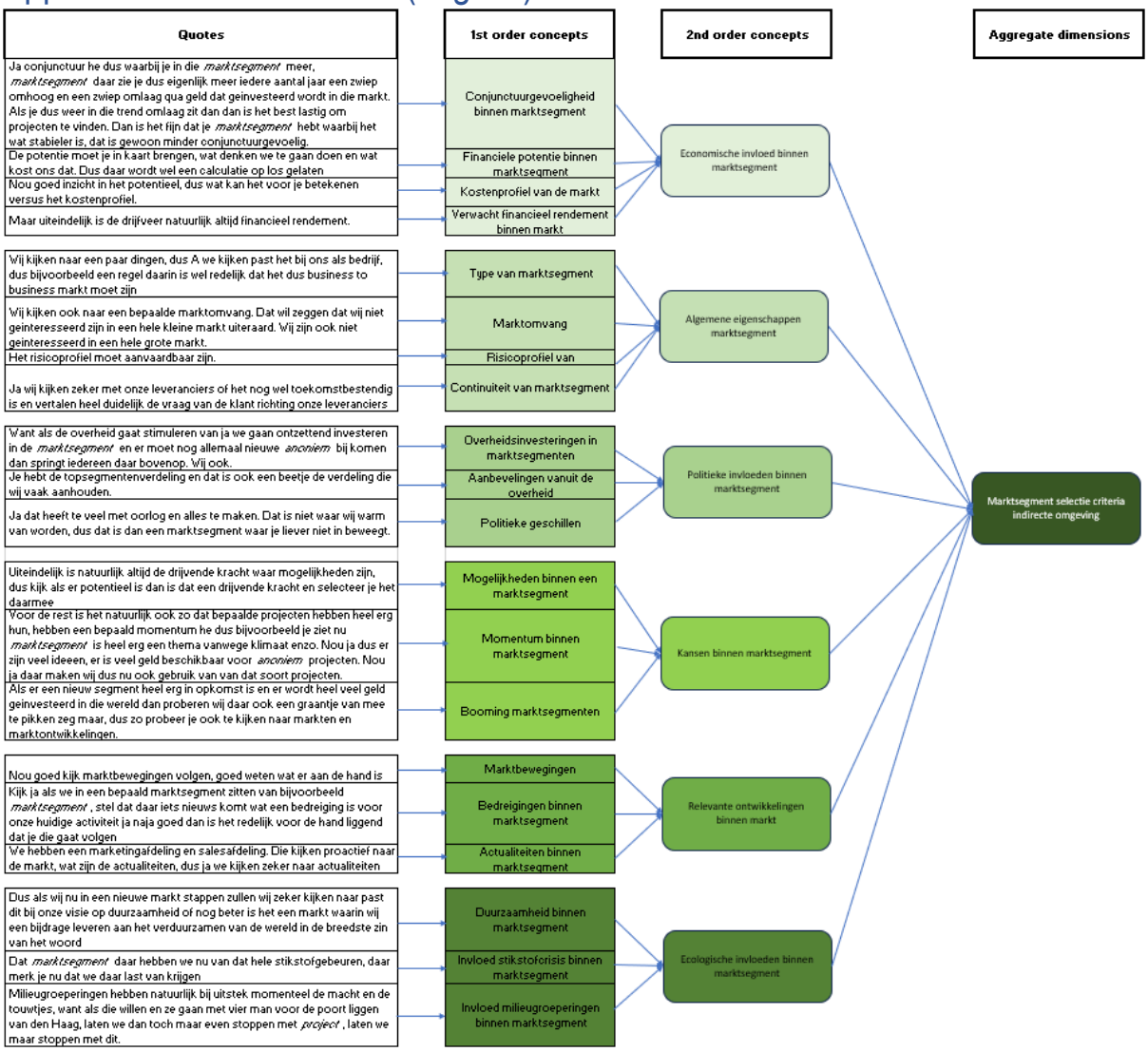
Future selection methods

- To what extent would you keep applying used selection methods to future market segment selection questions?
    - Other methods?
    - Potential changes within process?
    - Potential changes within particular steps?
- To what extent do you think that during future market segment selection questions changes should occur regarding who is concerned with the selection process compared to previous selection processes?
    - Why yes or no?

Conclusion

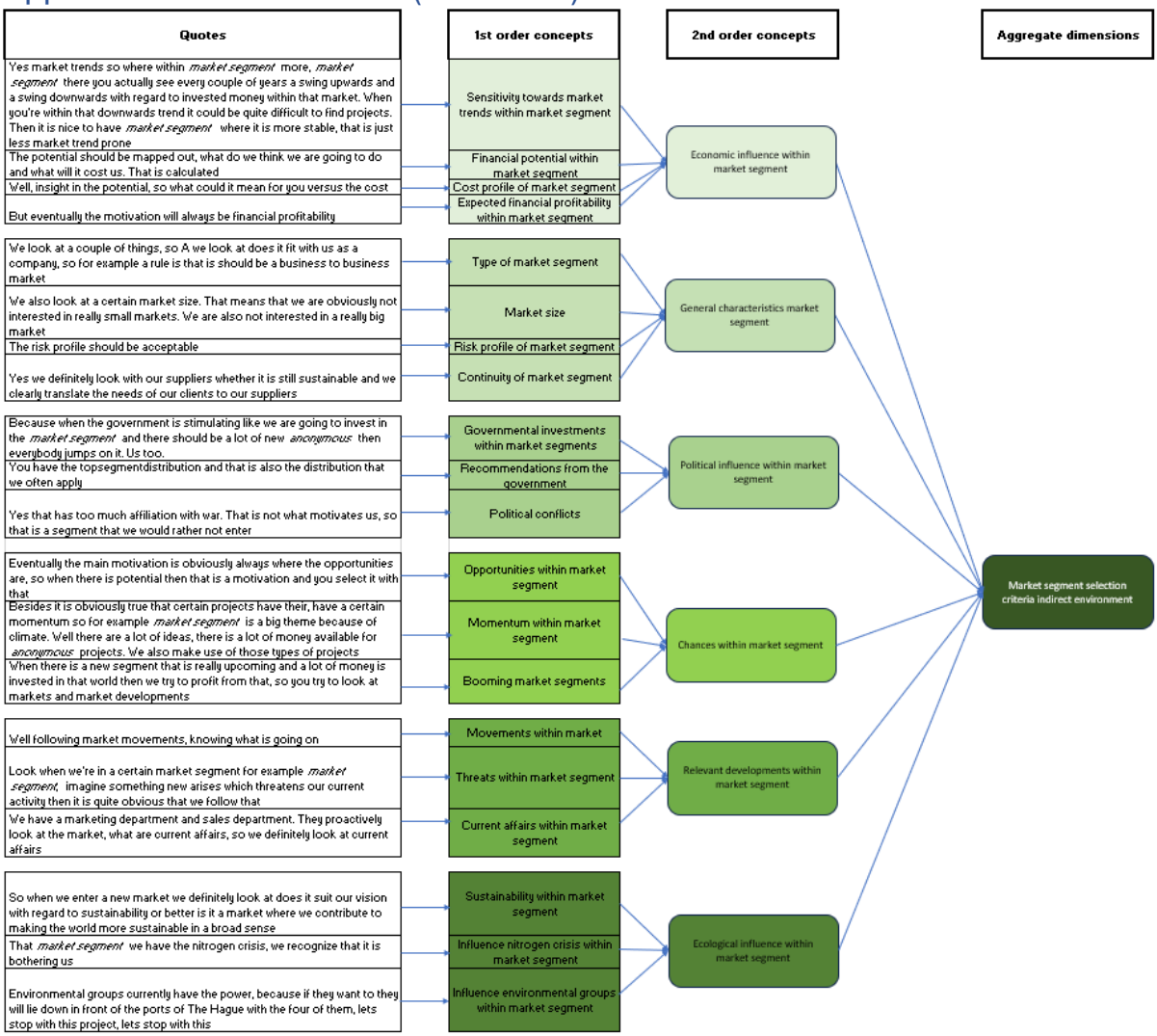
- What cannot be missing within the selection process for correctly selecting suitable market segments?
- Did I forget to ask something important that you would like to tell regarding this topic?

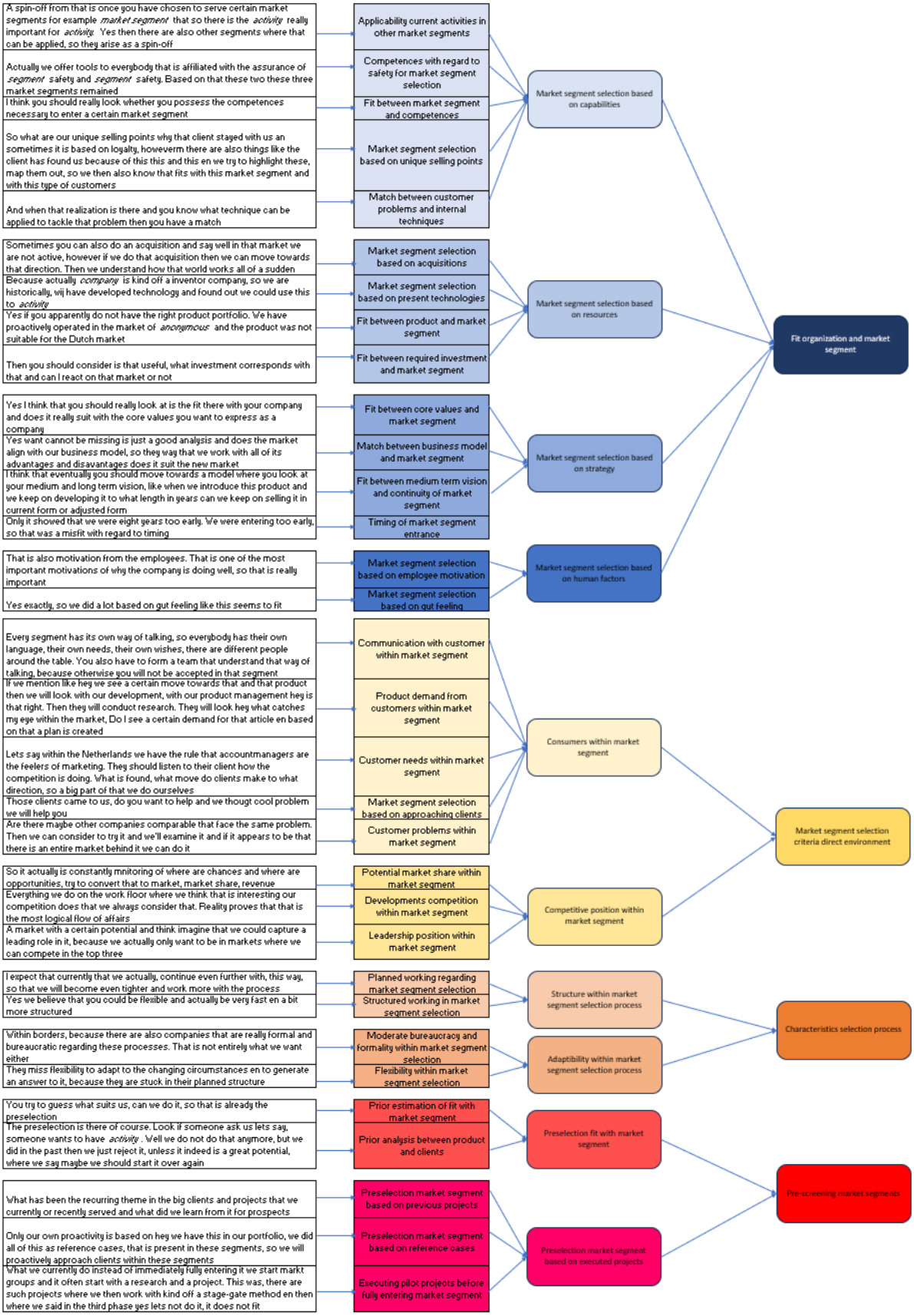
Appendix 5: Data structure (original)




