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Interconnectivity between Success Factors in the Front End of Innovation

A single case study on the interconnectivity between the integration of Marketing & Sales and Research & Development and Customer Involvement in the Front End of Innovation

by

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ABSTRACT

Keywords: Front End of Innovation, Customer Involvement, Integration, Interconnection, Cross-functional collaboration

The aim of this thesis is to answer the question how the interconnection of two success factors contribute to the individual elements of the Front End of Innovation, as identified by Koen et al. (2001). The distinguished success factors are; the integration of marketing & sales and research & development, and customer involvement (Florén, et al. 2018). To get a thorough understanding of the concepts 'Front End of Innovation', 'Integration of marketing & sales and research & development, and 'customer involvement' a literature review was performed. By conducting a qualitative, single case study, data was obtained via semi-structured interviews to get an understanding of the topic. Thereafter, the data was analysed using the Grounded Theory Model of Gioia, Corley and Hamilton (2012), whereby the data was deductively classified according to the different elements of the Front End of Innovation, and within the elements the data was inductively analysed. This resulted in a Grounded Theory Model that displays the main facilitators that lead to a successful contribution of the interconnection between integration of marketing & sales and research & development and customer involvement to every element of the Front End of Innovation. Furthermore, influencers are identified within the integration of marketing & sales and research & development, and between the cross-functional team and the customer that positively or negatively impact the facilitator. The facilitators show the importance of a mutual contribution of the customer and the cross-functional team to the Front End of Innovation elements. This research contributes to closing the knowledge gap in the Front End of Innovation literature, by clarifying the contribution of the interconnection between two distinguished success factors to the individual elements of the Front end of Innovation. Additionally, it will deliver valuable suggestion for companies to successfully manage the Front End of Innovation.

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List of Abbreviations

B2B	Business-to-Business
FEI	Front End of Innovation
M&S	Marketing & Sales
NPD	New Product Development
RQ	Research Question
R&D	Research & Development

1 · INTRODUCTION

Innovation is something companies often commit to, but sooner or later realise that this process is much more complex and complicated than expected (Griffin & Hauser, 1996). The cornerstone for successful innovations are the first few steps taken in the innovation process. Therefore, spending time and effort on improving and correctly managing this process will lead to a competitive advantage for companies. Before the first steps can be managed successfully, it should be understood what could lead to a success in the first steps of innovation.

1.1 BACKGROUND

The innovation process consists out of two main parts; the Front End of Innovation (FEI) and the New Product Development (NPD) (Koen et al. 2001). More specifically, the FEI is the period from the initial opportunity recognition, to when the decision is made to stop the project or continue with the actual development of the product (Florén & Frishammer, 2012). The NPD starts once the decision is made to execute the idea (Moenaert, DeMeyer, Souder & Deschoolmeester, 1995).

The FEI is the first step towards developing an innovation (Takey & Carvalho, 2016). However, scholars disagree on which model describes the FEI most accurately. Two often cited articles are Khurana and Rosenthal (1998) and Koen et al. (2001). Khurana and Rosenthal (1998) describe the FEI as three consecutive steps: pre-phase zero, phase zero, and phase one. Whereas Koen et al. (2001), explain five non-consecutive elements to be executed within the FEI, namely; opportunity identification, opportunity analysis, idea genesis, idea selection, and concept and technology development. The elements of the FEI as described by Koen et al. (2001) will be used throughout this thesis, since there are clear distinctions between the different elements of the FEI, and that will allow for a thorough understanding. Although the scholars have a different understanding of the content of the different steps of the FEI, there is a general agreement regarding the influence of various factors on the outcome of the FEI (Khurana & Rosenthal, 1998; Koen et al. 2001).

A complex external environment and internal dissimilarities between departments call for a need for information sharing, in order to reduce the ambiguity within the FEI (Zhang, Cao & Doll, 2019). In order to reduce the ambiguity, Florén, Frishammer, Parida and Wincent (2018) distinguish multiple critical success factors influencing the FEI. Therefore, the focus of this thesis will be on the two success factors of ‘cooperation among functions and departments’ and ‘early customer involvement’ (Florén et al. 2018), since cross-functional teams could be established to bridge the gap between the departments (Kohn, 2006), and involving the customer could lead to a better understanding of the environment (Florén & Frishammer, 2012).

Cross-functional cooperation is an attempt to align individual department goals in order to improve the companies innovative success (Kahn & Mentzer, 1998; Tsai & Hsu, 2014). To be able to align departments, integration is necessary (Moenaert et al. 1995). The benefits of integration and collaboration of different business units has been acknowledged in literature since the 1970s (Souder, 1977). At first, scholars concentrated on the individual activities of the Marketing and Research & Development departments (Souder, 1977). Later, starting from the late 1990s, the trend developed towards the integration of M&S and R&D in various industries (Leenders & Wierenga, 2002).

The FEI can be perceived as the connection between technological capabilities and market assumptions of a company (Moenaert et al. 1995). Marketing is contributing to innovation in the role of the market representative; offering market insights, market needs, and incremental product ideas (Souder & Sherman, 1993; Sherman, Berkowitz & Souder, 2005). Many authors mention the function of marketing as a stand-alone contributor to innovation (Souder & Sherman, 1993; Griffin & Hauser, 1996). However, the role of sales has changed over time. Nowadays, there appears to be an overlap in tasks between the sales and marketing department (Keszey & Biemans, 2016). Therefore, this thesis will refer to it as one department; Marketing & Sales (M&S). As a liaison to the M&S department, Research and Development (R&D) complements the innovation process with their technological capabilities (Moenaert et al. 1995), as they are responsible for conducting research in a company (Griffin & Hauser, 1996).

As previously mentioned, customer involvement is also distinguished to positively contribute to the outcome of the FEI (Florén et al. 2018). Customer involvement refers to involving the customer as an external actor, in order to create added value in the FEI of a company (Florén & Frishammer, 2012). The effect of customer involvement on the FEI is different in a Business-to-Business (B2B) compared to Business-to-Consumer market (Barrutia, Velez & Echebarria, 2018). Abrell, Pihlajamaa, Kanto, vom Borocke and Uebernickel (2016) point out that B2B customers have a short-term focus, and in-depth knowledge regarding market needs, product design, and functionality. Early involvement of the customer can lead to a higher quality of generated ideas (Walsh, Lee & Nagaoka, 2016), and the customers within the FEI process represents the market demands and customer needs (Enkel, Perez-Freije & Gassmann, 2005).

1.2 Problem Discussion

The process of developing new innovative products is quite complex (Griffin & Hauser, 1996). Nonetheless, product innovation is important for companies, since it will result in a higher company performance (Lau, Tang & Yam, 2010). As the FEI is the start of the innovation process (Koen et al. 2001), it should be managed correctly in order to benefit from the FEI, and obtain a competitive advantage (Florén et al. 2018).

The FEI plays a crucial role for a company, because it is the innovation phase with the highest uncertainty and ambiguity, and it influences where financial, human and physical resources will be assigned to (Schoonmaker, Carayannis & Rau, 2013). The underlying reasons for the failure of many products can be explained by mismanaging the FEI (Zhang, Cao & Doll, 2019). The FEI should be managed differently than the rest of the innovation process, since the work performed in the FEI is dissimilar to that of the NPD (Koen et al. 2001; Florén et al. 2018). Part of mismanaging the FEI comes from the unclarity surrounding the activities that should be conducted in the FEI, as there is a high level of ambiguity encompassing the activities in the individual elements of the FEI (Zhang, Cao & Doll, 2019). Therefore, it is necessary for managers to understand the role and different elements of the FEI to foster the success of innovation (Spieth & Joachim, 2017), as the FEI gives an important impulse to new product success (Kock, Heising & Gemünden, 2014).

It is common for companies to assume, if they invest sufficient resources in R&D the end result will be alright (Brettel, Heinemann, Engelen & Neubauer, 2011). However, often this results in insufficient outcomes from the innovation process, as there is no market demand for the new product, or the new product is not addressing the needs of customers at the time of the product launch (Berkhout, Hartmann & Trott, 2010). Especially in technology-driven companies, it appears difficult to commercialise products initiated by R&D (Schoonmaker & Rau, 2014). Integration between the M&S and R&D department will result in successful project performances, as science and market perspectives will be brought together (Souder & Sherman, 1993; Moenaert et al. 1995; Jassawalla & Sashittal, 1998). However, often the perceptions of the R&D and M&S departments seem incompatible (Gupta, Raj & Wilemon, 1985; Gupta, Raj & Wilemon, 1986; Gupta, Raj & Wilemon, 1987; Kahn & Mentzer, 1998). Therefore, understanding the integration between different departments in the FEI could contribute to the success of products (Schoonmaker & Rau, 2014), as technical and market opportunities are early on distinguished and united (Florén et al. 2018).

Customer involvement in the FEI helps the company to understand market demands (Enkel, Perez-Freije & Gassmann, 2005), and quick adaptation to a changing market environment (Lau, Tang & Yam, 2010). Customer involvement allows companies to reflect upon their own strengths and weaknesses via knowledge exchange (Lau, Tang & Yam, 2010). Scholars on customer involvement in the innovation process have shown different results, some studies underline the importance of collaborations with customers as it results in a higher level of innovation performance, while other scholars point out that customer involvement is not beneficial for the innovation process (Takahashi, Indulska & Steen, 2018). As there is quite some contradicting literature about customer involvement for innovation, it is important to shed a light on this aspect and distinguish how the role of the customer in the FEI can be beneficial.

In a cross-functional team, there are often difficulties merging the M&S and R&D perspective, whereby the M&S brings in the market know-how and R&D the science expertise (Griffin & Hauser, 1996). M&S is often the main contact towards the customer (Griffin & Hauser, 1996), and involvement of the customer in innovation also results in market insights (Enkel, Perez-Freije & Gassmann, 2005). Therefore, it is interesting to look into the interconnection between the integration of M&S and R&D and customer involvement in the FEI, whereby interconnection is "a mutual connection between two or more things" (Oxford Living Dictionaries, 2019, n.p.).

The purpose of the thesis is to contribute to the knowledge gap in the FEI literature, as literature regarding the FEI is relatively new and there are still many gaps to be filled (Florén et al. 2018). Therefore, the focus will be on understanding the interconnection between different success factors, as the success factors have been distinguished (Florén et al. 2018), but it is unclear how the interconnection of customer involvement and the integration of M&S and R&D could contribute to the individual elements of the FEI. Insights in the interconnection between customer involvement and the integration of M&S and R&D in the individual elements of the FEI results in a better understanding of how the FEI should be successfully managed, allowing managers to obtain a competitive advantage and develop successful innovations.

1.3 Research Question

Building on the identified knowledge gap, the following research question is identified:

"How does the interconnection between the two success factors of 'integration of Marketing & Sales and Research & Development' and 'customer involvement' contribute to the individual elements of the Front End of Innovation?"

1.4 Outline of the Thesis

This thesis is divided into six chapters. Chapter 1 offers an introduction to the research topic, highlights the importance of research in this topic, contains the research purpose, the research question, and a short description of the company where the research is conducted. In the second chapter, a literature review will be performed to gain a thorough understanding of the topic. The relevant methodology and description of the data collection and analysis that was applied in this thesis will be described in chapter 3. Thereafter, in chapter 4 the research findings will be presented. In chapter 5, a thorough analysis will be conducted, and a discussion will be presented. Concluding, chapter 6 summarises the research outcomes and presents theoretical and managerial implications, limitations, and suggestions for future research.

1.5 The Case Company

The case company is classified as a small and medium-sized enterprise, with a headquarter located in Sweden. The company sells B2B in the biotech market.

The industry dynamics are quite complex. There are companies active in the industry that are science-driven, such as the case company whereby every product they sell has a scientifically proven background, but also more market-driven companies; they sell products without a scientific background. This causes the quality of products available on the market to differ strongly, and it results in a low market entry barrier, allowing companies to enter easily. Furthermore, the focus of the case company is on delivering value in two stages of the supply chain, both supplying the raw materials to other businesses, and manufacturing the end product and then selling it to pharmaceutical companies.

The case company is suitable for this research as it has often successfully worked together with customers to come up with new ideas and define the concept of the idea. Every time they worked together with a customer for co-development, at least two internal departments were involved in this process; M&S and R&D. Therefore, conducting the research in this company will be beneficial to develop a best-case practice regarding the dynamics between the customer, M&S and R&D in the FEI.

2 · Literature Review

The literature review will present a framework that is relevant to this thesis. Therefore, three different concepts will be addressed. First, the Front End of Innovation (FEI) and its different elements will be discussed. Second, literature regarding integration between different departments, but specifically focusing on Marketing & Sales (M&S) and Research & Development (R&D), will be presented. And third, customer involvement for innovation will be explained by literature.

2.1 Front End of Innovation

In literature, different definitions have been used to describe the early phase of the innovation process; the Fuzzy Front End (Stevens, 2014; Takey & Carvalho, 2016), Front End of Innovation (Koen et al. 2001; Florén et al. 2018), Front End (Kock, Heising & Gemünden, 2014; Spieth & Joachim, 2017), Fuzzy Front End of Innovation (Schoonmaker, Carayannis & Rau, 2013). In this thesis, the term 'Front End of Innovation' (FEI) will be used, as the word 'fuzzy' implies that it is difficult to grasp and vague, while the aim of the thesis is to provide some clarification on the different elements of the FEI.

The FEI is where the company is focused on identifying the idea (Florén & Frishammer, 2012; Gama, Frishammer & Parida, 2019), defining the concept of a potential new product, and select whether the concept is worth dedicating resources to, to continue development of the idea (Moenaert et al. 1995). It is the first step towards developing an innovation (Takey & Carvalho, 2016). The FEI is completed when the decision is made to kill the product idea (Florén et al. 2018), or continue with the idea in the NPD process (Koen et al. 2001).

2.1.1 Success Factors Impacting the Front End of Innovation

There are multiple factors influencing the FEI; the alignment between the innovation process and the company's strategy and goal, suitable in-house capabilities, the identification of relevant science and technologies for the FEI, and the utilisation of competitive factors (Koen et al. 2001). Florén et al. (2018) elaborate on those, by identifying factors that will increase the possibility of success in the FEI, whereby success in their opinion is when the outcome of the FEI is an idea concept, that will result in idea development. According to Florén et al. (2018), factors that are positively relating to success are; top management involvement, customer involvement, collaborations with stakeholders, and interdepartmental and inter-functional integration. Although Koen et al. (2001) could not identify a relation between the company's culture, leadership and the FEI, Florén et al. (2018) found a positive relation between a creative company culture and success in the FEI. Furthermore, the commercial success of the product is achieved when uncertainty is reduced during the FEI, this can be reduced via standardising the work performed in the FEI, and having a common goal with clearly defined steps to be taken in the process (Moenaert et al. 1995). However, a technologically complicated project and/or a project where the market is unknown makes

uncertainty reduction via the above-mentioned ways more difficult (Moenaert et al. 1995). Therefore, acquiring information from different sources to reduce uncertainty is recommended (Stevens, 2014). Stevens (2014) also mentions the positive impact of a formally established project team, that is focused on work in the FEI, in relation to uncertainty reduction. Furthermore, each project should be treated individually, and activities from the marketing and R&D departments should be decentralised (Moenaert et al. 1995).

2.1.2 Elements of the Front End of Innovation

Koen et al. (2001) describe five elements of the FEI that happen rather randomly, in no specific order, and before the NPD starts; opportunity identification, opportunity analysis, idea genesis, idea selection, and concept and technology development. The elements identified by Koen et al. (2001) will be used as guidance for the literature review of the FEI, as their research is widely acknowledged, clearly distinguishes different elements and their corresponding activities, and therefore will allow for the identification of different contributions to the individual elements of the FEI. However, this thesis adopts the perspective that the FEI happens rather sequential (Khurana & Rosenthal, 1998), instead of randomly (Koen et al. 2001).

Opportunity Identification

In the 'opportunity identification' element the company identifies an opportunity they want to pursue (Khurana & Rosenthal, 1998; Koen et al. 2001). There should be a formalised process in place (Florén & Frishammer, 2012), as that allows the company to best capture the ideas, and it encourages creativity in employees (Gama, Frishammer & Parida, 2019). The creativity to identify these opportunities can be encouraged via top management support, and self-autonomy of the project team (Kock, Heising & Gemünden, 2014). These opportunities can be perceived broadly, they could be related to business or technological capabilities, incremental or radical, process changes or product changes (Koen et al. 2001). In a technology-driven industry, the opportunities are often identified by R&D (Schoonmaker, Carayannis & Rau, 2013). The importance of this element lies in the approach the company uses and the resources that are committed to the opportunity identification (Koen et al. 2001). A team with divergent backgrounds will be able to come up with many new product ideas (Frishammer, Dahlskog, Krumlinde & Yazgan, 2016). Companies should follow an approach whereby both incremental and radical opportunities are identified (Kock, Heising & Gemünden, 2014).

Opportunity Analysis

The 'opportunity analysis' focuses on acquiring additional information about the identified opportunity (Koen et al. 2001). Obtaining additional information might be hard, since the team should have a clear understanding of the information required to fill in the gaps (Stevens, 2014). Therefore, having a big personal network for the team will help accomplishing this goal (Stevens, 2014). Acquiring the right information can be done via external sources as well, such as customers, market trends, and scientific trials (Koen et al. 2001).

Idea Genesis

The idea is shaped and defined in the 'idea genesis' element, in this element, the original idea will become more concrete (Koen et al. 2001). When the opportunity is identified, other people should be brought on board to refine the idea (Florén & Frishammer, 2012), as working in cross-functional teams is beneficial for this element to enable further defining of the concept (Khurana & Rosenthal, 1998). Koen et al. (2001) suggest that the involvement of external stakeholders, such as customers, users, institutions, and competitors is valuable in this element to shape the idea. A simple and easy to understand description of the idea is key to enable a mutual understanding throughout the team (Frishammer et al. 2016). The quality of the idea is crucial, risks should be estimated, and uncertainty reduced (Florén & Frishammer, 2012).

Idea Selection

In the element 'idea selection' the company decides which idea to pursue (Koen et al. 2001). Uncertainty is perceived as a hindering factor in this element, since the lack of information limits the ability to make a thorough decision (Koen et al. 2001). Formalising the idea selection process will lead to a higher possibility of FEI success, as systematically evaluating the ideas will help identifying and selecting the most promising ideas (Kock, Heising & Gemünden, 2014). By selecting an idea, one should not only assess the idea itself, but also whether the idea is an addition to the company's product portfolio to obtain a variety of different ideas and concepts (Kock, Heising & Gemünden, 2014).

Concept and Technology Development

The 'concept and technology development' element is where the company writes a business case (Koen et al. 2001). The potential of the idea should be investigated via estimating the uncertainty surrounding the technology (Koen et al. 2001), conducting a market analysis, a technological assessment, defining the product qualifications and test it, defining the needed resources, and making a risk assessment (Khurana & Rosenthal, 1998). However, trade-offs have to be made regarding the resources, time, and money that will be dedicated to the project (Stevens, 2014).

2.2 INTEGRATION

The concept of 'integration' is referring to merging different functions and processes to, in a combined effort, develop a higher level of performance in the innovation process (Sherman, Berkowitz & Souder, 2005). Functions commonly acknowledged to take part in integration, are the R&D and M&S departments, as they help to identify market and technical opportunities (Griffin & Hauser, 1996; Sherman, Berkowitz & Souder, 2005). The main process in integration is information and knowledge sharing (Sherman, Berkowitz & Souder, 2005).