Een spin-off daarvan is als je eenmaal gekozen hebt voor bepaalde marktsegmenten om die te bedienen he bijvoorbeeld marktsegment dus daar is het activiteit heel belangrijk voor onder andere de activiteit . Ja dan zijn er ook andere segmenten waar dat ook toe te passen is, dus die komen dan een beetje als spin-off tussen aanhalingsteken vanzelf mee.
Eigenlijk bieden wij hulpmiddelen aan alles en iedereen wat te maken heeft met de borging van voedselveiligheid of patientveiligheid. En op basis van die twee zijn eigenlijk deze drie marktsegmenten overgebleven
Ik denk dat je heel erg moet kijken of je competenties in huis hebt om een bepaald marktsegment te kunnen dienen
Dus wat zijn onze unique selling points waarom die klant bij ons is gebleven en daar zit natuurlijk soms ook gewoon wat loyaliteit in, maar er zitten ook wel dingen in van die klant heeft ons echt gevonden vanwege dit dit en dit en dat proberen we wel echt te pinpointen, goed in kaart te brengen, zodat we dan ook weten van joh dat past goed bij dit marktsegment of dat past goed bij dat soort klanten.
En als dat beseft daar is en je weet hier welke techniek we kunnen inzetten om dat probleem aan te pakken dan op papier heb je een match
Toepasbaarheid huidige activiteiten in andere marktsegmenten
Competenties met betrekking tot veiligheid voor selecteren marktsegment
Fit tussen marktsegment en competenties
Marktsegment selectie op basis van unique selling points
Match tussen probleem klanten en interne technieken
Marktsegment selectie op basis van capabilities
je kunt soms ook een overname doen door te zeggen van nou ja in die markt zijn we helemaal niet actief, maar als we nou die overname doen dan kunnen we in een keer een stap in die richting zetten. Dan snappen we in een keer hoe die wereld werkt.
Want eigenlijk is bedrijf je kunt het zien als een soort uitvindersbedrijf, dus wij zijn vooral van origine, wij hebben die technologie ontwikkeld, kwamen erachter hey dit kun je inzetten om activiteit
Ja als je niet het juiste productportfolio blijkt te hebben. We hebben ons heel actief gemaakt in de markt van ancoviem en het product was niet helemaal geschikt voor de Nederlandse markt
Dan moet je voor jezelf overwegen van is dat zinvol, welke investering hoort daarbij en kan ik op die markt wel of niet inspelen
Marktsegment selectie op basis van overnames
Marktsegment selectie op basis van aanwezige technologien
Fit tussen product en marktsegment
Fit tussen investeringsbedrag en marktsegment
Marktsegment selectie op basis van resources
Ja ik denk dat je heel erg moet kijken naar is de fit er met je bedrijf en past het echt bij de kernwaarden die je als bedrijf wil uitdragen
Ja wat volgens mij niet kan ontbreken is gewoon een goeie analyse en past die markt ook op ons bedrijfsmodel, dus de manier zoals wij werken met alle voor-en nadelen past dat bij die nieuwe markt
Ik denk dat je uiteindelijk toe moet naar een model waar je middellange en lange termijnvisie kijkt, van als we dit product nu inzetten en we blijven door ontwikkelen in welke lengte van jaren kunnen we dan dat blijven vermarkten in de huidige vorm of een aangepaste vorm
Alleen het bleek dat wij gewoon acht jaar te vroeg waren. We liepen op de muziek vooruit, dus dat was qua timing was dat een misfit
Fit tussen kernwaarden en marktsegment
Match tussen bedrijfsmodel en marktsegment
Fit tussen middellange termijnvisie en continuiteit binnen marktsegment
Timing binnentreden marktsegment
Marktsegment selectie op basis van strategie
Dat is ook motivatie van de medewerkers. Dat is een van de belangrijkste drijfveren van waarom het goed gaat met een bedrijf, dus dat is gewoon heel erg belangrijk.
Ja precies, dus we hebben veel gedaan op beetje toch wel onderbuikgevoel van dit lijkt wel te passen
Marktsegment selectie op basis van motivatie van medewerkers
Marktsegment selectie op basis van onderbuikgevoel
Marktsegment selectie op basis van menselijke factoren
Fit organisatie en marktsegment
Elk segment heeft weer een eigen manier van praten, dus iedereen heeft zijn eigen taal, zijn eigen behoeften, zijn eigen wensen, er zitten andere mensen aan tafel. Daar moet jij ook intern een team op vormen die die manier van praten begrijpt, want anders word je gewoon niet geaccepteerd in dat segment
als wij daar aangeven van hey we zien een bepaalde move richting dat en dat product dan gaan wij kijken met onze ontwikkeling, met ons productmanagement van hey is dat zo. Die gaat dan onderzoek verrichten. Die gaat kijken hey wat merk ik in de markt. Zie ik een bepaalde vraag naar dat artikel of dat artikel en op basis daarvan wordt een plan gesmeed
Laten we zeggen in Nederland hebben we een regel dat de voelsprieten van marketing zijn de accountmanagers. Die moeten luisteren bij hun klant hoe de concurrent beweegt. Wat komt daaruit, welke move zie je klanten maken naar welke kant uit, dus een heel groot deel doen we daar zelf in.
Die klanten zijn naar ons toegekomen, willen jullie ons helpen en wij dachten gaaf probleem daar gaan we mee helpen
Zijn er misschien heel veel andere bedrijven vergelijkbaar die datzelfde probleem hebben. Dan kunnen we wel overwegen om dat toch wat te gaan proberen en dan gaan we dat onderzoeken en als blijkt dat er eigenlijk stiekem een hele markt achterzit dan kunnen we het doen
Communnicatie met klant binnen een marktsegment
Vraag naar product vanuit klanten binnen marktsegment
Klantbehoeften binnen marktsegment
Benadering door klanten voor selecteren marktsegmenten
Problemen klant binnen een marktsegment
Consumenten binnen marktsegment
Dus het is eigenlijk continu monitoren van naja waar liggen de kansen en waar liggen de mogelijkheden, probeer die om te zetten naar markt, marktaandeel, omzet
Alles wat wij op de werkvloer meekrijgen waarvan wij denken hey dat is interessant onze concullega doet dat, dat nemen we altijd mee. De praktijk wijst uit dat dat ook wel de meest logische gang van zaken is.
Een markt met een bepaald potentieel en bedenken wij stel dat wij daar een leidende rol in kunnen veroveren, want wij willen eigenlijk alleen in markten zitten waar wij laten we zeggen in de top 3 mee kunnen doen
Potentieel marktaandeel in een markt
Ontwikkelingen concurrentie binnen marktsegment
Leiderschapspositie binnen marktsegment
Concurrentiepositie binnen marktsegment
Marktsegment selectie criteria directe omgeving
Ik verwacht op dit moment dat wij eigenlijk, nog meer door zullen gaan met, op deze weg, dus dat we nog wat strakker worden en meer met het proces gaan werken
Ja wij geloven dat je een flexibel en juist heel snel kunt zijn en toch wel wat gestuctureerder.
Procesmatiger werken met betrekking tot marktsegment selectie
Gestructureerd werken in marktsegment selectie
Structuur binnen marktsegment selectieproces
wel binnen grenzen, omdat er zijn ook bedrijven die echt heel formeel en bureaucratisch die processen hebben. Dat willen wij eigenlijk ook niet helemaal
Die missen flexibiliteit om aan die veranderende omstandigheden invulling te geven en daar een antwoord op te genereren, want die zitten in hun planmatige structuur.
Gematigde bureaucratie en formaliteit binnen marktsegment selectie
Flexibiliteit binnen marktsegment selectie
Aanpassingsvermogen binnen marktsegment selectieproces
Eigenschappen selectieproces
Je probeert dan in te schatten van past het bij ons, kunnen we het, dus dat is al de voorselectie.
Die voorselectie die is er natuurlijk wel he. Kijk als iemand bij ons iets aanvraagt ik zeg maar wat, iemand wil activiteit hebben. Nou ja dat hebben we niet meer in ons pakket, maar vroeger wel nou goed dat wijzen we gewoon af, tenzij het inderdaad een heel groot potentieel is, waarbij we zeggen ja misschien zouden we het weer overnieuw moeten opstarten
Preventieve inschatting van fit met segment
Preventieve analyse tussen product en klant
Voorselectie fit met marktsegment
Wat is tot nu toe de rode draad in de grote klanten en projecten die we op dit moment of recentelijk bediend hebben en wat leren we daar uit voor de prospects
Alleen onze eigen proactiviteit die is gebaseerd op van hey we hebben dit in ons portfolio, we hebben dit allemaal gedaan als referentiecases, dat zit in deze segmenten, dus wij gaan in die segmenten gaan wij klanten proactief benaderen.
Wat we nu doen in plaats van dat we daar in een keer instappen zetten we startende marktgroepen op en begint het vaak als een onderzoek en een project. Dit was, er zijn zulke projecten waarvan we dan met een soort stage-gate methode werken en dan waarbij we in de derde fase zeiden van ja we gaan het toch niet doen, past niet
Voorselectie marktsegment op basis van eerdere projecten
Voorselectie marktsegment op basis van referentiecases
Pilotprojecten uitvoeren voordat een marktsegment volledig uitgevoerd wordt
Voorselectie marktsegment op basis van uitgevoerde projecten
Pre-screening marktsegmenten

Appendix 6: Data structure (translated)




A spin-off from that is once you have chosen to serve certain market segments for example market segment that so there is the activity really important for activity. Yes then there are also other segments where that can be applied, so they arise as a spin-off
Actually we offer tools to everybody that is affiliated with the assurance of segment safety and segment safety. Based on that these two these three market segments remained
I think you should really look whether you possess the competences necessary to enter a certain market segment
So what are our unique selling points why that client stayed with us an sometimes it is based on loyalty, howeverm there are also things like the client has found us because of this this and this en we try to highlight these, map them out, so we then also know that fits with this market segment and with this type of customers
And when that realization is there and you know what technique can be applied to tackle that problem then you have a match
Applicability current activities in other market segments
Competences with regard to safety for market segment selection
Fit between market segment and competences
Market segment selection based on unique selling points
Match between customer problems and internal techniques
Market segment selection based on capabilities
Sometimes you can also do an acquisition and say well in that market we are not active, however if we do that acquisition then we can move towards that direction. Then we understand how that world works all of a sudden
Because actually company is kind off a inventor company, so we are historically, wij have developed technology and found out we could use this to activity
Yes if you apparently do not have the right product portfolio. We have proactively operated in the market of anonymous and the product was not suitable for the Dutch market
Then you should consider is that useful, what investment corresponds with that and can I react on that market or not
Market segment selection based on acquisitions
Market segment selection based on present technologies
Fit between product and market segment
Fit between required investment and market segment
Market segment selection based on resources
Yes I think that you should really look at is the fit there with your company and does it really suit with the core values you want to express as a company
Yes want cannot be missing is just a good analysis and does the market align with our business model, so they way that we work with all of its advantages and disavantages does it suit the new market
I think that eventually you should move towards a model where you look at your medium and long term vision, like when we introduce this product and we keep on developing it to what length in years can we keep on selling it in current form or adjusted form
Only it showed that we were eight years too early. We were entering too early, so that was a misfit with regard to timing
Fit between core values and market segment
Match between business model and market segment
Fit between medium term vision and continuity of market segment
Timing of market segment entrance
Market segment selection based on strategy
That is also motivation from the employees. That is one of the most important motivations of why the company is doing well, so that is really important
Yes exactly, so we did a lot based on gut feeling like this seems to fit
Market segment selection based on employee motivation
Market segment selection based on gut feeling
Market segment selection based on human factors
Fit organization and market segment
Every segment has its own way of talking, so everybody has their own language, their own needs, their own wishes, there are different people around the table. You also have to form a team that understand that way of talking, because otherwise you will not be accepted in that segment
If we mention like hey we see a certain move towards that and that product then we will look with our development, with our product management hey is that right. Then they will conduct research. They will look hey what catches my eye within the market, Do I see a certain demand for that article en based on that a plan is created
Lets say within the Netherlands we have the rule that accountmanagers are the feelers of marketing. They should listen to their client how the competition is doing. What is found, what move do clients make to what direction, so a big part of that we do ourselves
Those clients came to us, do you want to help and we thougt cool problem we will help you
Are there maybe other companies comparable that face the same problem. Then we can consider to try it and we'll examine it and if it appears to be that there is an entire market behind it we can do it
Communication with customer within market segment
Product demand from customers within market segment
Customer needs within market segment
Market segment selection based on approaching clients
Customer problems within market segment
Consumers within market segment
So it actually is constantly mnitoring of where are chances and where are opportunities, try to convert that to market, market share, revenue
Everything we do on the work floor where we think that is interesting our competition does that we always consider that. Reality proves that that is the most logical flow of affairs
A market with a certain potential and think imagine that we could capture a leading role in it, because we actually only want to be in markets where we can compete in the top three
Potential market share within market segment
Developments competition within market segment
Leadership position within market segment
Competitive position within market segment
Market segment selection criteria direct environment
I expect that currently that we actually, continue even further with, this way, so that we will become even tighter and work more with the process
Yes we believe that you could be flexible and actually be very fast en a bit more structured
Planned working regarding market segment selection
Structured working in market segment selection
Structure within market segment selection process
Within borders, because there are also companies that are really formal and bureaucratic regarding these processes. That is not entirely what we want either
They miss flexibility to adapt to the changing circumstances en to generate an answer to it, because they are stuck in their planned structure
Moderate bureaucracy and formality within market segment selection
Flexibility within market segment selection
Adaptibility within market segment selection process
Characteristics selection process
You try to guess what suits us, can we do it, so that is already the preselection
The preselection is there of course. Look if someone ask us lets say, someone wants to have activity . Well we do not do that anymore, but we did in the past then we just reject it, unless it indeed is a great potential, where we say maybe we should start it over again
Prior estimation of fit with market segment
Prior analysis between product and clients
Preselection fit with market segment
What has been the recurring theme in the big clients and projects that we currently or recently served and what did we learn from it for prospects
Only our own proactivity is based on hey we have this in our portfolio, we did all of this as reference cases, that is present in these segments, so we will proactively approach clients within these segments
What we currently do instead of immediately fully entering it we start markt groups and it often start with a research and a project. This was, there are such projects where we then work with kind off a stage-gate method en then where we said in the third phase yes lets not do it, it does not fit
Preselection market segment based on previous projects
Preselection market segment based on reference cases
Executing pilot projects before fully entering market segment
Preselection market segment based on executed projects
Pre-screening market segments

Appendix 7: Interview guide competencies (Original)

Introductie

- Voor het targeten van marktsegmenten is het cruciaal om te analyseren of er een fit is tussen organisatie en marktsegment. Het analyseren van de fit tussen capabilities/competenties en marktsegment is hierbij een belangrijke factor. De marktsegmenten die geanalyseerd worden binnen het onderzoek zijn defense & security, test & measurement, medisch en high-tech systems (industrie)
- Om deze reden is het doel van dit interview om een beter inzicht te krijgen in de competenties en de passendheid met geanalyseerde marktsegmenten
- Start recording

Algemene vragen

- Wat is de core competentie die u beheert en kunt u die kort toelichten?
    - Proces?
- Wat zijn bijbehorende capabilities
- In hoeverre heeft het bedrijf al veel ervaring binnen de competentie?
    - Is het een van de main competenties?

Applicaties competentie

- Bij wat voor soort projecten is de competentie tot nu toe voornamelijk toegepast?
    - Geanalyseerde marktsegmenten?
    - Specifieke projecten
    - Waar het meest en waarom?
- Welke gebieden waar de competentie nog niet is toegepast zouden interessant kunnen zijn?
    - Marktsegmenten
    - Specifieke projecten

Ervaring met competentie

- In hoeverre zijn de ervaringen met projecten waarbij de competentie is toegepast positief
    - Welk type projecten wel welk type niet?
- In hoeverre wordt er gereflecteerd op projecten met betrekking tot de competentie?
    - Wat zijn verbeterpunten die zijn gevonden
    - Wat zijn de sterke punten
    - Welke capabilities ontbreken eventueel nog
- Wat zijn knelpunten die zijn geidentificeerd tijdens projecten met betrekking tot de competentie?
- In hoeverre zit er veel verschil in het toepassen van de competentie binnen diverse projecten?
    - Marktsegmenten?
    - Voorkeur?

Dynamic capabilities

- In hoeverre wordt er gezocht naar nieuwe kansen met betrekking tot de competentie
- In hoeverre wordt er gekeken hoe dit plan geexploiteerd kan worden?
    - Resources

Afsluitende vragen

- Bij welk marktsegment kan de competentie het beste toegepast worden
    - Waarom?
- In hoeverre is er overlap met andere competenties binnen de competentie?
- Ben ik nog iets belangrijks vergeten te vragen dat u nog graag zou willen toevoegen met betrekking tot het onderwerp?

Appendix 8: Interview guide competencies (Translated)

Introduction

- To target market segments, it is crucial to examine whether there is a fit between organization and market segment. Hereby the analysis of fit between capabilities/competences and market segment is an important factor. The market segments that will be examined within the research are defense & security, test & measurement, medical and high-tech systems (industry)
- Therefore, the goal of this interview is to get insights into the competences and the suitability with analyzed market segments
- Start recording

General questions

- What is the core competence that you manage and could you elaborate on it?
    - Process?
- What are corresponding capabilities?
- To what extent does the company have a lot of experience with the competence?
    - Is it a main competence?

Applications competence

- At what kind of projects has the competence been applied mostly until now?
    - The examined segments?
    - Specific projects
    - Where the most and why?
- What areas where the competence has not been applied yet could be interesting
    - Examined market segments?
    - Specific projects?

Experience with competence

- To what extent are experiences with projects where the competence has been applied positive?
    - What type of projects were and what type not
- To what extent does the company reflect on projects regarding the competence?
    - What are possible points of improvements?
    - What are strengths?
    - What capabilities are missing currently?
- What are bottlenecks that have been identified during projects concerning the competence?
- To what extent do many differences exist between application of the competences among diverse projects?
    - Market segments?
    - Preference?

Dynamic capabilities

- To what extent does the company look for new opportunities regarding the competence?
- To what extent does the company examine how this plan can be executed?
    - Resources?

Concluding questions

- At wat market segment is the competence best applied?
    - Why?
- To what extent does the competence have overlap with the other competences?
- Did I forget to ask something important that you would like to add regarding the topic?

Appendix 9: R&D expenditures

Germany					
Segment	**2021**	**2020**	**2019**	**2018**	**2017**
D&S	**€ 2.317,94**		**€ 2.525,50**	**€ 2.798,77**	**€ 2.512,54**
% of total	**3,1%**		**3,3%**	**3,9%**	**3,7%**
Manufacture of communication equipment	€ 654,06		€ 634,50	€ 726,30	€ 678,80
Manufacture of electrical equipment*	€ 240,43		€ 224,60	€ 230,17	€ 224,34
Building of ships and boats	€ 171,91		€ 171,70	€ 135,20	€ 118,10
Manufacture of air and spacecraft and related machinery	€ 1.251,54		€ 1.494,70	€ 1.707,10	€ 1.491,30
Manufacture of military fighting vehicles	€ -		€ -	€ -	€ -
T&M	**€ 3.985,12**		**€ 3.962,60**	**€ 3.380,00**	**€ 3.165,10**
% of total	**5,3%**		**5,2%**	**4,7%**	**4,6%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	€ 3.985,12		€ 3.962,60	€ 3.380,00	€ 3.165,10
MED	**€ 2.548,42**		**€ 2.074,40**	**€ 1.785,50**	**€ 1.703,50**
% of total	**3,4%**		**2,7%**	**2,5%**	**2,5%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	€ 1.193,45		€ 1.083,60	€ 1.044,00	€ 968,70
Manufacture of medical and dental instruments and supplies	€ 1.354,97		€ 990,80	€ 741,50	€ 734,80
HTS	**€ 7.415,66**		**€ 7.674,90**	**€ 7.341,27**	**€ 7.341,04**
% of total	**9,8%**		**10,1%**	**10,2%**	**10,7%**
Manufacture of electrical equipment*	€ 240,43		€ 224,60	€ 230,17	€ 224,34
Manufacture of machinery and equipment n.e.c.	€ 7.175,23		€ 7.450,30	€ 7.111,10	€ 7.116,70
Total BERD	**€ 75.761,16**		**€ 75.830,40**	**€ 72.101,30**	**€ 68.787,30**

Austria					
Segment	**2021**	**2020**	**2019**	**2018**	**2017**
D&S	**€ 149,77**		**€ 167,79**		**€ 165,23**
%of total	**1,6%**		**1,9%**		**2,1%**
Manufacture of communication equipment	€ 31,68		€ 40,03		€ 37,02
Manufacture of electrical equipment*	€ 65,60		€ 72,51		€ 69,70
Building of ships and boats	€ 3,20		€ 3,36		€ -
Manufacture of air and spacecraft and related machinery	€ 49,29		€ 51,89		€ 58,51
Manufacture of military fighting vehicles	€ -		€ -		€ -
T&M	**€ 550,21**		**€ 140,14**		**€ 130,22**
% of total	**6,0%**		**1,6%**		**1,7%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	€ 550,21		€ 140,14		€ 130,22
MED	**€ 169,58**		**€ 142,87**		**€ 128,83**
% of total	**1,9%**		**1,6%**		**1,6%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	€ 103,80		€ 91,34		€ 76,04
Manufacture of medical and dental instruments and supplies	€ 65,78		€ 51,53		€ 52,79
HTS	**€ 1.443,88**		**€ 1.391,72**		**€ 1.143,22**
% of total	**15,9%**		**15,9%**		**14,5%**
Manufacture of electrical equipment*	€ 65,60		€ 72,51		€ 69,70
Manufacture of machinery and equipment n.e.c.	€ 1.378,28		€ 1.319,21		€ 1.073,52
Total BERD	**€ 9.107,80**		**€ 8.749,14**		**€ 7.888,44**

Denmark					
Segment	**2021**	**2020**	**2019**	**2018**	**2017**
D&S		**€ 48,75**	**€ 54,01**		**€ 57,96**
% of total		**0,9%**	**0,9%**		**1,1%**
Manufacture of communication equipment		€ 35,69	€ 38,57		€ 46,11
Manufacture of electrical equipment*		€ 4,07	€ 8,34		€ 5,40
Building of ships and boats		€ 5,37	€ 3,75		€ 3,90
Manufacture of air and spacecraft and related machinery		€ 3,62	€ 3,35		€ 2,55
Manufacture of military fighting vehicles		€ -	€ -		€ -
T&M		**€ 193,72**	**€ 196,09**		**€ 184,44**
% of total		**3,4%**	**3,4%**		**3,4%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks		€ 193,72	€ 196,09		€ 184,44
MED		**€ 217,33**	**€ 275,92**		**€ 218,05**
% of total		**3,8%**	**4,8%**		**4,0%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment		€ 131,07	€ 210,69		€ 191,57
Manufacture of medical and dental instruments and supplies		€ 86,26	€ 65,23		€ 26,48
HTS		**€ 746,87**	**€ 414,91**		**€ 711,58**
% of total		**13,1%**	**7,3%**		**13,0%**
Manufacture of electrical equipment*		€ 4,07	€ 8,34		€ 5,40
Manufacture of machinery and equipment n.e.c.		€ 742,80	€ 406,57		€ 706,18
Total BERD		**€ 5.700,68**	**€ 5.698,24**		**€ 5.479,12**

France					
Segment	**2021**	**2020**	**2019**	**2018**	**2017**
D&S	**€ 4.421,62**	**€ 3.964,90**			**€ 3.493,42**
% of total	**12,1%**	**11,5%**			**10,6%**
Manufacture of communication equipment	€ 166,14	€ 651,91			€ 656,34
Manufacture of electrical equipment*	€ 110,75	€ 66,67			€ 69,73
Building of ships and boats	€ 160,44	€ 143,09			€ 139,57
Manufacture of air and spacecraft and related machinery	€ 3.896,40	€ 3.014,11			€ 2.627,78
Manufacture of military fighting vehicles	€ 87,89	€ 89,12			
T&M	**€ 2.279,87**	**€ 1.588,28**			**€ 1.597,73**
% of total	**6,3%**	**4,6%**			**4,8%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	€ 2.279,87	€ 1.588,28			€ 1.597,73
MED	**€ 378,70**	**€ 352,97**			**€ 372,09**
% of total	**1,0%**	**1,0%**			**1,1%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	€ 133,79	€ 127,66			€ 115,78
Manufacture of medical and dental instruments and supplies	€ 244,91	€ 225,31			€ 256,31
HTS	**€ 1.222,54**	**€ 1.164,14**			**€ 1.211,90**
% of total	**3,4%**	**3,4%**			**3,7%**
Manufacture of electrical equipment*	€ 110,75	€ 66,67			€ 69,73
Manufacture of machinery and equipment n.e.c.	€ 1.111,79	€ 1.097,47			€ 1.142,17
Total BERD	**€ 36.477,73**	**€ 34.624,90**			**€ 33.019,11**