The term integration has been acknowledged by scholars in literature since the 1980s (Gupta, Raj & Wilemon, 1985; Gupta, Raj & Wilemon, 1986; Gupta, Raj & Wilemon, 1987). Gupta, Raj and Wilemon (1985) focused on the integration between the R&D and M&S department, and

how this affects a company's innovation performance. They found the existence of an integration gap; a gap between the proper integration of R&D and M&S (Gupta, Raj & Wilemon, 1985). In their findings, they point out different definitions of the term 'integration' and identify thirteen different levels of integration (Gupta, Raj & Wilemon, 1985). Kahn and Mentzer (1998) confirm the variety of definitions of integration. According to the authors, some literature suggests the definition of integration as simply the interaction and communication frequency between different business units, without paying attention to the type and usage of the information shared (Kahn & Mentzer, 1998). While other authors view a comprehensive approach as a crucial point for the process of integration (Kahn & Mentzer, 1998). In their article, Kahn and Mentzer (1998) define integration as the interaction and cooperation between the M&S and R&D department. Jassawalla and Sashittal (1998) point out the difference between integration and collaboration, as they describe collaboration as more complex and containing a stronger linkage compared to integration. Leenders and Wierenga (2008) apply a comprehensive approach, pointing out the different levels of integration: collaboration, communication and cooperation between R&D and M&S. Rubera, Ordanini and Calantone (2012) describe the relationship between integration and collaboration as integration being the umbrella definition for interaction and collaboration, whereby interaction is achieved on a low-intensity level, and collaboration is happening once the intensity increases. Table 1 summarises the different focus areas in studies of integration, and definitions of integration. In this thesis, the definition of integration is: "Integration as the collaboration, communication and cooperation relationship between R&D and M&S" (Leenders & Wierenga, 2008, p.4).

Focus Area	Definition of Integration	Author
Integration of the R&D and marketing department for firms innovation performance in High Tech Firms	Integration as the joint involvement and information sharing of R&D and marketing within the innovation process	*Gupta, Raj & Wilemon (1985)*
Collaboration in High-Technology New Product Development Processes	Describe integration as a part of cross-functional collaboration, which is focused on interaction, coordination of activities and cooperation.	*Jassawalla & Sashittal (1998)*
Marketing's Integration with Other Departments	Integration as the umbrella term for interaction and collaboration between the M&S and R&D department.	*Kahn & Mentzer (1998)*
The effect of the marketing–R&D interface on new product performance	Integration as the collaboration, communication and cooperation relationship between R&D and M&S	*Leenders & Wierenga (2008)*
Whether to Integrate R&D and Marketing: The Effect of Firm Competence	Integration as the umbrella definition for interaction and collaboration	*Rubera, Ordanini & Calantone (2012)*

TABLE 1 DIFFERENT DEFINITIONS AND FOCUS AREAS OF STUDIES ABOUT INTEGRATION

The aspect of cross-functional collaboration within integration has received special attention in the literature (Kahn & Mentzer, 1998; Leenders & Wierenga, 2008; Rubera, Ordanini & Calantone, 2012). Therefore, its function will be elaborated on more into detail, as it is a key aspect within integration.

2.2.1 Cross-Functional Collaboration

Multiple scholars point out that there has not been a generally accepted definition of cross-functional integration in the literature yet (Kahn, 1996; Kohn, 2006). Definitions vary greatly around unidimensional measures of the interaction frequency between different units, and multidimensional measures of collaboration (Kahn, 1996; Brettel et al. 2011). The term 'cross-functional collaboration' is described as the cooperation between different departments in a company, by aligning the individual department goals, and interacting jointly for the companies success (Kahn & Mentzer, 1998; Tsai & Hsu, 2014). Integration between M&S and R&D often takes place in teams, therefore, those teams are called cross-functional team (Jassawalla & Sashittal, 1998).

Cross-functional collaboration has been receiving a lot of attention in the literature, due to the attributes of resources and knowledge exchange that complement the innovation process of a company (He, Sun & Chen, 2016). Research has not only focused on the interchange of complementing resources and knowledge within the company's different departments, but also the positive influence on a company's ability to spot shortcomings in managerial capabilities and practices, thus creating a fruitful environment for innovation activities (Sherman, Berkowitz & Souder, 2005; He, Sun & Chen, 2016; Su, Chen & Wang, 2019).

Aspects of cross-functional collaboration are high levels of transparency and openness, acknowledge the differences between the team members, and work towards a common company goal (Jassawalla & Sashittal, 1998). Furthermore, a cross-functional team is important for gaining insights in the effective and efficient usage of company's technological capabilities for developing new products that meet market demands (Song, Thieme & Xie, 1998), and the collaboration is beneficial for developing both incremental and radical innovations (Florén & Frishammer, 2012).

As mentioned by Khurana and Rosenthal (1998), a cross-functional team during the FEI is favourable to be able to achieve a competitive advantage, since cross-functional teams enable communication (Olson, Walker, Ruekert & Bonner, 2001). Besides enabling communication, constant interaction and communication between different departments will promote creativity and knowledge transfer (Song, Thieme & Xie, 1998). Furthermore, the knowledge management capabilities increase, which will lead to an improved company's performance (Sherman, Berkowitz & Souder, 2005). This is because different perspectives are offered, as a diverse group of employees is involved in cross-functional collaboration (Tsai & Hsu, 2014). However, the collaborative approaches within a company can complicate the relationship between different departments, as communication will take longer, which will decrease productivity, and increase decision-making time (Song, Thieme & Xie, 1998).

2.2.2 Integration of Marketing & Sales and Research & Development

FEI is a versatile process wherein different departments contribute (Koen et al. 2001). Griffin and Hauser (1996) identified that in the FEI particularly, there is a high need for integration between the M&S and R&D departments, since they contribute ideas and knowledge, discussions of different solutions, and development of a concept (Moenaert et al. 1995). Although Khurana and Rosenthal (1998) do not specify the departments involved in the cross-functional team, part of the FEI is identifying the opportunities in the market, defining the concept and the technology needed (Khurana & Rosenthal, 1998; Koen et al. 2001). Therefore, the collective effort of R&D and M&S seems beneficial for identifying the market opportunities and assessing the technological capabilities of the company, as both competences of the departments increases the possibility of creating a new product with a competitive advantage (Song, Thieme & Xie, 1998; Becker & Lillemark, 2006).

Within the FEI elements, strong interdependencies between the M&S and R&D department call for strong integration and collaboration between these two departments (Kohn, 2006). Many scholars agree on the aspect that a high level of integration between M&S and R&D in the FEI will result in successful project performance (Souder & Sherman, 1993; Moenaert et al. 1995; Jassawalla & Sashittal, 1998). The two departments are distinguished as the key contributors to the innovation process (Moenaert et al. 1995). Therefore, this research will have a specific focus on the integration of these two departments.

The integration and collaboration of R&D and M&S has a bigger influence on the innovation success of a product in the FEI, compared to the influence on later development phases (Moenaert et al. 1995). Additionally, the quality of the end product is influenced by the cross-functional collaboration between M&S and R&D in the FEI, whereas the collaboration in later stages of the innovation process has a bigger impact on the time to market, than on the costs and quality of the end product (Song, Thieme & Xie, 1998; Gomes, Weerd-Nederhof, Pearson & Cunha, 2003). Information sharing between departments is also perceived as an important aspect for reducing the ambiguity within the FEI (Zhang, Cao & Doll, 2019). Griffin and Hauser (1996) underline the lack of interaction between M&S and R&D as a leading contributor to the failure of many new products.

A growing number of scholars examined the incompatibility of perceptions between R&D and M&S, as this results in challenges for integration (Gupta, Raj & Wilemon, 1985; Gupta, Raj & Wilemon, 1986; Gupta, Raj & Wilemon, 1987; Kahn & Mentzer, 1998). This view of differences in perspective between M&S and R&D is further supported by the claim that integration of the departments is essential to overcome initial specialisations and behaviours, in order to resolve conflicts (Griffin & Hauser, 1996; Jassawalla & Sashittal, 1998). The individual functions and contributions of M&S and R&D in the FEI are more elaborated on in the next paragraphs.

Marketing & Sales

The role of marketing is concerned with finding and accessing new markets for already existing products, producing trend reports and selecting advertising channels (Griffin & Hauser, 1996). The role of sales is mostly working with customer demands and pinpointing market potentials (Griffin & Hauser, 1996). M&S is quite often the initiator for new incremental product ideas, as they tend to have a strong market orientation, and a shorter performance planning (Souder & Sherman, 1993; Sherman, Berkowitz & Souder, 2005). M&S general identifies trends related to short-term incremental projects, adopts a strong market focus, and a high degree of ambiguity on the side with a more bureaucratic orientation are approved (Griffin & Hauser, 1996). In a technology-intensive firm, M&S can contribute to the FEI by determining the tasks of the M&S department, identifying available resources, and stating the brands and products within the company, in this way, R&D is able to take that into account when scanning for idea opportunities (Schoonmaker, Carayannis & Rau, 2013).

Research & Development

The R&D department is developing long-term research directions, incremental development of already existing products (product renewal for long-term profitability), and designing future products (Griffin & Hauser, 1996). The R&D department is more scientifically than market-driven, they tend to favour radical innovations over incremental ones, and have a long-time planning (Souder & Sherman, 1993; Sherman, Berkowitz & Souder, 2005). In a research-oriented firm, R&D tends to acquire more new product ideas compared to M&S (Schoonmaker, Carayannis & Rau, 2012). Compared to the M&S department, R&D focuses more on scientific development, and are more loyal to their scientific profession rather than the company as a whole, thus they have lower tolerances for bureaucracy and ambiguity (Griffin & Hauser, 1996).

The dimensions of the functional positioning of M&S and R&D vary greatly (Table 2). Although these two departments work for the same company, thus have the same corporate goals, the interpretation of these goals varies greatly which can be traced back to the departmental backgrounds that limit their ability to look over one's function (Griffin & Hauser, 1996).

	Functional Position	
Dimensions	**M&S**	**R&D**
Time orientation	Short	Long
Projects preferred	Incremental	Advanced
Ambiguity tolerance	High	Low
Departmental structure	Medium	Low
Bureaucratic orientation	More	Less
Orientation to others	Permissive	Permissive
Professional orientation	Market	Science
Professional orientation	Less	More

TABLE 2 DIFFERENCES AND SIMILARITIES OF THE M&S AND R&D DEPARTMENTS (GRIFFIN & HAUSER, 1996)

Benefits and Shortcomings

There is often an integration gap between M&S and R&D (Gupta, Raj & Wilemon, 1986). The gap directly influences the innovation performance of the firm; the smaller the integration gap between M&S and R&D, the higher the possibility of success in innovations, and vice versa (Gupta, Raj & Wilemon, 1986).