Appendix 10: R&D intensity

Company	Country	R&D spend 2022 in $M	Net sales 2022 in $M	R&D as % of net sales 2022	R&D spend 2021 in $M	Net Sales in 2021 in $M	R&D as % of net sales in 2021
Defense							
Thales	France	€ 1.064,00	€ 17.569,00	6,1%	€ 1.027,00	€ 16.192,00	6,3%
Safran	France	€ 1.019,00	€ 19.035,00	5,4%	€ 924,00	€ 15.257,00	6,1%
BAE Systems	UK	€ 2.000,00	€ 21.258,00	9,4%	€ 1.600,00	€ 19.521,00	8,2%
Naval Group	France	€ 92,60	€ 4.353,00	2,1%	€ 81,00	€ 4.053,00	2,0%
Hensoldt	Germany	€ 36,00	€ 1.707,00	2,1%	€ 31,00	€ 1.474,00	2,1%
Rheinmetall Group	Germany	€ 351,00	€ 6.410,00	5,5%	€ 337,00	€ 5.658,00	6,0%
Qinetiq	UK	€ 302,10	€ 1.330,90	22,7%	€ 300,40	€ 1.278,20	23,5%
FACC	Austria	€ 1,44	€ 607,00	0,2%	€ 1,46	€ 497,60	0,3%
GOMspace	Sweden	€ 6,40	€ 17,10	37,4%	€ 1,90	€ 18,40	10,3%
Airbus	France	€ 3.079,00	€ 58.763,00	5,2%	€ 2.746,00	€ 52.149,00	5,3%
Rolls Royce	UK	€ 891,00	€ 13.520,00	6,6%	€ 778,00	€ 11.218,00	6,9%
Melrose Industries	UK		€ 7.537,00	-		€ 6.650,00	
SAAB	Sweden	€ 156,10	€ 3.608,30	4,3%	€ 142,50	€ 3.363,30	4,2%
Wartsila	Finland	€ 241,00	€ 5.842,00	4,1%	€ 196,00	€ 4.778,00	4,1%
Kratos	USA	€ 38,60	€ 893,30	4,3%	€ 35,20	€ 811,50	4,3%
Northrop Grumman	USA	€ 1.200,00	€ 36.602,00	3,3%	€ 1.100,00	€ 35.667,00	3,1%
Raytheon	USA	€ 2.711,00	€ 67.074,00	4,0%	€ 2.732,00	€ 64.388,00	4,2%
Security							
Assa Abloy	Sweden	€ 415,20	€ 10.376,10	4,0%	€ 338,10	€ 8.161,00	4,1%
Securitas	Sweden		€ 11.445,10			€ 9.251,40	
Dormakaba	Switzerland	€ 136,70	€ 3.005,50	4,5%	€ 125,50	€ 2.908,50	4,3%
Mobotix	Germany	€ 7,90	€ 56,00	14,1%	€ 8,10	€ 62,40	13,0%
Mobile Systems	Denmark	€ 47,60	€ 199,40	23,9%	€ 39,90	€ 152,90	26,1%
TKH group	Netherlands	€ 60,90	€ 1.816,60	3,4%	€ 56,20	€ 1.523,80	3,7%
Nedap	Netherlands	€ 40,40	€ 230,60	17,5%	€ 36,70	€ 207,00	17,7%
Axis Communications	Sweden	€ 234,80	€ 1.368,40	17,2%	€ 200,60	€ 1.006,10	19,9%
Allegion	USA	€ 74,50	€ 3.271,90	2,3%	€ 73,30	€ 2.867,40	2,6%
Napco Security	USA	€ 8,00	€ 143,60	5,6%	€ 7,60	€ 114,00	6,7%
Optex	Japan	€ 19,50	€ 288,80	6,8%	€ 21,30	€ 345,10	6,2%
Vivotek	Taiwan	€ 21,10	€ 290,30	7,3%	€ 18,80	€ 159,10	11,8%

Company	Country	R&D spend 2022 in $M	Net sales 2022 in $M	R&D as % of net sales 2022	R&D spend 2021 in $M	Net Sales in 2021 in $M	R&D as % of net sales in 2021
Test & Measurement							
Chroma ATE	Taiwan	€ 56,18	€ 646,57	8,7%	€ 44,29	€ 515,21	8,6%
Advantest	Japan	€ 306,50	€ 2.639,80	11,6%	€ 270,40	€ 1.980,60	13,7%
Teradyne	USA	€ 440,60	€ 3.155,00	14,0%	€ 427,60	€ 3.702,90	11,5%
Rohde & Schwarz	Germany		€ 2.500,00			€ 2.300,00	
Mettler Toledo	Switzerland	€ 177,10	€ 3.919,70	4,5%	€ 169,80	€ 3.717,90	4,6%
SKF	Sweden	€ 272,90	€ 8.326,50	3,3%	€ 236,30	€ 7.020,80	3,4%
Anritsu	Japan	€ 72,30	€ 702,30	10,3%	€ 72,10	€ 667,30	10,8%
Fortive	USA	€ 401,50	€ 5.825,70	6,9%	€ 354,80	€ 5.254,70	6,8%
Viavi Solutions	USA	€ 206,90	€ 1.106,10	18,7%	€ 213,20	€ 1.292,40	16,5%
Ametek	USA	€ 198,80	€ 6.150,50	3,2%	€ 194,20	€ 5.546,50	3,5%
National Instruments	USA	€ 331,70	€ 1.657,00	20,0%	€ 336,00	€ 1.469,70	22,9%
Yokogawa	Japan	€ 193,10	€ 2.890,20	6,7%	€ 180,60	€ 2.468,60	7,3%
Cohu	USA	€ 92,60	€ 812,80	11,4%	€ 92,00	€ 887,20	10,4%
Keysight Technologies	USA	€ 841,00	€ 5.420,00	15,5%	€ 811,00	€ 4.941,00	16,4%

Company	Country	R&D spend 2022 in $M	Net sales 2022 in $M	R&D as % of net sales 2022	R&D spend 2021 in $M	Net Sales in 2021 in $M	R&D as % of net sales in 2021
Medical							
Medtronic	USA	$ 2.746,00	$ 31.686,00	8,7%	$ 2.500,00	$ 30.117,00	8,3%
Abbott	USA	$ 2.888,00	$ 43.653,00	6,6%	$ 2.742,00	$ 43.075,00	6,4%
Johnson & Johnson*	USA	$ 14.603,00	$ 94.943,00	15,4%	$ 14.714,00	$ 93.775,00	15,7%
Boston Scientific	USA	$ 1.323,00	$ 12.682,00	10,4%	$ 1.204,00	$ 11.888,00	10,1%
Becton Dickinson	USA	$ 1.256,00	$ 18.870,00	6,7%	$ 1.279,00	$ 19.131,00	6,7%
GE Healthcare	USA	$ 1.056,00	$ 18.461,00	5,7%	$ 847,00	$ 17.725,00	4,8%
Siemens	Germany	€ 5.591,00	€ 71.977,00	7,8%	€ 4.859,00	€ 62.265,00	7,8%
Philips	Netherlands	€ 1.822,00	€ 17.313,00	10,5%	€ 1.806,00	€ 17.156,00	10,5%
Roche	Switzerland	€ 16.023,00	€ 66.426,00	24,1%	€ 14.799,00	€ 65.850,00	22,5%
Fresenius	Germany	€ 867,00	€ 40.840,00	2,1%	€ 805,00	€ 37.520,00	2,1%
B. Braun Melsungen	Germany	€ 541,00	€ 8.500,00	6,4%	€ 417,00	€ 7.860,00	5,3%
Novartis	Switzerland	€ 9.996,00	€ 51.828,00	19,3%	€ 9.540,00	€ 52.877,00	18,0%
Zimmer Bionet	Germany	€ 406,00	€ 6.940,00	5,9%	€ 436,00	€ 6.827,00	6,4%
Smith & Nephew	UK	€ 345,00	€ 5.125,00	6,7%	€ 356,00	€ 5.212,00	6,8%
Carl Zeiss Meditec	Germany	€ 258,00	€ 1.353,00	19,1%	€ 209,00	€ 1.120,00	18,7%
Elekta	Sweden	€ 119,00	€ 1.258,00	9,5%	$ 129,00	$ 1.190,00	10,8%
Alcon	Switzerland	$ 702,00	$ 8.717,00	8,1%	$ 842,00	$ 8.291,00	10,2%
Arjo	Sweden	$ 9,90	$ 859,20	1,2%	$ 8,60	$ 780,90	1,1%
Biotage	Sweden	$ 9,40	$ 134,80	7,0%	$ 7,80	$ 106,10	7,4%
Iom Beam Applications	Belgium	$ 41,80	$ 361,30	11,6%	$ 34,00	$ 313,00	10,9%
Bico	Sweden						
Cellavision	Sweden	$ 7,60	$ 55,00	13,8%	$ 5,50	$ 48,70	11,3%
Surgical Science	Sweden	$ 14,90	$ 69,10	21,6%	$ 5,70	$ 31,60	18,0%
Getinge	Sweden	$ 102,00	$ 2.435,90	4,2%	$ 73,30	$ 2.328,90	3,1%
Stratec	Germany	€ 6,90	€ 274,60	2,5%	$ 9,30	$ 287,30	3,2%
Skan	Switzerland	€ 19,50	€ 292,10	6,7%	$ 15,60	$ 247,10	6,3%

Company	Country	R&D spend 2022 in $M	Net sales 2022 in $M	R&D as % of net sales 2022	R&D spend 2021 in $M	Net Sales in 2021 in $M	R&D as % of net sales in 2021
High-tech systems							
NXP semiconductors	Netherlands	€ 2.148,00	€ 13.205,00	16,3%	€ 1.936,00	€ 11.063,00	17,5%
ASML	Netherlands	€ 3.253,50	€ 21.173,40	15,4%	€ 2.547,00	€ 18.611,00	13,7%
Vanderlande	Netherlands	€ 30,78	€ 506,60	6,1%	€ 15,10	€ 411,50	3,7%
ASM	Netherlands	€ 233,90	€ 2.410,90	9,7%	€ 151,20	€ 1.729,90	8,7%
Infineon Technologies	Germany	€ 1.798,00	€ 14.218,00	12,6%	€ 1.448,00	€ 11.060,00	13,1%
Besi	Netherlands	€ 53,90	€ 722,90	7,5%	€ 36,40	€ 749,30	4,9%
Aixtron	Germany	€ 57,70	€ 463,20	12,5%	€ 56,80	€ 429,00	13,2%
Jenoptik	Germany	€ 54,60	€ 980,70	5,6%	€ 38,90	€ 750,70	5,2%
Elmos	Germany	€ 55,50	€ 447,20	12,4%	€ 48,70	€ 322,10	15,1%
Schneider Electric	Germany	€ 1.040,00	€ 34.176,00	3,0%	€ 855,00	€ 28.905,00	3,0%
Melexis	Belgium	€ 90,20	€ 836,20	10,8%	€ 78,40	€ 643,80	12,2%
AT&S	Austria	€ 181,50	€ 1.589,90	11,4%	€ 118,90	€ 1.188,20	10,0%
DMG MORI	Germany	€ 77,00	€ 2.365,67	3,3%	€ 72,90	€ 2.052,92	3,6%
Epiroc	Sweden	€ 121,80	€ 4.209,10	2,9%	€ 99,30	€ 3.357,90	3,0%
Aalberts	Netherlands	€ 203,00	€ 3.230,00	6,3%		€ 2.979,10	
Atlas Copco	Sweden	€ 463,50	€ 12.154,00	3,8%	€ 354,80	€ 9.538,40	3,7%
ABB	Switzerland	€ 1.166,00	€ 29.446,00	4,0%	€ 1.219,00	€ 28.945,00	4,2%
Durr	Germany	€ 136,50	€ 4.314,10	3,2%	€ 123,90	€ 3.536,70	3,5%
Danfoss	Denmark	€ 457,00	€ 10.256,00	4,5%	€ 328,00	€ 7.539,00	4,4%
Heidelberger Druckmas	Germany	€ 96,00	€ 2.435,00	3,9%	€ 98,00	€ 2.183,00	4,5%
U-Blox	Switzerland	€ 117,70	€ 658,20	17,9%	€ 112,10	€ 436,80	25,7%
Merck Group	Germany	€ 2.521,00	€ 22.232,00	11,3%	€ 2.426,00	€ 19.687,00	12,3%
Comet	Switzerland	€ 67,50	€ 620,90	10,9%	€ 58,60	€ 544,00	10,8%
ThyssenKrupp	Germany	€ 246,00	€ 41.140,00	0,6%	€ 234,00	€ 34.015,00	0,7%
Omron	Japan	€ 280,40	€ 4.831,60	5,8%	€ 273,50	€ 4.151,50	6,6%
Yaskawa	Japan	€ 118,60	€ 3.505,90	3,4%	€ 114,80	€ 3.021,10	3,8%
Fanuc	Japan	€ 315,10	€ 4.622,30	6,8%	€ 296,10	€ 3.476,40	8,5%
Honeywell	USA	€ 1.478,00	€ 35.466,00	4,2%	€ 1.333,00	€ 34.392,00	3,9%
ON Semiconductors	USA	€ 600,20	€ 8.326,20	7,2%	€ 655,00	€ 6.739,80	9,7%