Usually, M&S plays a big role in translating consumer needs into technical solutions in a collaboration project regarding product development (Griffin & Hauser, 1996), but in a highly science-driven company, the specific scientific requirements prevent M&S from being too much involved in the actual product development activities (Becker & Lillemark, 2006). Hise, O'neal, Parasuraman and McNeal (1990) conclude in their paper that the collaboration between M&S and R&D during the FEI has a key function for explaining the success levels of new products. M&S and R&D both provide expertise and share responsibilities for core tasks that influence the new product success, such as understanding customer and market needs, selecting and evaluating new product ideas and recognising opportunities for incremental and radical innovations in products (Griffin & Hauser, 1996). Furthermore, in a cross-functional team where M&S and R&D are involved, the efficiency of the FEI process increases (Brettel et al. 2011).

Integration between M&S and R&D does not come easy, as both departments develop their own understanding of the concept, and since they have different perspectives it results in misunderstanding (Kohn, 2006). There are challenges regarding the goals, solutions, languages, trade-offs, and cultural differences in M&S and R&D due to the focus of the departments (Griffin & Hauser, 1996; Song, Neeley & Zhao, 1996). Creating a common understanding and goal for a project is an important aspect in reducing the unclarity within the FEI (Zhang, Cao & Doll, 2019). However, even when a common goal is formulated by a cross-functional team, due to divergent perspectives it might be interpreted differently, causing unclarity again (Zhang, Cao & Doll, 2019).

A lack of credibility, trust and respect from both departments acts as a barrier for collaboration with individuals from other departments (Song, Neeley & Zhao, 1996). Cross-functional teams consisting out of M&S and R&D increase the complexity of the innovation process (Griffin & Hauser, 1996). Therefore, adopting a high level of integration between the two departments, when the company wants to enter a new market with a new technological product, results in a longer new product development process, and requires more resources (Rubera, Ordanini & Calantone, 2012). The trade-off between the increased complexity of the FEI, and the increased level of innovation should be considered (Griffin & Hauser, 1996). To avoid a clash to happen, the idea should be clearly defined in the early elements of the FEI, during a discussion where both perspectives are brought together to create a mutual understanding (Kohn, 2006).

2.3 Customer Involvement

Recent findings regarding the innovation potential of external stakeholders, such as customers or suppliers, has become increasingly discussed in literature as a practice known as 'Open Innovation' (Chesbrough, 2003; Lakhani, Hutter, Okrywa & Fuller, 2013). The fundamental benefit of opening up a company for innovation is the ability to quickly react to a changing environment (Sandmeier, Jamali, Kobe, Enkel, Gassmann, & Meier, 2004). Customer involvement has been winning more and more on significance within the open innovation field, as the benefits have been acknowledged (Enkel, Kausch & Gassmann, 2005).

Until lately, the role of the customer has been described as passive in the innovation process, wherein the customer is described as the passive receiver of innovations provided by the company (Sawhney, Verona & Prandelli, 2005). The interaction between the customer and the company is only in one direction, meaning company to the customer, and only on a contingent basis (Sawhney, Verona & Prandelli, 2005). The richness of the integration is more focused on the individuals' knowledge (Sawhney, Verona & Prandelli, 2005). This form of integration is rather limited, as no rich dialogue or knowledge sharing can be established (Sawhney, Verona & Prandelli, 2005).

In recent years, more and more companies recognised the possibilities of co-creation with a more customer-centric approach (Chesbrough, 2003). The role of the customer is thereby described to be active, meaning that the customer is a partner in the innovation process, and there is a two-way dialogue between the customer and the company (Sawhney, Verona & Prandelli, 2005). The richness of interaction flourishes, as social and experiential knowledge is shared between the customer and the company (Sawhney, Verona & Prandelli, 2005). However, in a highly competitive environment knowledge exchange with the customer could limit the ability of the company to develop radical innovations (Lau, Tang & Yam, 2010). Especially, if the company decides to co-develop a product with an existing customer, since that could hinder the focus on new technologies and markets, however, this might not apply in cases where the company develops a new product together with a new customer (Lau, Tang & Yam, 2010).

There is a difference in the role of the customer in a B2B, or a Business-to-Consumer environment (Barrutia, Velez & Echebarria, 2018). Described by Elvers and Song (2016) respectively as direct or indirect customers. As both customers have different competencies in relation to a company, it is important to distinguish the two of them (Elvers & Song, 2016). The indirect customer complements the company by giving insights into market trends and needs as they allow for a close connection to the market (Elvers & Song, 2016). Due to this focus, working together with the indirect customer allows for early recognition of innovations that are difficult to introduce to the market (Elvers & Song, 2016). The direct customer is focused on the technical aspects of innovations, and whether the product is technically feasible (Elvers & Song, 2016).

2.3.1 Customer Involvement in the Front End of Innovation

The involvement of customers in the FEI includes all activities where customer knowledge for process or product innovation is utilised (Barrutia, Velez & Echebarria, 2019). This approach differentiates to the traditional approach of customer orientation (e.g. acquiring customers wishes), it rather adapts the co-creation view, wherein customers play an active role in the co-creation with the company (Barrutia, Velez & Echebarria, 2019). How to involve the customers in the FEI varies according to the specific innovation problems, and the knowledge the company intends to acquire (Eslami & Lakemon, 2016). The interaction between the company and the customer is focused on discovering dissimilarities in capabilities and skills for opportunity identification, and analysising within the early elements of the FEI, meanwhile in the later elements it is possible to harvest the common ground that was established (Eslami & Lakemond, 2016). Consequently, the customer has the highest integration with the company in the ideation element, the element where new opportunities are identified (Eslami & Lakemond, 2016).

Various authors point out the positive impact on customer involvement in the FEI; Florén et al. (2018) state that involving customers early on in the FEI is positively associated with the success of the development of the new product, as customer involvement in the idea generation stage results in a higher quality of the idea (Walsh, Lee & Nagaoka, 2016). Customer involvement whereby knowledge is shared between the company and the customer has a positive impact on the performance of the product (Lau, Tang & Yam, 2010). Several studies have been conducted, revealing the importance of the customer's knowledge contribution within the collaborative FEI environment (Eslami & Lakemond, 2016). Customer involvement is beneficial for incremental innovations, as a potential market can be identified before the start of the development of the product (Florén & Frishammer, 2012).

However, downsides of customer integration in the FEI should not be disregarded. Involving the customer could result in being too dependent on the customer, or losing in-house expertise to them (Enkel, Kausch & Gassmann, 2005). Customers tend to be risk-averse, favour reliability and are quite traditional (Abrell et al. 2016). As a result, customers are more inhibited towards more radical, and thus more risky, innovations (Barrutia, Velez & Echebarria, 2018), and favour incremental innovations (Enkel, Kausch & Gassmann, 2005). Furthermore, misunderstandings between the customer and the project team is also a common downside (Enkel, Kausch & Gassmann, 2005).

To manage early customer involvement in the FEI, a trustable relationship should be established, whereby a clear goal and vision are formulated and decisions are made collectively (Matinheikki, Artto, Peltokorpi & Rajala, 2016). Long-term relationships positively influence the value creation in the FEI (Matinheikki et al. 2016). Customer involvement in the FEI is highly effective when the company has developed formalised idea generation processes (Gama, Frishammer & Parida, 2018). The contribution of the customer to product innovation

is moderated by the strength of the relation between the customer and the company (Zhang & Zhu, 2019). When the interdependence between the customer and the company is high, the customer positively impacts product innovation, however, when there is an unequal interdependence between customer and company the impact from the customer on product innovation will be lower (Zhang & Zhu, 2019). Brockhoff (2003) acknowledged the different intensities of customer involvement in the innovation process, pointing out a decline over the elements of opportunity identification to concept and technology development. Within the opportunity identification, opportunity analysis, idea genesis, and idea selection of the FEI, the customer is described to actively provide suggestions and complaints, whereas in the concept and technology development element of the FEI, the customer is contributing with evaluating the company's concepts (Brockhoff, 2003).

2.4 Interconnection Between the Cross-Functional Team and Customer Involvement

During the FEI, the integration of customers with the company's ecosystem can result in developing a new business model, instead of only producing a new product, what often happens with a cross-functional collaboration (Takey & Carvalho, 2016). Additionally, customers contribute to the FEI by providing information regarding customer needs, via different departments within a company this information is further distributed throughout the company to support the development of new products and services (Enkel, Perez-Freije & Gassmann, 2005). Customer involvement with the company's project team, in terms of exploring customer expectations and requirements, is beneficial for determining project objectives (Florén & Frishammer, 2012). Additionally, new insights and ideas might be offered that the cross-functional team has not considered yet (Florén & Frishammer, 2012).

To conclude, five elements and their corresponding content in the FEI are identified: opportunity identification, opportunity analysis, idea genesis, idea selection, and concept and technology development (Koen et al. 2001). The contribution of cross-functional teams, and more specifically, the main contributors to the innovation process; the integration of M&S and R&D, is assumed to be different according to the element of the FEI. The same reasoning applies to customer involvement. The assumption is that the interconnection between the integration of M&S and R&D, and customer involvement lead to a different contribution of every element in the FEI, due to task variety in the elements of the FEI. Figure 1 shows a visualisation.

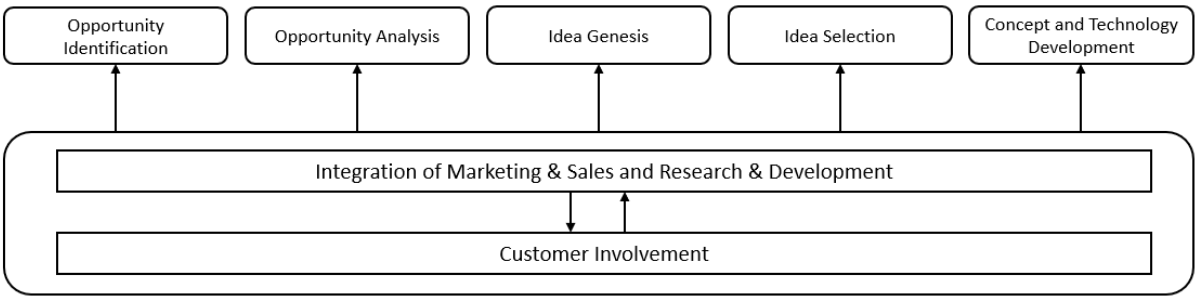

FIGURE 1 SYNTHESISED RELATIONS BETWEEN THE CONCEPTS OF THE LITERATURE REVIEW

3 · METHODOLOGY

The focus of this chapter is on creating an understanding of the choices that have been made regarding the methodology. Therefore, the research strategy will be explained, the research design, the procedure that is followed to collect data, and the data analysis approach that will be used.

3.1 RESEARCH STRATEGY

Bryman and Bell (2011) distinguish between a deductive and inductive research approach. Whereby the deductive theory starts with existing literature, and the researcher comes up with one or multiple hypotheses based on the research that is known, and will test whether the hypotheses are confirmed or must be rejected (Bryman & Bell, 2011). The inductive approach starts with observations and/or findings, based on these findings a certain theory will be developed (Bryman & Bell, 2011). This research mainly follows the inductive approach, but with deductive aspects. The first steps are following the inductive approach, as unstructured interviews will be used to distinguish a research area, once this has been determined, an in-depth literature review is performed to identify the research gap. However, no hypotheses will be derived from this literature review. After the data collection, a deductive approach will be used, as the findings will be linked back to existing literature. The research will be performed qualitatively, and observations and interviews will be used to develop generalisable theories.

Epistemological considerations are concerned with what is pointed out as given knowledge in a certain area (Bryman & Bell, 2011). There are different perspectives on this matter, and this research supports the view that the social science requires a different approach when studied, compared to the natural sciences, this approach is called 'interpretivism' (Bryman & Bell, 2011). The interpretivism approach is supported because the researchers believe that natural sciences follow a different logic than social sciences. The aim of this research is understanding certain behaviours, while taking into consideration that people are different. Ontological considerations are regarding the way social creatures are viewed (Bryman & Bell, 2011). Bryman and Bell (2011) distinguish two types; objectivism, whereby social sciences are perceived as independently acting individuals, that cannot be influenced by other actors, and constructionism, that supports the view that social actors constantly influence eachother and are therefore constantly changing. This research adopts the constructionism approach, since the departments within the company are not seen as individual entities, but their interactions are dependent on the individuals within the departments. Thus, individual employees influence how the departments are perceived.

The above-described choices that are made regarding the strategy of the research lead back to the fundamental differences between quantitative and qualitative research as described by Bryman and Bell (2011), whereby this research will be qualitative.

3.2 Research Design

There are multiple designs for qualitative research possible, the design of this research is a single case study.

3.2.1 Case Study

The aim of a case study is to create a complete understanding of the complex nature of social science by analysing a single case (Bryman & Bell, 2011). This research will be conducted in a single organisation, to be able to grasp the complexity of the variables of this research. The research will try to explore how the interconnection between M&S, R&D and the customer is in the FEI. The level of analysis will be on the organisational level, as the researchers aim to understand the dynamics within the case company. Therefore, it was decided to conduct a single case study to be able to in-depth analyse the situation within the company, and as a follow-up simplify the findings of the study, and it allows for detailed data obtainment.

Conducted qualitative research can be assessed based on four criteria; (1) credibility, (2) transferability, (3) dependability, and (4) confirmability (Bryman & Bell, 2011).

Credibility

By gaining trust and familiarity with the case company, the researchers aim to develop a good understanding of the viewpoints of the organisation. Via being often present in the case company and socialising with the employees, the researchers aspire to be accepted by the employees. The intention of creating this sense of inclusiveness is to create an interview-guide that is understandable for the employees as it fit their social world, and obtain more honest and sensitive data than otherwise would be provided during interviews. Furthermore, two interviewees were included as to cross-check the findings of the main interviewees (elaborated on in section 3.3.3 Semi-structured interviews), as this will result in higher credibility of the obtained data. Understanding the social world of the case company allows for a more correct data analysis, as the collected data can be better interpreted. However, the drawback of this approach is that there is a possibility that the researchers are going native with the employees of the case company.

Transferability

Collecting data that enlightens all the aspects of the situation allows for creating a detailed understanding. A limitation of conducting a case study is that it harms the generalisability of the developed theory, as data is collected in one place, and therefore does not necessarily allow for transferring the developed theory to other situations (Bryman & Bell, 2011). This research tries to tackle that aspect by adopting a nomothetic approach, whereby data is obtained out of representative sample size, to allow for conclusions that could be applied in a context that is not related to time and space. However, since the research is still conducted within one organisation it does not allow for complete generalisation. The advantage of

conducting the research in one organisation is that an in-depth understanding can be created because of the small sample size (Bryman & Bell, 2011).

Dependability

Dependability is secured by carefully explaining every step, and being transparent throughout the process about the steps that were taken and why they were taken. The aspect of dependability is ensured by developing an interview-guide to make sure that the questions asked in every interview are more-or-less the same. However, as the interviews are semi-structured, there is some room for asking follow-up questions. Therefore, the interviews will not exactly be the same as the researchers believe not asking these follow-up questions will result in a less in-depth data collection, and will do more harm than having stable interviews.

Confirmability

The interviews were conducted in two rounds, whereby the first round consists out of the unstructured interviews to be able to be open and still be an 'unwritten book', the second round consists out of semi-structured interviews, for a more in-depth analysis of the research question. After the data is collected, this data is translated into data-categories. The catch in developing data categories with two researchers is that, due to the subjectivity of the researchers, the decisions made regarding the categories can differ per researcher and result inconsistency. First, both researchers will individually develop categories for every interview based on the transcriptions, as this will result in inconsistency in the categories, the researchers will discuss the reasoning and decisions made for the different categories. The second step allows for iterations and will facilitate consistent decision making.

3.2.2 Research Process

The first step of the research process is to identify the interviewees and develop the interview guide that will help to answer the research question. At the same time as the data is being obtained, a first preliminary analysis will be made, and the interview guide will continuously be critically assessed to allow for improvement. As soon as all the data is obtained, the data will be presented, a thorough data analysis will be conducted, and the data will be related to literature.

3.3 Data Collection

The data in this study will be collected via unstructured and semi-structured interviews. The interviews will be conducted in a conference room in the case company, as this is a trusted and quiet environment for the interviewees, where they cannot be disturbed by their phone, e-mail, or other office related things, Bryman and Bell (2011) point this out to be a beneficial environment for the interviews. Furthermore, all the interviews will be recorded, as this allows for transcribing afterwards.

3.3.1 Ethics

As the data collection is dependent on individuals sharing their knowledge, some ethical considerations should be taken into consideration. Bryman and Bell (2011) point out four main areas of ethical considerations; harm to participants, lack of informed consent, invasion of privacy, and deception.

In relevance to this research, when the interviewees were asked to participate in this research, a few things were mentioned; (1) the aim of the research was explained, (2) the estimated length of the interview, (3) their anonymity was ensured, (4) and it was promised that the identity of the participant will be held confidential at all times.

Before the interview started, a few things were mentioned again by the researchers; (1) the purpose of the data collection was explained, (2) and it was stressed that the interviewee will be ensured complete anonymity.

There were also a few things asked by the researchers before the interview started; (1) if it is okay to record the interview, (2) if the interviewee still wanted to participate in the research, and (3) if the above-mentioned things were all understood and agreed upon by the interviewee.

3.3.2 Unstructured Interviews

The aim of the unstructured interviews is to create an understanding of the company, distinguish the research area, test the measurability of the topic, and determine the employees that should be interviewed to be able to answer the research question. Table 3 sums up who the unstructured interviews were conducted with, and the obtained insights.

Employee	Department	Insights
Employee A	Research & Development	The struggle of perspectives between Marketing & Sales and Research & Development.
Employee B	Research & Development	Customer involvement in different idea generation and development projects. Challenges and the necessity of increased integration between M&S and R&D.
Employee C	Other	The role of customers in innovation projects.
Employee D	Marketing & Sales	The importance of clearly defined responsibilities and roles, while generating and defining a concept together with a customer.
Employee E	Marketing & Sales	Emphasised the importance of a shared understanding of M&S and R&D.
Employee F	Marketing & Sales	Different cases whereby customers were involved together with R&D and M&S, the importance of a shared vision and structure between different departments, and the ability of the integration of the different departments.

TABLE 3 UNSTRUCTURED INTERVIEWS

3.3.3 Semi-Structured Interviews

Semi-structured interviews are conducted with the help of a predefined set of questions, however, the questions allow for an open answer of the interviewee and some freedom for the interviewers to ask follow-up questions (Bryman & Bell, 2011). The focus of the semi-structured interviews is on understanding the complexity of the roles between different departments, while interacting with the customer within the different elements of the FEI. The interviews are semi-structured to still allow for some iterations and freedom in asking the questions during the interview, while having guidelines targeting the research question. The interviews are conducted by two interviewers, as this strengthens the reliability of the research. Two interviewers allow for different perspectives during the interviews, resulting in a more abundant data analysis (Eisenhardt, 1989). The interviews will be recorded, to enable for transcribing the interviews later on. Furthermore, during the interview, the tasks will be divided, as one interviewer will ask the interview questions, and the other interviewer will make notes and record the interview.

Selection of interviewees

The small size of the case company allowed the researchers to distinguish the interviewees partly themselves with the help of the unstructured interviews and an internal contact person, and partly via snowball sampling whereby employees were asked which other employees were involved in the project cases. The requirements for the interviewees were that they are either working in the Research & Development department or in the Marketing & Sales department, that they have participated in a FEI project, where a customer was involved, in the past. By critically assessing the requirements of the interviewees, the researchers aimed at ensuring to answerability of the research question. Therefore, the requirements of working in one of the two departments are to ensure the obtainment regarding the integration between the two departments. A customer should be involved in the project, since that would allow for looking into the interconnection between the customer and the M&S and R&D department, and the project should have completed the FEI to be able to ask questions about every element of the FEI. The total size of the Marketing & Sales department consists out of seven employees, from which six are interviewed. The total size of the Research & Development department is nine employees, and six are interviewed. Table 4 gives an overview of the interviewees, and for which department they are working. Appendix A shows the criteria on which the interviewees were assessed to decide whether they work for the M&S or R&D department. Two interviewees were included that do not work for the M&S or R&D department, as that will allow for triangulation; obtaining data on a project from the third point of view to ensure credibility (Bryman & Bell, 2011).