Appendix 11: Innovation rate

Germany					
Segment	**2020**	**2019**	**2018**	**2017**	**2016**
D&S	***274,5***	***392,6***	***355,2***	***409,9***	***393,5***
% of total	***1,8%***	***1,7%***	***1,6%***	***1,7%***	***1,7%***
Signalling or calling systems; order telegraphs; alarm systems	30,1	48,3	35,1	35,2	40,8
Traffic control systems	59,8	73,8	78,8	90,8	78,2
Aircraft; Aviation; Cosmonautics	88,4	142,7	129	143,8	153,6
Ships or other waterborne vessels; related equipment	34,9	52,7	39,7	48,8	53
Weapons	38,9	56,1	47,9	51	49
Ammunition; Blasting	22,4	19	24,7	40,3	18,9
T&M	***772,7***	***1202,5***	***1277,2***	***1202,2***	***1082,3***
% of total	***5,1%***	***5,1%***	***5,6%***	***5,1%***	***4,7%***
Measuring; testing	767,2	1196,3	1271,9	1195,6	1078,1
Horology	5,5	6,2	5,3	6,6	4,2
Med	***717,8***	***1247,8***	***1116,8***	***1163,9***	***1151,4***
% of total	***4,7%***	***5,3%***	***4,9%***	***4,9%***	***5,0%***
Medical or veterinary science; hygiene	715,8	1244,5	1111,9	1161,1	1149,6
X-ray technique	2	3,3	4,9	2,8	1,8
HTS	***1286***	***1846,7***	***1667,3***	***1710,5***	***1568,1***
% of total	***8,4%***	***7,9%***	***7,3%***	***7,2%***	***6,8%***
Semiconductors	213,7	307	224,5	275,4	277,3
Electric elements	624,2	902,8	904	942	858,4
Printed circuit and assemblage of electrical components	88,1	120,9	123,9	138,5	123,1
Controlling; regulating	360	516	414,9	354,6	309,3
Total patent applications to EPO	**15291,6**	**23428,2**	**22803,7**	**23782,6**	**22963,1**

Netherlands					
Segment	**2020**	**2019**	**2018**	**2017**	**2016**
D&S	***41,4***	***65,9***	***46,1***	***51,6***	***50,9***
% of total	***1,6%***	***1,6%***	***1,1%***	***1,2%***	***1,4%***
Signalling or calling systems; order telegraphs; alarm systems	8,9	20,8	19	11,4	6,3
Traffic control systems	1,8	2,6	3	5,1	7,9
Aircraft; Aviation; Cosmonautics	14,1	14,6	6,1	11,9	5,9
Ships or other waterborne vessels; related equipment	14,8	23,6	15,1	17,4	26,8
Weapons	1,8	3,2	2	4,4	1,3
Ammunition; Blasting	0	1,1	0,9	1,4	2,7
T&M	***142,8***	***248***	***398,8***	***248,2***	***206,5***
% of total	***5,5%***	***5,9%***	***9,6%***	***6,0%***	***5,6%***
Measuring; testing	140,1	244,9	396	248,2	203,5
Horology	2,7	3,1	2,8	0	3
Med	***367,7***	***597,4***	***653,8***	***642,3***	***484,1***
% of total	***14,2%***	***14,2%***	***15,8%***	***15,5%***	***13,1%***
Medical or veterinary science; hygiene	360,1	587	646,6	642,3	481,6
X-ray technique	7,6	10,4	7,2	0	2,5
HTS	***184,7***	***193,5***	***171,8***	***170***	***151,6***
% of total	***7,1%***	***4,6%***	***4,1%***	***4,1%***	***4,1%***
Semiconductors	68,4	76,3	70,1	92,1	81
Electric elements	91,7	79,2	65	55,4	46,1
Printed circuit and assemblage of electrical components	10,8	11,8	20,7	8,8	9,8
Controlling; regulating	13,8	26,2	16	13,7	14,7
Total patent applications to EPO	**2588,4**	**4201**	**4143,6**	**4144,8**	**3706,9**

Belgium					
Segment	**2020**	**2019**	**2018**	**2017**	**2016**
D&S	***16,1***	***26,6***	***18***	***21,4***	***23,2***
% of total	***1,4%***	***1,6%***	***1,0%***	***1,2%***	***1,3%***
Signalling or calling systems; order telegraphs; alarm systems	1,4	4,1	1,7	5	3,5
Traffic control systems	3	0	1,7	0	1,1
Aircraft; Aviation; Cosmonautics	1,6	8,7	2,1	2	5,2
Ships or other waterborne vessels; related equipment	3,5	3,8	2,9	0,8	2
Weapons	6,5	10	9,6	10,3	11,4
Ammunition; Blasting	0,1	0	0	3,3	0
T&M	***61,5***	***107,6***	***102***	***87,1***	***111,8***
% of total	***5,5%***	***6,3%***	***5,8%***	***5,0%***	***6,2%***
Measuring; testing	61,5	107,1	102	87,1	110,4
Horology	0	0,5	0	0	1,4
Med	***62,9***	***89***	***99,4***	***99***	***76,5***
% of total	***5,6%***	***5,2%***	***5,6%***	***5,7%***	***4,3%***
Medical or veterinary science; hygiene	62,9	89	99,4	99	76,5
X-ray technique	0	0	0	0	0
HTS	***65,5***	***80,9***	***106,4***	***98,5***	***76,7***
% of total	***5,8%***	***4,8%***	***6,0%***	***5,7%***	***4,3%***
Semiconductors	42,8	62	75,6	67	52,9
Electric elements	19,9	17,5	29	27,8	18,3
Printed circuit and assemblage of electrical components	2,8	1,4	1,8	3,7	5,5
Controlling; regulating	5,9	6,4	5,4	8,4	5,2
Total patent applications to EPO	**1122,6**	**1695,6**	**1759,4**	**1734,6**	**1794,4**

Luxembourg					
Segment	**2020**	**2019**	**2018**	**2017**	**2016**
D&S	***0,2***	***1***	***0,1***	***1,5***	***0***
% of total	***0,3%***	***0,9%***	***0,1%***	***1,6%***	***0,0%***
Signalling or calling systems; order telegraphs; alarm systems	0,1	0	0	0,4	0
Traffic control systems	0	0,3	0	0	0
Aircraft; Aviation; Cosmonautics	0,1	0	0,1	1,1	0
Ships or other waterborne vessels; related equipment	0	0,7	0	0	0
Weapons	0	0	0	0	0
Ammunition; Blasting	0	0	0	0	0
T&M	***1,3***	***6,5***	***5,1***	***2,5***	***4,7***
% of total	***1,6%***	***5,6%***	***5,5%***	***2,7%***	***4,4%***
Measuring; testing	1,3	6,5	5,1	2,5	4,7
Horology	0	0	0	0	0
Med	***0,6***	***5,9***	***1,3***	***7,7***	***2,1***
% of total	***0,8%***	***5,1%***	***1,4%***	***8,3%***	***2,0%***
Medical or veterinary science; hygiene	0,6	5,9	1,3	7,7	2,1
X-ray technique	0	0	0	0	0
HTS	***2,2***	***2,5***	***4,6***	***3,9***	***7,3***
% of total	***2,8%***	***2,2%***	***5,0%***	***4,2%***	***6,9%***
Semiconductors	1	0,1	1,2	3,4	1,5
Electric elements	0	1,8	2,8	0,5	3,9
Printed circuit and assemblage of electrical components	0,7	0,2	0	0	0
Controlling; regulating	0,5	0,4	0,6	0	1,9
Total patent applications to EPO	**79,9**	**115,8**	**92,6**	**93**	**105,7**

Switzerland					
Segment	**2020**	**2019**	**2018**	**2017**	**2016**
D&S	***22,2***	***47,7***	***38***	***29,6***	***44,7***
% of total	***0,9%***	***1,2%***	***1,0%***	***0,8%***	***1,2%***
Signalling or calling systems; order telegraphs; alarm systems	3,5	19	11,2	10	8,7
Traffic control systems	3	2,3	4,5	3,3	5,8
Aircraft; Aviation; Cosmonautics	8,3	8,5	3,7	9,9	7,7
Ships or other waterborne vessels; related equipment	2,3	9	8,3	3,1	5,2
Weapons	2,8	3,8	6,9	0,8	6,9
Ammunition; Blasting	2,3	5,1	3,4	2,5	10,4
T&M	***337,6***	***500,5***	***507,8***	***486,9***	***482,6***
% of total	***14,0%***	***12,8%***	***13,0%***	***13,1%***	***13,1%***
Measuring; testing	187,7	283	293,7	303,3	277,7
Horology	149,9	217,5	214,1	183,6	204,9
Med	***198***	***363,9***	***376,2***	***312,4***	***321,1***
% of total	***8,2%***	***9,3%***	***9,6%***	***8,4%***	***8,7%***
Medical or veterinary science; hygiene	198	363,9	375,2	312,4	320,2
X-ray technique	0	0	1	0	0,9
HTS	***150,8***	***178,1***	***182,6***	***134,1***	***180,9***
% of total	***6,2%***	***4,5%***	***4,7%***	***3,6%***	***4,9%***
Semiconductors	48,2	49,4	43	38,1	63,4
Electric elements	72,2	83,7	103,7	62,4	90,1
Printed circuit and assemblage of electrical components	5	12,3	5,9	8,4	10,2
Controlling; regulating	25,4	32,7	30	25,2	17,2
Total patent applications to EPO	**2413,7**	**3916,1**	**3909,9**	**3727**	**3697,5**

Austria					
Segment	**2020**	**2019**	**2018**	**2017**	**2016**
D&S	***12,3***	***58,8***	***28,2***	***28,9***	***31,6***
% of total	***0,8%***	***2,6%***	***1,3%***	***1,3%***	***1,5%***
Signalling or calling systems; order telegraphs; alarm systems	2,2	2,1	6,5	1,9	4,7
Traffic control systems	1	4,9	4,3	2,9	2,1
Aircraft; Aviation; Cosmonautics	0,7	10,7	1,7	7,2	8,4
Ships or other waterborne vessels; related equipment	0,5	5,6	5,1	6,8	4,7
Weapons	7,5	34,3	8,5	8,2	11,2
Ammunition; Blasting	0,4	1,2	2,1	1,9	0,5
T&M	***94,8***	***134,6***	***142,8***	***124,1***	***120,9***
% of total	***6,4%***	***5,9%***	***6,7%***	***5,7%***	***5,8%***
Measuring; testing	94,8	134,6	142,8	124,1	117,2
Horology	0	0	0	0	3,7
Med	***47,1***	***59,6***	***83,1***	***80,4***	***47,1***
% of total	***3,2%***	***2,6%***	***3,9%***	***3,7%***	***2,3%***
Medical or veterinary science; hygiene	47,1	59,6	83,1	80,4	47,1
X-ray technique	0	0	0	0	0
HTS	***143***	***214,6***	***195,4***	***183,7***	***177,9***
% of total	***9,6%***	***9,5%***	***9,2%***	***8,5%***	***8,5%***
Semiconductors	39,3	49,2	48,6	41,8	48,3
Electric elements	59,8	104,5	95,7	84,4	87,6
Printed circuit and assemblage of electrical components	20,8	27,2	25,4	24,4	20,6
Controlling; regulating	23,1	33,7	25,7	33,1	21,4
Total patent applications to EPO	**1490,4**	**2268,8**	**2132,3**	**2162,7**	**2093,1**