Interviewee	Department	Recorded	Transcribed
Employee A	Research & Development	X	X
Employee C	Other	X	X
Employee D	Marketing & Sales	X	X
Employee E	Marketing & Sales	X	X
Employee F	Marketing & Sales	X	X
Employee G	Other	X	X
Employee H	Marketing & Sales	X	X
Employee J	Research & Development	X	X
Employee K	Research & Development	X	X
Employee L	Research & Development	X	X
Employee M	Research & Development	X	X
Employee N	Marketing & Sales	X	X
Employee O	Research & Development	X	X
Employee P	Marketing & Sales	X	X

TABLE 4 SEMI-STRUCTURED INTERVIEWS

3.3.4 INTERVIEW GUIDE

To allow for a thorough, but similar way of interviewing (Bryman & Bell, 2011), an interview guide is developed to lead the interviewers through the interview. The interview guide (Appendix B) is meant as a guidance for the interviewers and contains questions and instructions.

There were some overall requirements taken into account while developing the interview guide. First of all, the questions should all be formulated as 'open questions', as this will not influence the interviewee (Bryman & Bell, 2011). Second, the questions should be applicable to ask employees of both departments, because this allows for generalisability. Third, the questions should not contain any jargon due to the possible unclarity of the formulation of the questions. Fourth, the start of the interview guide contains easy-to-answer questions to let the employee get familiar with the interview setting, as thereafter some sensitive topics are being addressed.

A pilot interview was conducted, and based on the insights of the pilot interview and reflections of the researchers, the interview guide was checked upon four aspects; (1) clarity of the questions, (2) whether the set of questions clearly relate to the element of the FEI they should relate to, (3) whether there are questions both relating to the interconnection between the customer and cross-functional team, internal cross-functional team integration, and customer involvement, (4) the repetitiveness of the questions, (5) the relevance of the questions in regard to the research question. Based on the check, questions were reformulated, added, or deleted.

The following main categories are identified in the interview guide: (1) factsheet information, (2) general project questions, (3) Front End of Innovation questions, (4) general RQ questions. Table 5 provides information with the aim of every question of the interview guide, and the reference that provided the background literature for the question.

The questions in category 1 are regarding fact sheet information, meaning that they relate to factual information about the employee and to the employee's job. The aim of these questions is to get to know the employee, and an understanding of the work duties of the employee, to be able to categorise them in a certain department.

The general project questions relate to an activity whereby time is constrained, and it is in addition to the core tasks of the company and employee (Griffin & Hauser, 1996). The focus of the interview was on a single project, since that allowed for creating an understanding of the involvement of the cross-functional team and the customer in certain elements of the FEI, and since it appeared easier for the interviewees to provide more relevant information and recall the situation at that point in time. The aim of asking the general project questions is to get familiar with the type of project and who were involved in the project. The chronological order of the project was also discussed, to be able to ask the next category of questions in the right order according to the chronological process.

The following category contains questions relating to elements of the FEI as described by Koen et al. (2001). The elements of Koen et al. (2001) and the elaborated description as in 2.1.1 Elements of the FEI, are used to create a structure for the interviewers to enable gaining a deep understanding of what happens between the different departments and the customer from a single department perspective, during the different elements of the FEI and how this impacts the FEI. It was asked whether the interviewee could talk chronologically about the project, from the start until the decision was made to develop the project. This approach helped in identifying the chronological order of the FEI. Based on the chronological story of the interviewee, the questions were asked as developed in the interview guide. However, the order in which the questions were being asked in this category depended on the story of the interviewee.

The general questions are in place to get an understanding of the challenges and difficulties of working with a different department and when a customer was involved in the front end of innovation. These questions are incorporated to make sure that all the information was provided by the interviewee.

Questions	Aim of the question	Reference
(1) General Information		
Functional title	Obtain background information.	Bryman & Bell, 2011
Time in firm	Obtain background information.	Bryman & Bell, 2011
How would you describe your function within the case company?	Identify to which department the interviewee belongs.	Griffin & Hauser, 1996
How would you describe the tasks of the department in the case company?	Obtain background information.	Bryman & Bell, 2011; Griffin & Hauser, 1996
(2) Project-questions		
What was the project about?	Identify details of the case the interviewee will provide information about.	Bryman & Bell, 2011
What was the aim of the project? *Did the goal of the project change over time?* *If so, why?*	Identify project aim and goal in order to investigate the different perceptions of the department the interviewee represents.	Griffin & Hauser, 1996; Song, Neeley & Zhao, 1996; Kahn & Mentzer, 1998; Kohn, 2006
Would you classify this project as market-oriented or research oriented? *Why?*	Identify the perception of project classification from the individual departmental background.	Griffin & Hauser, 1996
Which other departments were involved?	Determine which other departments contributed to this element.	Moenaert et al. 1995
Could you shortly describe the chronological order of the project, from when the idea originated, to when the decision was made to scale up the project?	Distinguish the different steps that were taken in the process, to be able to ask the Front End of Innovation questions according to the chronological order.	Koen et al. 2001
(3) Front End of Innovation		
Opportunity Identification		Koen et al. 2001
Who initiated the project?	Identifying who identified the opportunity.	Koen et al. 2001; Sawhney, Verona & Prandelli, 2005; Florén et al. 2018
How was the contact between the customer and the project team while coming up with new ideas?	Investigate the perception of integration between the customer and the project team.	Griffin & Hauser, 1996; Koen et al. 2001; Enkel, Kausch & Gassmann, 2005; Sawhney, Verona & Prandelli, 2005
What was the contribution of the customer while coming up with new project ideas?	Determine the customer contribution in the opportunity identification phase.	Koen et al. 2001; Brockhoff, 2003; Sawhney, Verona & Prandelli, 2005; Elvers & Song, 2016 Walsh, Lee & Nagaoka, 2016
How was the contact between the members of the project team while coming up with new ideas?	Identify the level of integration between the different departments of the case company.	Gupta, Raj & Wilemon, 1985; Griffin & Hauser, 1996; Song, Neeley & Zhao, 1996; Kahn & Mentzer, 1998; Koen et al. 2001; Rubera, Ordanini & Calantone, 2012
What was your contribution within the project team while coming up with new ideas?	Identify the individual functional perception of the contribution made in this element of the FEI.	Souder & Sherman, 1993; Moenaert et al. 1995; Griffin & Hauser, 1996; Koen et al. 2001; Sherman, Berkowitz & Souder, 2005; Becker & Lillemark, 2006; Schoonmaker, Carayannis & Rau, 2013

Did the project team or customer have to compromise more than the other for deciding on one idea? If so, why?	Determine the integration relationship between the customer and the project team.	Griffin & Hauser, 1996; Koen et al. 2001; Matinheikki et al. 2016
Opportunity Analysis		Koen et al. 2001
What type of information did you think was important to obtain, to assess the value of the possible project idea?	Identify what information was perceived as important by the interviewee regarding the new idea.	Griffin & Hauser, 1996; Koen et al. 2001; Becker & Lillemark, 2006; Schoonmaker, Carayannis & Rau, 2013,, Stevens, 2014
What type of information did you give regarding the possible idea? What challenges did you encounter when sharing this information?	Investigate individual departmental contribution in this element and challenges, while trying to integrate that information with the other project team members.	Gupta, Raj & Wilemon, 1985; Gupta, Raj & Wilemon, 1986; Gupta, Raj & Wilemon, 1987; Song, Neeley & Zhao, 1996; Koen et al. 2001,
What type of information did the other team members give regarding the possible ideas? What difficulties did you encounter while understanding this information? How was this information shared?	Determine other departments contribution in this element and challenges, while trying to integrate the other department's information.	Gupta, Raj & Wilemon, 1985; Gupta, Raj & Wilemon, 1986; Gupta, Raj & Wilemon, 1987; Song, Neeley & Zhao, 1996; Kahn & Mentzer, 1998; Koen et al. 2001; Rubera, Ordanini & Calantone, 2012
What type of information did the customer give regarding the possible idea?	Identification of information contributed by the customer for interconnectivity	Koen et al. 2001; Brockhoff, 2003; Enkel, Kausch & Gassmann, 2005; Abrell et al. 2016; Elvers & Song, 2016; Barrutia, Velez & Echebarria, 2018
How was the information shared between the customer and the project team regarding the possible idea? What challenges did you encounter when sharing this?	Identification of the form of integration between the customer and project team in this element, and experienced difficulties.	Griffin & Hauser, 1996; Koen et al. 2001; Enkel, Kausch & Gassmann, 2005; Abrell et al. 2016; Barrutia, Velez & Echebarria, 2018
Idea Genesis		Koen et al. 2001
How did you optimise the idea?	Identification of how the project idea was further developed.	Koen et al. 2001
Who was involved in this optimisation?	Determination of which key contributors were involved in this element.	Koen et al. 2001; Brockhoff, 2003; Elvers & Song, 2016
While optimising the idea with the project team, what were challenges you were encountering? How where these tackled?	Investigation of challenges within the project team in this element, and how they overcome these challenges.	Griffin & Hauser, 1996; Kohn, 2006; Khurana & Rosenthal, 1998
Which challenges did you encounter working with the customer to optimise the idea?	Investigation whether there were challenges between the customer and the project team in this element.	Koen et al. 2001; Enkel, Kausch & Gassmann, 2005; Abrell et al. 2016; Barrutia, Velez & Echebarria, 2018
While optimising the idea, how was your functional interests aligned with the project idea?	Distinguish whether there were differences in the idea and the department background.	Griffin & Hauser, 1996; Koen et al. 2001
While optimising the idea, how was the customer interest aligned with the project idea?	Distinguish to which extent the customer was satisfied with the project idea.	Griffin & Hauser, 1996; Koen et al. 2001; Enkel, Kausch & Gassmann, 2005
Idea Selection		Koen et al. 2001

How was the decision made to continue or kill the idea?	Distinguish on what grounds the decision was made regarding the idea.	Koen et al. 2001
How was the customer involved in the decision making regarding continuing or killing the idea?	Determine customer involvement in the idea selection element.	Koen et al. 2001; Brockhoff, 2003; Enkel, Kausch & Gassmann, 2005; Matinheikki et al. 2016
How did the final choice of the project align itself with your functional goals?	Compliance of departmental functional goals with the project goal	Moenaert et al. 1995; Griffin & Hauser, 1996; Kohn, 2006
What was the general feeling within the project team about the decided idea that was decided on?	Compliance of other departments functional goals with project goal (a department which is not interviewed)	Griffin & Hauser, 1996
Concept and Technology Development		Koen et al. 2001
How did you proceed after the idea was selected?	Identify the next steps taken in the process.	Koen et al. 2001
How was the business case made?	Identify via which communication channels the business case was made.	Kahn & Mentzer, 1998; Koen et al. 2001; Rubera, Ordanini & Calantone, 2012
How was the knowledge acquired to make the business case within the project team?	Distinguish who was involved in developing the business case.	Griffin & Hauser, 1996; Koen et al. 2001
Which department contributes what type of knowledge?	Identify the different types of knowledge that were contributed by every department.	Koen et al. 2001
How did the customer participate in developing the business case?	Determine the role of the customer in this stage of the process.	Koen et al. 2001; Brockhoff, 2003; Enkel, Kausch & Gassmann, 2005
(4) General questions		
What were for you the benefits that you have not mentioned yet of working together with this project team?	Identify the benefits of integration between M&S and R&D in the FEI	Hise et al. 1990; Griffin & Hauser, 1996; Brettel et al. 2011
What were for you the difficulties that you have not mentioned yet of working together with this project team?	Identify the shortcomings of integration between M&S and R&D in the FEI	Griffin & Hauser, 1996; Song, Neeley & Zhao, 1996; Kohn, 2006
What were for you the benefits that you have not mentioned yet of working together with this customer?	Identify the benefits of customer involvement in the FEI	Abrell et al. 2016; Barrutia, Velez & Echebarria, 2018
What were for you the difficulties that you have not mentioned yet of working together with this customer?	Identify the shortcomings of customer involvement in the FEI	Enkel, Kaush & Gassmann, 2005; Abrell et al. 2016; Barrutia, Velez & Echebarria, 2018
Did the other department act as a middle man between your department and the customer? *If so, why?* *What was the context of this situation?*	Identify the relationship between the integration of M&S and R&D and customer involvement, and in which situations that happened.	Florén & Frishammer, 2012

TABLE 5 EXPLANATION OF THE INTERVIEW GUIDE

3.4 Data Analysis

The data will be analysed using the coding method developed by Gioia, Corley and Hamilton (2012). This coding method allows for building a concept that is based on an organisational situation and is theoretical and generalisable (Gioia, Corley & Hamilton, 2012). The systematic method developed by Gioia, Corley and Hamilton (2012) is useful for capturing the complexity and richness of a qualitative, inductive study.

The first order concept is based on the first quotes that are subtracted from the data. The researchers went through the interview transcripts to identify relevant quotes. All the quotes can be found in Appendix D - J. Both researchers first went individually through every interview and divided every quote in an element of the FEI based on the criteria in Appendix C. This approach was rather deductive, since the quotes were divided into seven categories; (1) Function, quotes that enable the researchers to allocate the interviewees in the two departments (Appendix D), (2) General, quotes that were referring to the project, since this allowed the researchers to create an understanding of the context of the situation (Appendix E), (3) Opportunity Identification, quotes relating to the first element in the FEI (Appendix F), (4) Opportunity Analysis, quotes that were relating to the second element in the FEI (Appendix G), (5) Idea Genesis, quotes that related to the third element of the FEI (Appendix H), (6) Idea Selection, the quotes relating to the fourth element of the FEI (Appendix I), and (7) Concept and Technology Development, quotes relating to the fifth element of the FEI (Appendix J). However, the deductive approach enables distinguishing the interconnection between the M&S and R&D department and the customer involvement in the individual elements of the FEI. Within the elements of the FEI, an inductive approach was followed to jointly develop the 1st-order concept based on the quotes from the data.

To create the 2nd-order level the categories of the 1st-order will be analysed to see which concepts can be combined (Gioia, Corley & Hamilton, 2012), as this allows for cross-case pattern recognition (Eisenhardt, 1989). Furthermore, the 2nd-order level is on a more general level and combined with some conceptual literature.

After having created the 1st order concept and 2nd order themes, a more abstract approach will be used to develop the final aggregated dimensions (Gioia, Corley & Hamilton, 2012). This is where the dimensions are brought to a conceptual level. The funnel from the data quotes to the aggregated dimensions allowed for step-by-step generalising the data and get to a more conceptual level.

4 · FINDINGS

The findings of the obtained data will be presented. The structure of this chapter is divided according to the individual elements of the Front End of Innovation; opportunity identification, opportunity analysis, idea genesis, idea selection, and concept and technology development. Within every element, it is explained how the first order concepts are derived from the quotes, how the grouped first order concepts lead to the second order themes, and how the second order themes resulted in the aggregated dimensions. The identified themes and aggregated dimension are distinguished based on the formulated research question in Chapter 1. Appendix F – J displays the quotes that are extracted from the conducted interviews. This chapter does not present all the quotes, but only the ones that are perceived to be the most relevant for the findings.

4.1 OPPORTUNITY IDENTIFICATION

4.1.1 CUSTOMER AND CROSS-FUNCTIONAL TEAM CONNECT THEIR CAPABILITIES

The aggregated dimension of 'customer and cross-functional team connect their capabilities' was identified based on four second order themes (Figure 2). These four second order themes were identified to be: customer contact was established via M&S, separate preparations from the cross-functional team and the customer, capability sharing between the customer and the cross-functional team, and cross-functional teams from the customer and the company. These second order themes led to the aggregated dimension, since they are all related to the connection between the customer and the cross-functional team.

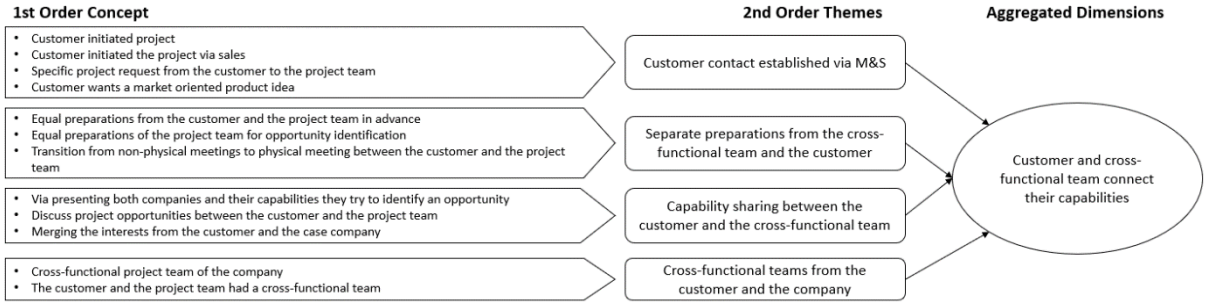

FIGURE 2 OPPORTUNITY IDENTIFICATION

Customer contact established via M&S

The first order concepts were all regarding how the first contact between the customer and M&S was initiated (Table 6). The customer proactively reached out to the cross-functional team with a request (*"So we were contacted by the customer. … And already at that point, they knew what they wanted to do."- Employee A, R&D*). The customer identified a gap in the market that they try to fill in together with the cross-functional team (*"They wanted to find something unique for the positioning on the market."- Employee M, R&D*). The initial contact with the customer is mostly through the company's M&S department (*"They approached us,…, if we could do something together. Then I forward that to our sales people."- Employee L,*

R&D). One of the main reasons for the customer to reach out was to ask for a unique, market oriented request (*"A company wanting to move into a new market."- Employee N, M&S*).

Representative quotes	2nd order Theme
"It was the customer who initiated the project, they contacted us, and wanted to use our product." - Employee K, R&D	Customer contact established via M&S
"This was a thing coming from my customer." - Employee D, M&S	
"The customer contacted me, I'll have some initial calls with the customer." - Employee H, M&S	

TABLE 6 CUSTOMER CONTACT ESTABLISHED VIA M&S

Separate preparations from the cross-functional team and the customer

The first order concepts were all regarding the individual preparations before the actual meeting between the customer and cross-functional team took place, resulting in the second order theme (Table 7). Separate preparations from both the cross-functional team and the customer took place in advance to the first physical meeting (*"So, we've prepared beforehand, try to read up on potential opportunities." - Employee M, R&D*). In this element, the customer and the cross-functional team have phone calls and emails, before having the actual meeting (*"Yeah, that was phone calls, emails. And then we set up a meeting."- Employee N, M&S*). Both the cross-functional team (*"I was coordinating everything, making sure that we, we had the meetings, that we made progress, and that we, in the end, had clear proposals to share with the customer."- Customer M, R&D*), and the customer prepared (*"People from both companies tried to read up in advance."- Employee M, R&D*).

Representative quotes	2nd order Theme
"It was a joint effort from that point. We had a lot of internal discussions. You know, everybody was allowed to pitch in, so that was cross-functional as well. We had input from sales, we had from product development, and we had from a lot of it from research basically." - Employee L, R&D	Separate preparations from the cross-functional team and the customer

TABLE 7 SEPARATE PREPARATIONS FROM THE CROSS-FUNCTIONAL TEAM AND THE CUSTOMER

Capability sharing between the customer and the cross-functional team

In the first order concepts, the different procedures of sharing between the customer and cross-functional team were depicted, leading to the second order theme (Table 8). During the opportunity identification, the unique capabilities of the customer and the cross-functional team are exchanged. It was a mutual effort; the cross-functional team presents their capabilities (*"So we went there and discussed the opportunities and our capabilities and products."- Employee F, M&S*), and checks if the customer's capabilities are valuable for them (*"We then go in to see the customer abilities, are they able to make the product, what their resources are."- Employee G, Other*). Information regarding capabilities was shared in a transparent manner between the customer and the cross-functional team (*"We made some suggestions and then they had to say, is this okay? Or not? But they had suggestions."- Employee J, R&D*). Part of sharing the capabilities was to merge the diverging interests of both

actors (*"So I think it was that we came from two different worlds. And, you know, in the end, it takes some time, then the, your worlds would merge."- Employee N, M&S*).