Sweden					
Segment	**2020**	**2019**	**2018**	**2017**	**2016**
D&S	***33,4***	***68,8***	***71,8***	***57,8***	***73,1***
% of total	***1,8%***	***1,9%***	***2,1%***	***1,7%***	***2,1%***
Signalling or calling systems; order telegraphs; alarm systems	5,9	14,3	22,3	13,1	13,9
Traffic control systems	11,3	20,5	11,1	9,9	17,9
Aircraft; Aviation; Cosmonautics	3,9	5,6	11	10,6	7,5
Ships or other waterborne vessels; related equipment	5,5	15,1	19,9	9	15
Weapons	3,8	8,9	3,2	6,6	10,6
Ammunition; Blasting	3	4,4	4,3	8,6	8,2
T&M	***88,3***	***165,2***	***154,9***	***153,2***	***156,9***
% of total	***4,8%***	***4,7%***	***4,5%***	***4,6%***	***4,5%***
Measuring; testing	87,3	165,2	154,3	153,2	156,9
Horology	1	0	0,6	0	0
Med	***94,1***	***169,3***	***186,3***	***218,9***	***208,2***
% of total	***5,1%***	***4,8%***	***5,4%***	***6,5%***	***5,9%***
Medical or veterinary science; hygiene	93,9	167,8	179	218,9	208,2
X-ray technique	0,2	1,5	7,3	0	0
HTS	***92,2***	***144,2***	***135,6***	***128,8***	***114,7***
% of total	***5,0%***	***4,1%***	***3,9%***	***3,8%***	***3,3%***
Semiconductors	7,8	14,8	13,6	18	17,1
Electric elements	46,2	60,1	60,8	74	58,9
Printed circuit and assemblage of electrical components	7,1	19	22,1	7	7,9
Controlling; regulating	31,1	50,3	39,1	29,8	30,8
Total patent applications to EPO	**1834**	**3552,4**	**3454,2**	**3365,8**	**3511,1**

Norway					
Segment	**2020**	**2019**	**2018**	**2017**	**2016**
D&S	***13,2***	***13,8***	***20,4***	***11,6***	***19,1***
% of total	***4,9%***	***2,7%***	***3,5%***	***2,0%***	***3,3%***
Signalling or calling systems; order telegraphs; alarm systems	3	2,5	5,6	2	6,3
Traffic control systems	0,3	0,3	5,6	0	0,5
Aircraft; Aviation; Cosmonautics	1,3	3,5	1,8	2,3	3,6
Ships or other waterborne vessels; related equipment	8,6	4,1	7	5,1	6,7
Weapons	0	3,1	0,4	2,2	1
Ammunition; Blasting	0	0,3	0	0	1
T&M	***18,3***	***51,7***	***38,1***	***47,9***	***29,3***
% of total	***6,8%***	***10,3%***	***6,6%***	***8,3%***	***5,0%***
Measuring; testing	18,3	51,7	38,1	47,3	29
Horology	0	0	0	0,6	0,3
Med	***2,2***	***20,4***	***26,3***	***14,9***	***21,1***
% of total	***0,8%***	***4,1%***	***4,6%***	***2,6%***	***3,6%***
Medical or veterinary science; hygiene	2,2	20,4	26,3	14,9	21,1
X-ray technique	0	0	0	0	0
HTS	***20,7***	***25,8***	***19,6***	***26***	***26,9***
% of total	***7,7%***	***5,1%***	***3,4%***	***4,5%***	***4,6%***
Semiconductors	0,1	2,6	2,2	1,8	3,1
Electric elements	16,1	18	10,3	17,5	18,3
Printed circuit and assemblage of electrical components	2,2	0,9	1,7	0,8	1
Controlling; regulating	2,3	4,3	5,4	5,9	4,5
Total patent applications to EPO	**268,8**	**502,5**	**575,8**	**577**	**585,6**

Denmark					
Segment	**2020**	**2019**	**2018**	**2017**	**2016**
D&S	***21***	***21,7***	***16,7***	***14,7***	***19,3***
% of total	***1,9%***	***1,3%***	***1,0%***	***0,9%***	***1,3%***
Signalling or calling systems; order telegraphs; alarm systems	0,2	1,3	2	2,2	2,5
Traffic control systems	0	0,1	0,7	0,8	0
Aircraft; Aviation; Cosmonautics	3,3	2,4	2,8	1,6	3,8
Ships or other waterborne vessels; related equipment	17,5	16,9	10,8	9,1	12
Weapons	0	1	0,4	1	1
Ammunition; Blasting	0	0	0	0	0
T&M	***42,5***	***66,7***	***79,8***	***73,5***	***77,7***
% of total	***3,8%***	***4,1%***	***4,8%***	***4,7%***	***5,2%***
Measuring; testing	42,5	66,7	78,8	72,9	77,7
Horology	0	0	1	0,6	0
Med	***75,1***	***121,5***	***157,7***	***171,9***	***136,1***
% of total	***6,8%***	***7,4%***	***9,6%***	***11,0%***	***9,1%***
Medical or veterinary science; hygiene	75,1	121,5	157,7	171,9	136,1
X-ray technique	0	0	0	0	0
HTS	***29,3***	***47,9***	***30,3***	***35,8***	***29,4***
% of total	***2,6%***	***2,9%***	***1,8%***	***2,3%***	***2,0%***
Semiconductors	1	0,7	1,6	3,1	1,4
Electric elements	12,6	18,1	12	18,2	11,5
Printed circuit and assemblage of electrical components	2,8	9,4	0,5	0,6	1,8
Controlling; regulating	12,9	19,7	16,2	13,9	14,7
Total patent applications to EPO	**1111,7**	**1641,5**	**1646,9**	**1568,7**	**1496,3**

Finland					
Segment	**2020**	**2019**	**2018**	**2017**	**2016**
D&S	***12,2***	***16,8***	***19,9***	***18,1***	***30,2***
% of total	***1,3%***	***1,1%***	***1,3%***	***1,2%***	***2,1%***
Signalling or calling systems; order telegraphs; alarm systems	0,6	2,2	1	2,4	5,3
Traffic control systems	0	2	1,5	0,4	4
Aircraft; Aviation; Cosmonautics	1,2	2,9	4,2	1	3,3
Ships or other waterborne vessels; related equipment	7,1	4,1	10,5	9,9	16
Weapons	1,8	3,3	2	2,6	0,8
Ammunition; Blasting	1,5	2,3	0,7	1,8	0,8
T&M	***68,4***	***130,8***	***92,3***	***53,8***	***89,1***
% of total	***7,4%***	***8,6%***	***6,0%***	***3,7%***	***6,1%***
Measuring; testing	68,4	130,3	91,4	53,8	89,1
Horology	0	0,5	0,9	0	0
Med	***26,3***	***67,7***	***72,4***	***77,3***	***74,5***
% of total	***2,9%***	***4,4%***	***4,7%***	***5,3%***	***5,1%***
Medical or veterinary science; hygiene	26,3	67,7	72,4	77,3	74,5
X-ray technique	0	0	0	0	0
HTS	***34,4***	***76,7***	***55,9***	***67,1***	***32,1***
% of total	***3,7%***	***5,0%***	***3,7%***	***4,6%***	***2,2%***
Semiconductors	11,1	20,6	12,7	18,2	7,4
Electric elements	9,2	19,2	25,9	22,3	10
Printed circuit and assemblage of electrical components	3,5	12,5	8	11,6	7,3
Controlling; regulating	10,6	24,4	9,3	15	7,4
Total patent applications to EPO	**921,2**	**1524,1**	**1528,2**	**1465**	**1450,3**

France					
Segment	**2020**	**2019**	**2018**	**2017**	**2016**
D&S	***156,8***	***325,2***	***300,7***	***276,6***	***275,1***
% of total	***3,0%***	***3,4%***	***3,2%***	***2,9%***	***3,0%***
Signalling or calling systems; order telegraphs; alarm systems	13,4	28	17,6	19,5	27,2
Traffic control systems	11,5	29,2	20,8	23,3	14
Aircraft; Aviation; Cosmonautics	98,7	191,4	188,4	146,5	152,2
Ships or other waterborne vessels; related equipment	15,5	33	38,5	50,5	39,2
Weapons	9,3	25	20,1	24,5	35,1
Ammunition; Blasting	8,4	18,6	15,3	12,3	7,4
T&M	***420,6***	***649,9***	***676,2***	***633,5***	***649,3***
% of total	***8,2%***	***6,9%***	***7,2%***	***6,6%***	***7,1%***
Measuring; testing	380,5	599,7	626,3	593,4	605,2
Horology	40,1	50,2	49,9	40,1	44,1
Med	***296,6***	***474,8***	***456,9***	***418,7***	***424,6***
% of total	***5,8%***	***5,0%***	***4,9%***	***4,3%***	***4,6%***
Medical or veterinary science; hygiene	296,3	474,3	455,9	418,1	421,8
X-ray technique	0,3	0,5	1	0,6	2,8
HTS	***402,1***	***651,2***	***619,4***	***642***	***589,5***
% of total	***7,8%***	***6,9%***	***6,6%***	***6,7%***	***6,4%***
Semiconductors	138	226,4	234	214,3	199,9
Electric elements	190,6	296,1	271,4	307,5	271,7
Printed circuit and assemblage of electrical components	30,2	57,8	46,1	61,9	51,8
Controlling; regulating	43,3	70,9	67,9	58,3	66,1
Total patent applications to EPO	**5145,7**	**9463,6**	**9400,2**	**9630,6**	**9168,4**

Appendix 12: Profit margins

Company	Country	Net sales 2022 in $M	Gross profit 2022 in $M	Gross profit margin 2022	Net Sales in 2021 in $M	Gross profit 2021 in $M	Gross profit margin 2021
Defense							
Thales	France	€ 17.569,00	€ 4.456,00	25,4%	€ 16.192,00	€ 4.033,00	24,9%
Safran	France	€ 19.035,00	-		€ 15.257,00	-	
BAE Systems	UK	€ 21.258,00	-		€ 19.521,00		
Naval Group	France	€ 4.353,00	€ 812,00	18,7%	€ 4.053,00	€ 597,00	14,7%
Hensoldt	Germany	€ 1.707,00	€ 393,00	23,0%	€ 1.474,00	€ 330,00	22,4%
Rheinmetall Group	Germany	€ 6.410,00			€ 5.658,00		
Qinetiq	UK	€ 1.330,90	€ 181,50	13,6%	€ 1.278,20	€ 185,80	14,5%
FACC	Austria	€ 607,00	€ 48,50	8,0%	€ 497,60	€ 34,70	7,0%
GOMspace	Sweden	€ 17,10	€ -4,40	-25,7%	€ 18,40	€ 4,22	22,9%
Airbus	France	€ 58.763,00	€ 10.571,00	18,0%	€ 52.149,00	€ 9.631,00	18,5%
Rolls Royce	UK	€ 13.520,00	€ 2.757,00	20,4%	€ 11.218,00	€ 2.136,00	19,0%
Melrose Industries	UK	€ 7.537,00	€ 1.079,00	14,3%	€ 6.650,00	€ 900,00	13,5%
SAAB	Sweden	€ 3.608,30	€ 763,30	21,2%	€ 3.363,30	€ 704,80	21,0%
Wartsila	Finland	€ 5.842,00			€ 4.778,00		
Kratos	USA	€ 893,30	€ 226,00	25,3%	€ 811,50	€ 225,10	27,7%
Northrop Grumman	USA	€ 36.602,00	€ 7.474,00	20,4%	€ 35.667,00	€ 7.268,00	20,4%
Raytheon	USA	€ 67.074,00	€ 13.668,00	20,4%	€ 64.388,00	€ 12.491,00	19,4%
Security							
Assa Abloy	Sweden	€ 10.376,10	€ 4.117,30	39,7%	€ 8.161,00	€ 3.245,00	39,8%
Securitas	Sweden	€ 11.445,10	€ 2.243,10	19,6%	€ 9.251,40	€ 1.704,70	18,4%
Dormakaba	Switzerland	€ 3.005,50	€ 1.199,70	39,9%	€ 2.908,50	€ 1.141,00	39,2%
Mobotix	Germany	€ 56,00			€ 62,40		
Mobile Systems	Denmark	€ 199,40	€ 177,30	88,9%	€ 152,90	€ 145,70	95,3%
TKH group	Netherlands	€ 1.816,60	€ 857,90	47,2%	€ 1.523,80	€ 736,50	48,3%
Nedap	Netherlands	€ 230,60	€ 151,50	65,7%	€ 207,00	€ 140,20	67,7%
Axis Communications	Sweden	€ 1.368,40	€ 672,10	49,1%	€ 1.006,10	€ 494,70	49,2%
Allegion	USA	€ 3.271,90	€ 1.322,40	40,4%	€ 2.867,40	€ 1.204,90	42,0%
Napco Security	USA	€ 143,60	€ 59,20	41,2%	€ 114,00	€ 50,70	44,5%
Optex	Japan	€ 288,80	€ 150,40	52,1%	€ 345,10	€ 176,30	51,1%
Vivotek	Taiwan	€ 290,30			€ 159,10		

Company	Country	Net sales 2022 in $M	Gross profit 2022 in $M	Gross profit margin 2022	Net Sales in 2021 in $M	Gross profit 2021 in $M	Gross profit margin 2021
Test & Measurement							
Chroma ATE	Taiwan	€ 646,57	€ 332,76	51,5%	€ 515,21	€ 247,59	48,1%
Advantest	Japan	€ 2.639,80	€ 1.493,80	56,6%	€ 1.980,60	€ 1.065,60	53,8%
Teradyne	USA	€ 3.155,00	€ 1.867,20	59,2%	€ 3.702,90	€ 2.206,70	59,6%
Rohde & Schwarz	Germany	€ 2.500,00	€ 1.800,00	72,0%	€ 2.300,00	€ 1.700,00	73,9%
Mettler Toledo	Switzerland	€ 3.919,70	€ 2.308,00	58,9%	€ 3.717,90	€ 2.171,60	58,4%
SKF	Sweden	€ 8.326,50	€ 2.101,80	25,2%	€ 7.020,80	€ 1.999,30	28,5%
Anritsu	Japan	€ 702,30	€ 342,20	48,7%	€ 667,30	€ 351,20	52,6%
Fortive	USA	€ 5.825,70	€ 3.363,40	57,7%	€ 5.254,70	€ 3.007,10	57,2%
Viavi Solutions	USA	€ 1.106,10	€ 638,80	57,8%	€ 1.292,40	€ 773,50	59,8%
Ametek	USA	€ 6.150,50	€ 2.145,20	34,9%	€ 5.546,50	€ 1.912,60	34,5%
National Instruments	USA	€ 1.657,00	€ 1.122,30	67,7%	€ 1.469,70	€ 1.048,70	71,4%
Yokogawa	Japan	€ 2.890,20			€ 2.468,60		
Cohu	USA	€ 812,80	€ 383,40	47,2%	€ 887,20	€ 386,90	43,6%
Keysight Technologies	USA	€ 5.420,00	€ 3.450,00	63,7%	€ 4.941,00	€ 3.069,00	62,1%

Company	Country	Net sales 2022 in $M	Gross profit 2022 in $M	Gross profit margin 2022	Net Sales in 2021 in $M	Gross profit 2021 in $M	Gross profit margin 2021
Medical							
Medtronic	USA	$ 31.686,00	$ 19.808,00	62,5%	$ 30.117,00	$ 17.851,00	59,3%
Abbott	USA	$ 43.653,00	$ 22.498,00	51,5%	$ 43.075,00	$ 22.491,00	52,2%
Johnson & Johnson*	USA	$ 94.943,00	$ 63.854,00	67,3%	$ 93.775,00	$ 63.920,00	68,2%
Boston Scientific	USA	$ 12.682,00	$ 8.727,00	68,8%	$ 11.888,00	$ 8.177,00	68,8%
Becton Dickinson	USA	$ 18.870,00	$ 8.477,00	44,9%	$ 19.131,00	$ 8.631,00	45,1%
GE Healthcare	USA	$ 18.461,00			$ 17.725,00		
Siemens	Germany	€ 71.977,00	€ 25.847,00	35,9%	€ 62.265,00	€ 22.737,00	36,5%
Philips	Netherlands	€ 17.313,00	€ 7.820,00	45,2%	€ 17.156,00	€ 7.168,00	41,8%
Roche	Switzerland	€ 66.426,00	€ 46.029,00	69,3%	€ 65.850,00	€ 46.203,00	70,2%
Fresenius	Germany	€ 40.840,00	€ 10.725,00	26,3%	€ 37.520,00	€ 10.311,00	27,5%
B. Braun Melsungen	Germany	€ 8.500,00	€ 3.231,00	38,0%	€ 7.860,00	€ 3.061,00	38,9%
Novartis	Switzerland	€ 51.828,00	€ 36.342,00	70,1%	€ 52.877,00	€ 37.010,00	70,0%
Zimmer Bionet	Germany	€ 6.940,00	€ 4.920,00	70,9%	€ 6.827,00	€ 4.867,00	71,3%
Smith & Nephew	UK	€ 5.125,00	€ 3.675,00	71,7%	€ 5.212,00	€ 3.669,00	70,4%
Carl Zeiss Meditec	Germany	€ 1.353,00	€ 820,00	60,6%	€ 1.120,00	€ 669,00	59,7%
Elekta	Sweden	€ 1.258,00	$ 470,00	37,4%	$ 1.190,00	$ 485,00	40,8%
Alcon	Switzerland	$ 8.717,00	$ 4.748,00	54,5%	$ 8.291,00	$ 4.652,00	56,1%
Arjo	Sweden	$ 859,20	$ 362,60	42,2%	$ 780,90	$ 362,40	46,4%
Biotage	Sweden	$ 134,80	$ 81,60	60,5%	$ 106,10	$ 65,00	61,3%
Iom Beam Applications	Belgium	$ 361,30	$ 126,80	35,1%	$ 313,00	$ 107,70	34,4%
Bico	Sweden						
Cellavision	Sweden	$ 55,00	$ 37,70	68,5%	$ 48,70	$ 33,80	69,4%
Surgical Science	Sweden	$ 69,10	$ 45,80	66,3%	$ 31,60	$ 22,90	72,5%
Getinge	Sweden	$ 2.435,90	$ 1.154,60	47,4%	$ 2.328,90	$ 1.169,00	50,2%
Stratec	Germany	€ 274,60	$ 79,50	29,0%	$ 287,30	$ 87,70	30,5%
Skan	Switzerland	€ 292,10	$ 211,90	72,5%	$ 247,10	$ 179,40	72,6%

Company	Country	Net sales 2022 in $M	Gross profit 2022 in $M	Gross profit margin 2022	Net Sales in 2021 in $M	Gross profit 2021 in $M	Gross profit margin 2021
High-tech systems							
NXP semiconductors	Netherlands	€ 13.205,00	€ 7.517,00	56,9%	€ 11.063,00	€ 6.067,00	54,8%
ASML	Netherlands	€ 21.173,40	€ 10.700,10	50,5%	€ 18.611,00	€ 9.809,00	52,7%
Vanderlande	Netherlands	€ 506,60	€ 155,90	30,8%	€ 411,50	€ 124,30	30,2%
ASM	Netherlands	€ 2.410,90	€ 1.142,90	47,4%	€ 1.729,90	€ 828,10	47,9%
Infineon Technologies	Germany	€ 14.218,00	€ 6.131,00	43,1%	€ 11.060,00	€ 4.260,00	38,5%
Besi	Netherlands	€ 722,90	€ 443,10	61,3%	€ 749,30	€ 446,80	59,6%
Aixtron	Germany	€ 463,20	€ 195,30	42,2%	€ 429,00	€ 181,50	42,3%
Jenoptik	Germany	€ 980,70	€ 345,70	35,3%	€ 750,70	€ 256,90	34,2%
Elmos	Germany	€ 447,20	€ 207,50	46,4%	€ 322,10	€ 144,70	44,9%
Schneider Electric	Germany	€ 34.176,00	€ 13.876,00	40,6%	€ 28.905,00	€ 11.843,00	41,0%
Melexis	Belgium	€ 836,20	€ 374,70	44,8%	€ 643,80	€ 273,60	42,5%
AT&S	Austria	€ 1.589,90	€ 252,90	15,9%	€ 1.188,20	€ 167,00	14,1%
DMG MORI	Germany	€ 2.365,67			€ 2.052,92		
Epiroc	Sweden	€ 4.209,10	€ 1.610,90	38,3%	€ 3.357,90	€ 1.308,90	39,0%
Aalberts	Netherlands	€ 3.230,00			€ 2.979,10		
Atlas Copco	Sweden	€ 12.154,00	€ 5.107,00	42,0%	€ 9.538,40	€ 4.001,50	42,0%
ABB	Switzerland	€ 29.446,00	€ 9.710,00	33,0%	€ 28.945,00	€ 9.467,00	32,7%
Durr	Germany	€ 4.314,10	€ 938,70	21,8%	€ 3.536,70	€ 819,40	23,2%
Danfoss	Denmark	€ 10.256,00	€ 3.300,00	32,2%	€ 7.539,00	€ 2.452,00	32,5%
Heidelberger Druckmas	Germany	€ 2.435,00			€ 2.183,00		
U-Blox	Switzerland	€ 658,20	€ 323,60	49,2%	€ 436,80	€ 204,20	46,7%
Merck Group	Germany	€ 22.232,00	€ 13.705,00	61,6%	€ 19.687,00	€ 12.335,00	62,7%
Comet	Switzerland	€ 620,90	€ 277,00	44,6%	€ 544,00	€ 235,90	43,4%
ThyssenKrupp	Germany	€ 41.140,00	€ 5.660,00	13,8%	€ 34.015,00	€ 4.356,00	12,8%
Omron	Japan	€ 4.831,60	€ 2.196,40	45,5%	€ 4.151,50	€ 1.889,50	45,5%
Yaskawa	Japan	€ 3.505,90	€ 1.210,80	34,5%	€ 3.021,10	€ 1.063,50	35,2%
Fanuc	Japan	€ 4.622,30			€ 3.476,40		
Honeywell	USA	€ 35.466,00	€ 23.825,00	67,2%	€ 34.392,00	€ 23.394,00	68,0%
ON Semiconductors	USA	€ 8.326,20	€ 4.077,20	49,0%	€ 6.739,80	€ 2.714,30	40,3%

Appendix 13: Customer size

Netherlands											
Segment	Total	>250 employees	50-249 employees	20-49 employees	10-19 employees	0-9 employees	%>250 employees	%>50 employees	%>20 employees	%>10 employees	%>0 employees
D&S	**1404**	**17**	**38**	**45**	**60**	**1246**	**1,2%**	**3,8%**	**7,0%**	**11,3%**	**100,0%**
Manufacture of communication equipment	131	0	4	5	8	114	0,0%	3,1%	6,9%	13,0%	100,0%
Manufacture of electrical equipment*	138	3	4	4	8	120,5	1,8%	4,4%	6,9%	12,4%	100,0%
Building of ships and boats	1070	9	26	31	41	963	0,8%	3,3%	6,2%	10,0%	100,0%
Manufacture of air and spacecraft and related machinery	63	5	3	4	3	48	7,9%	12,7%	19,0%	23,8%	100,0%
Manufacture of military fighting vehicles	2	0	1	1	0	0	0,0%	50,0%	100,0%	100,0%	100,0%
T&M	**532**	**5**	**36**	**42**	**39**	**410**	**0,9%**	**7,7%**	**15,6%**	**22,9%**	**100,0%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	532	5	36	42	39	410	0,9%	7,7%	15,6%	22,9%	100,0%
MED	**2117**	**8**	**32**	**50**	**105**	**1922**	**0,4%**	**1,9%**	**4,3%**	**9,2%**	**100,0%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	84	2	5	4	2	71	2,4%	8,3%	13,1%	15,5%	100,0%
Manufacture of medical and dental instruments and supplies	2033	6	27	46	103	1851	0,3%	1,6%	3,9%	9,0%	100,0%
HTS	**3553**	**43**	**316**	**349**	**332**	**2515**	**1,2%**	**10,1%**	**19,9%**	**29,2%**	**100,0%**
Manufacture of electrical equipment*	138	3	4	4	8	120,5	1,8%	4,4%	6,9%	12,4%	100,0%
Manufacture of machinery and equipment n.e.c.	3415	40	312	345	324	2394	1,2%	10,3%	20,4%	29,9%	100,0%

Germany											
Segment	Total	>250 employees	50-249 employees	20-49 employees	10-19 employees	0-9 employees	>250 employees	>50 employees	>20 employees	>10 employees	>0 employees
D&S	**2439**	**94**	**206**	**184**	**242**	**1714**	**3,9%**	**12,3%**	**19,8%**	**29,7%**	**100,0%**
Manufacture of communication equipment	811	21	52	39	64	635	2,6%	9,0%	13,8%	21,7%	100,0%
Manufacture of electrical equipment*	806	30	94	70	77	536	3,7%	15,3%	24,0%	33,5%	100,0%
Building of ships and boats	569	15	26	43	75	410	2,6%	7,2%	14,8%	27,9%	100,0%
Manufacture of air and spacecraft and related machinery	247	25	34	29	26	133	10,1%	23,9%	35,6%	46,2%	100,0%
Manufacture of military fighting vehicles	6	3	0	3	0	0	50,0%	50,0%	100,0%	100,0%	100,0%
T&M	**2646**	**112**	**356**	**373**	**444**	**1361**	**4,2%**	**17,7%**	**31,8%**	**48,6%**	**100,0%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	2646	112	356	373	444	1361	4,2%	17,7%	31,8%	48,6%	100,0%
MED	**11699**	**95**	**412**	**892**	**3395**	**6905**	**0,8%**	**4,3%**	**12,0%**	**41,0%**	**100,0%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	294	9	13	27	80	165	3,1%	7,5%	16,7%	43,9%	100,0%
Manufacture of medical and dental instruments and supplies	11405	86	399	865	3315	6740	0,8%	4,3%	11,8%	40,9%	100,0%
HTS	**17086**	**825**	**2268**	**2185**	**2687**	**9122**	**4,8%**	**18,1%**	**30,9%**	**46,6%**	**100,0%**
Manufacture of electrical equipment*	806	30	94	70	77	536	3,7%	15,3%	24,0%	33,5%	100,0%
Manufacture of machinery and equipment n.e.c.	16280	795	2174	2115	2610	8586	4,9%	18,2%	31,2%	47,3%	100,0%

Austria											
Segment	Total	>250 employees	50-249 employees	20-49 employees	10-19 employees	0-9 employees	>250 employees	>50 employees	>20 employees	>10 employees	>0 employees
D&S	**206**	**8**	**18**	**19**	**13**	**148**	**3,9%**	**12,6%**	**21,8%**	**28,2%**	**100,0%**
Manufacture of communication equipment	71	2	4	2	4	59	2,8%	8,5%	11,3%	16,9%	100,0%
Manufacture of electrical equipment*	63	4	7	9	4	39	6,3%	17,5%	31,7%	38,1%	100,0%
Building of ships and boats	41	0	2	3	4	32	0,0%	4,9%	12,2%	22,0%	100,0%
Manufacture of air and spacecraft and related machinery	30	2	4	5	1	18	6,7%	20,0%	36,7%	40,0%	100,0%
Manufacture of military fighting vehicles	1	0	1	0	0	0	0,0%	100,0%	100,0%	100,0%	100,0%
T&M	**252**	**7**	**18**	**28**	**36**	**163**	**2,8%**	**9,9%**	**21,0%**	**35,3%**	**100,0%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	252	7	18	28	36	163	2,8%	9,9%	21,0%	35,3%	100,0%
MED	**954**	**7**	**17**	**47**	**116**	**767**	**0,7%**	**2,5%**	**7,4%**	**19,6%**	**100,0%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	61	3	1	3	4	50	4,9%	6,6%	11,5%	18,0%	100,0%
Manufacture of medical and dental instruments and supplies	893	4	16	44	112	717	0,4%	2,2%	7,2%	19,7%	100,0%
HTS	**1486**	**90**	**205**	**203**	**177**	**811**	**6,1%**	**19,9%**	**33,5%**	**45,4%**	**100,0%**
Manufacture of electrical equipment*	63	4	7	9	4	39	6,3%	17,5%	31,7%	38,1%	100,0%
Manufacture of machinery and equipment n.e.c.	1423	86	198	194	173	772	6,0%	20,0%	33,6%	45,7%	100,0%

Sweden											
Segment	Total	>250 employees	50-249 employees	20-49 employees	10-19 employees	0-9 employees	>250 employees	>50 employees	>20 employees	>10 employees	>0 employees
D&S	**918**	**9**	**27**	**27**	**37**	**820**	**0,9%**	**3,9%**	**6,8%**	**10,7%**	**100,0%**
Manufacture of communication equipment	180	4	7	8	12	149	2,2%	6,1%	10,6%	17,2%	100,0%
Manufacture of electrical equipment*	71	1	6	7	4	55	0,7%	9,2%	18,3%	23,2%	100,0%
Building of ships and boats	608	2	10	9	18	569	0,3%	2,0%	3,5%	6,4%	100,0%
Manufacture of air and spacecraft and related machinery	58	2	4	3	3	46	3,4%	10,3%	15,5%	20,7%	100,0%
Manufacture of military fighting vehicles	1	0	0	0	0	1	0,0%	0,0%	0,0%	0,0%	100,0%
T&M	**417**	**3**	**19**	**22**	**31**	**342**	**0,7%**	**5,3%**	**10,6%**	**18,0%**	**100,0%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	417	3	19	22	31	342	0,7%	5,3%	10,6%	18,0%	100,0%
MED	**819**	**6**	**16**	**28**	**40**	**729**	**0,7%**	**2,7%**	**6,1%**	**11,0%**	**100,0%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	59	0	2	4	3	50	0,0%	3,4%	10,2%	15,3%	100,0%
Manufacture of medical and dental instruments and supplies	760	6	14	24	37	679	0,8%	2,6%	5,8%	10,7%	100,0%
HTS	**2328**	**62**	**160**	**176**	**172**	**1760**	**2,6%**	**9,5%**	**17,1%**	**24,4%**	**100,0%**
Manufacture of electrical equipment*	71	1	6	7	4	55	0,7%	9,2%	18,3%	23,2%	100,0%
Manufacture of machinery and equipment n.e.c.	2257	61	154	169	168	1705	2,7%	9,5%	17,0%	24,5%	100,0%

Denmark											
Segment	Total	>250 employees	50-249 employees	20-49 employees	10-19 employees	0-9 employees	>250 employees	>50 employees	>20 employees	>10 employees	>0 employees
D&S	**280**	**5**	**13**	**18**	**26**	**220**	**1,6%**	**6,1%**	**12,3%**	**21,4%**	**100,0%**
Manufacture of communication equipment	95	1	5	7	9	73	1,1%	6,3%	13,7%	23,2%	100,0%
Manufacture of electrical equipment*	96	1	5	5	8	79	0,5%	5,2%	9,9%	17,7%	100,0%
Building of ships and boats	66	2	2	5	5	52	3,0%	6,1%	13,6%	21,2%	100,0%
Manufacture of air and spacecraft and related machinery	20	1	1	0	3	15	5,0%	10,0%	10,0%	25,0%	100,0%
Manufacture of military fighting vehicles	3	0	0	1	1	1	0,0%	0,0%	33,3%	66,7%	100,0%
T&M	**212**	**5**	**16**	**29**	**19**	**143**	**2,4%**	**9,9%**	**23,6%**	**32,5%**	**100,0%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	212	5	16	29	19	143	2,4%	9,9%	23,6%	32,5%	100,0%
MED	**492**	**8**	**15**	**15**	**22**	**432**	**1,6%**	**4,7%**	**7,7%**	**12,2%**	**100,0%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	62	3	2	7	4	46	4,8%	8,1%	19,4%	25,8%	100,0%
Manufacture of medical and dental instruments and supplies	430	5	13	8	18	386	1,2%	4,2%	6,0%	10,2%	100,0%
HTS	**1865**	**34**	**170**	**200**	**197**	**1266**	**1,8%**	**10,9%**	**21,6%**	**32,1%**	**100,0%**
Manufacture of electrical equipment*	96	1	5	5	8	79	0,5%	5,2%	9,9%	17,7%	100,0%
Manufacture of machinery and equipment n.e.c.	1769	33	165	195	189	1187	1,9%	11,2%	22,2%	32,9%	100,0%

Luxembourg											
Segment	Total	>250 employees	50-249 employees	20-49 employees	10-19 employees	0-9 employees	>250 employees	>50 employees	>20 employees	>10 employees	>0 employees
D&S	**3**	**0**	**0**	**0**	**0**	**3**	**0,0%**	**0,0%**	**0,0%**	**0,0%**	**100,0%**
Manufacture of communication equipment	1	0	0	0	0	1	0,0%	0,0%	0,0%	0,0%	100,0%
Manufacture of electrical equipment*	0	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Building of ships and boats	0	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Manufacture of air and spacecraft and related machinery	2	0	0	0	0	2	0,0%	0,0%	0,0%	0,0%	100,0%
Manufacture of military fighting vehicles	0	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
T&M	**5**	**2**	**0**	**1**	**0**	**2**	**40,0%**	**40,0%**	**60,0%**	**60,0%**	**100,0%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	5	2	0	1	0	2	40,0%	40,0%	60,0%	60,0%	100,0%
MED	**59**	**0**	**1**	**10**	**9**	**39**	**0,0%**	**1,7%**	**18,6%**	**33,9%**	**100,0%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	1	0	0	0	0	1	0,0%	0,0%	0,0%	0,0%	100,0%
Manufacture of medical and dental instruments and supplies	58	0	1	10	9	38	0,0%	1,7%	19,0%	34,5%	100,0%
HTS	**25**	**5**	**8**	**2**	**5**	**5**	**20,0%**	**52,0%**	**60,0%**	**80,0%**	**100,0%**
Manufacture of electrical equipment*	0	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Manufacture of machinery and equipment n.e.c.	25	5	8	2	5	5	20,0%	52,0%	60,0%	80,0%	100,0%

France											
Segment	Total	>250 employees	50-249 employees	20-49 employees	10-19 employees	0-9 employees	>250 employees	>50 employees	>20 employees	>10 employees	>0 employees
D&S	**1218**	**35**	**90**	**81**	**90**	**923**	**2,8%**	**10,2%**	**16,8%**	**24,2%**	**100,0%**
Manufacture of communication equipment	255	4	21	19	18	193	1,6%	9,8%	17,3%	24,3%	100,0%
Manufacture of electrical equipment*	185	3	18	17	19	129	1,4%	11,1%	20,1%	30,1%	100,0%
Building of ships and boats	564	9	20	31	37	467	1,6%	5,1%	10,6%	17,2%	100,0%
Manufacture of air and spacecraft and related machinery	214	19	31	14	16	134	8,9%	23,4%	29,9%	37,4%	100,0%
Manufacture of military fighting vehicles (confidential)	0	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
T&M	**886**	**27**	**73**	**70**	**89**	**627**	**3,0%**	**11,3%**	**19,2%**	**29,2%**	**100,0%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	886	27	73	70	89	627	3,0%	11,3%	19,2%	29,2%	100,0%
MED	**6647**	**34**	**90**	**159**	**375**	**5989**	**0,5%**	**1,9%**	**4,3%**	**9,9%**	**100,0%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	89	4	7	6	7	65	4,5%	12,4%	19,1%	27,0%	100,0%
Manufacture of medical and dental instruments and supplies	6558	30	83	153	368	5924	0,5%	1,7%	4,1%	9,7%	100,0%
HTS	**4406**	**123**	**404**	**535**	**502**	**2843**	**2,8%**	**12,0%**	**24,1%**	**35,5%**	**100,0%**
Manufacture of electrical equipment*	185	3	18	17	19	129	1,4%	11,1%	20,1%	30,1%	100,0%
Manufacture of machinery and equipment n.e.c.	4221	120	386	518	483	2714	2,8%	12,0%	24,3%	35,7%	100,0%

Finland											
Segment	Total	>250 employees	50-249 employees	20-49 employees	10-19 employees	0-9 employees	%>250 employees	%>50 employees	%>20 employees	%>10 employees	%>0 employees
D&S	**650**	**11**	**25**	**38**	**32**	**545**	**1,6%**	**5,5%**	**11,2%**	**16,1%**	**100,0%**
Manufacture of communication equipment	70	5	6	7	5	47	7,1%	15,7%	25,7%	32,9%	100,0%
Manufacture of electrical equipment*	109	1	5	8	7	89	0,5%	5,1%	12,0%	18,0%	100,0%
Building of ships and boats	452	4	13	22	20	393	0,9%	3,8%	8,6%	13,1%	100,0%
Manufacture of air and spacecraft and related machinery	18	0	1	1	0	16	0,0%	5,6%	11,1%	11,1%	100,0%
Manufacture of military fighting vehicles	1	1	0	0	0	0	100,0%	100,0%	100,0%	100,0%	100,0%
T&M	**296**	**6**	**17**	**20**	**23**	**230**	**2,0%**	**7,8%**	**14,5%**	**22,3%**	**100,0%**
Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	296	6	17	20	23	230	2,0%	7,8%	14,5%	22,3%	100,0%
MED	**499**	**3**	**10**	**15**	**18**	**453**	**0,6%**	**2,6%**	**5,6%**	**9,2%**	**100,0%**
Manufacture of irradiation, electromedical and electrotherapeutic equipment	44	3	5	3	3	30	6,8%	18,2%	25,0%	31,8%	100,0%
Manufacture of medical and dental instruments and supplies	455	0	5	12	15	423	0,0%	1,1%	3,7%	7,0%	100,0%
HTS	**1682**	**33**	**118**	**143**	**146**	**1243**	**1,9%**	**9,0%**	**17,4%**	**26,1%**	**100,0%**
Manufacture of electrical equipment*	109	1	5	8	7	89	0,5%	5,1%	12,0%	18,0%	100,0%
Manufacture of machinery and equipment n.e.c.	1573	32	113	135	139	1154	2,0%	9,2%	17,8%	26,6%	100,0%