Representative quotes from data collection	2nd order Theme
"We did the matchmaking way to the assessment. And we said, these are our capabilities."- Employee H, M&S *"They reached out, they wanted to do an for our industry specific product, we presented our capabilities."- Employee N, M&S* *"Present both, first the two companies, and the product offering that we have, and what capabilities we have."- Employee H, M&S* *"It was to get the request from customer, get them a bit down to earth, and match that with our capabilities. What we wanted from the business point of view. So, so my role was really to sort of merge the two companies interest."- Employee N, M&S*	Capability sharing between the customer and the cross-functional team

TABLE 8 CAPABILITY SHARING BETWEEN THE CUSTOMER AND THE CROSS-FUNCTIONAL TEAM

Cross-functional teams from the customer and the company

During the element opportunity identification, both teams from the customer and the company were cross-functional (Table 9). The first order concepts all mention the cross-functionality of the customer and cross-functional teams resulting in the second order theme 'cross-functional teams from the customer and the company'. Different departments were involved in the cross-functional team (*"So to start with sales, pretty early application and research development has been part of this project. And I would say that the quality department has been there as well."- Employee H, M&S*), and it was the same for the customer (*"So it's a cross functional effort from our side. And the same thing goes from their side."- Employee L, R&D*).

Representative quotes	2nd order Theme
"The customer was duplicating with R&D, marketing and sales people. And then they also had regulatory expertise in the whole team."- Employee M, R&D *"From the beginning, it was marketing and sales. So at that time, I was responsible for marketing sales. So it was a customer of mine. Then, of course, since it became obvious that we wanted to do joint development, R&D came on board as well."- Employee N, M&S*	Cross-functional teams from the customer and the company

TABLE 9 CROSS-FUNCTIONAL TEAMS FROM THE CUSTOMER AND THE COMPANY

4.2 Opportunity Analysis

4.2.1 Customer and Cross-Functional Team Combine Their Knowledge

One aggregated dimension is identified based on the data obtained; customer and cross-functional team combine their knowledge. Three second order themes were developed: individual departments contribution in the cross-functional team, cross-functional team analyses different aspects of the opportunity, and customer and cross-functional team join

forces, leading to the aggregated dimension (Figure 3). The analysed second order themes precede to the aggregated dimension, as they depict requirements that should be performed.

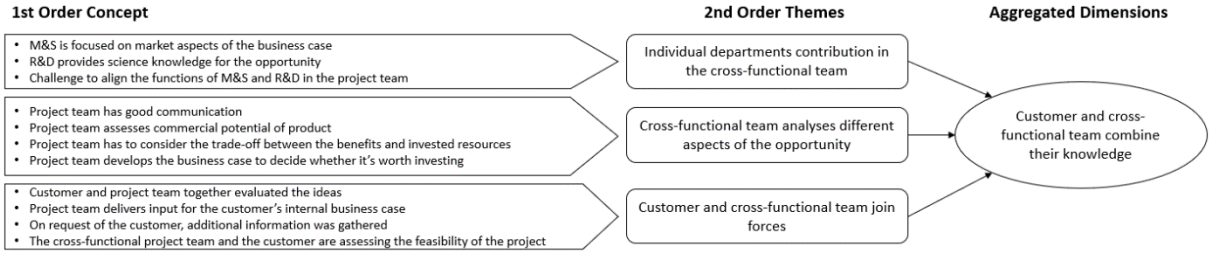

FIGURE 3 OPPORTUNITY ANALYSIS

Individual departments contribution in the cross-functional team

Within the element opportunity analysis, the efforts of the departments within the cross-functional team are pointed out (Table 10). The identified first order concepts depicted the individual department's involvement within the company's cross-functional team, resulting in the second order theme. Every department was focused on their tasks first (*"The M&S team assessed the value of the project. I was mainly involved in identifying if you can call it the scientific need for a product like that."- Employee K, R&D*). M&S on the market aspects ("*And then I need to make my assumptions from the commercial side." - Employee D, M&S*), and R&D provided the science aspects (*"So the R&D was bringing in the science, the rationale for the combination opportunities and so on."- Employee M, R&D*). The potential of the opportunity was jointly assessed (*"Together with our R&D team, we looked into what is important, what is important when developing a product form an R&D perspective."- Employee C, Other*). The input from the other departments was acknowledged (*"The application in business areas, is a part that the colleagues from the marketing and sales department. They had to add information about applications and business areas, that unique selling position."- Employee K, R&D*), as well as being transparent about the individual functional responsibilities (*"Normally, it's not us in research to think about if the project is valuable for the case company, we are not responsible for that."- Employee J, R&D; "I took the discussions with customers, and then pull that information back in the project. … I was representing marketing and sales."- Employee E, M&S*). The collaboration of different actors is described to be quite challenging, as sometimes involvement is not equal (*"Because it's quite often we end up being pure R&D based, you know, we do 90% of the business case, and we do our best guesses on everything and marketing and sales pitches in at the last minute."- Employee L, R&D*).

Representative quotes	2nd order Theme
"Whereas the marketing and sales people were then bringing in the market aspects of the business case and the numbers and values to it. How to find a unique position."- Employee M, R&D	Individual departments contribution in the cross-functional team
"It's a challenge when you work in cross functional project teams, where marketing and sales are very fluffy, … ,it's always between your thumb and forefinger, whereby R&D is very here and now. … . So it's about getting those sort of, front and back end together."- Employee N, M&S	
"There is an agreement that you don't start a project without someone from M&S involved. "- Employee O, R&D	

TABLE 10 INDIVIDUAL DEPARTMENTS CONTRIBUTION IN THE CROSS-FUNCTIONAL TEAM

Cross-functional team analyses different aspects of the opportunity

The first order concepts that led to the second order theme, depicted the cross-functional team's internal actions to prepare for the first meeting with the customer (Table 11). In order to exchange information, the cross-functional team was in close contact (*"There were quite close project meetings."- Employee E, M&S*). The opportunity was analysed in the cross-functional team (*"Whenever we decide to do a study, we start with doing a business case. Marketing, R&D are involved in writing and producing that business case."- Employee K, R&D*). A risk evaluation was conducted (*"We also have to do a risk evaluation of both the part related to marketing and sales, but also the research part."- Employee K, R&D*). Once a risk evaluation was completed, a business case was cross-functionally developed (*"We actually develop the business case, where we would put it together, we do our market research, we do our IP searches, we look at the science behind it, likelihood of success, indication, consumer needs, all those things."- Employee L, R&D*). The business case was developed to assess the opportunity (*"I mean, we always have to consider the benefits that potentially, you know, the science and the marketing and sales and the cost involved in this."- Employee Employee L, R&D*), and to analyse the potential of working together with the customer (*"We want to do what the customer asks us to, but we, we need to understand that this is feasible, that it can be upscaled, once if we get positive results."- Employee D, M&S*).

Representative quotes	2nd order Theme
"So internally, I think we had some very good discussion."- Employee L, R&D	Cross-functional team analyses different aspects of the opportunity
"So there was an opportunity from R&D, and then that was of course, evaluated whether it's a potential area that we want to move into."- Employee E, M&S	
"So that was sort of the upside of the, we thought that we could actually and make new products and attract new, different customers."- Employee E, M&S	
"There was a business case and it was one sales person, and one from R&D being the ones that writing the business case."- Employee C, Other	

TABLE 11 CROSS-FUNCTIONAL TEAM ANALYSES DIFFERENT ASPECTS OF THE OPPORTUNITY

Customer and cross-functional team join forces

The third second order theme is about the joint forces of the customer and the cross-functional team (Table 12). The identified first order concepts are regarding the interaction between the customer and cross-functional team to analyse the opportunity. The cross-functional team shared their knowledge with the customer, to get funding for a project (*"With the help of us, they actually did an internal business, presented this to their management, and actually got the funding internally approved. So they had quite a quite a big, we had a big input".- Employee D, M&S*). The cross-functional team identified the opportunities of a customer's request (*"Then we've discussed and try to evaluate in the meeting their ideas, according to specific criteria, to try to rank them all to prioritise between them."- Employee M, R&D*). Jointly, multiple opportunities were analysed by the customer and the cross-functional team ("*It was done in a workshop, or actually two workshops. I think it became, in the end where a lot of different ideas were discussed. And then pros and cons. And then, external investigations, experts were asked, and in the end there was a conclusion made. There were R&D experts, the M&S, and then different departments from the customer, and different people here as well."- Employee N, M&S*).

Representative quotes	2nd order Theme
"And when doing the business case, we involve people from both the marketing department trying to do an evaluation of the current market status and what other products are there in the market that we would compete with, and how many consumers could be addressed. .... R&D is more responsible, primarily for the research part, like background information, and what is currently available when it comes to to, to literature, on other products."- Employee K, R&D	Customer and cross-functional team join forces
"We came up with an equal number of ideas, more or less. And then we narrowed those down." - Employee M, R&D	
"Already in the beginning, you should sit down and try to identify it, as far as you can, potential showstoppers. And really identify them and try to solve them in one way or another."- Employee L, R&D	
"They did not contribute that much while coming up with the new idea, but they gave an acceptance that they wanted this product. They gave input in the requirements."- Employee P, M&S	

TABLE 12 CUSTOMER AND CROSS-FUNCTIONAL TEAM JOIN FORCES

4.3 IDEA GENESIS

4.3.1 ACCOMPLISH A COMMON PROJECT UNDERSTANDING BETWEEN THE CROSS-FUNCTIONAL TEAM AND THE CUSTOMER

One aggregated dimension is distinguished based on four second order themes (Figure 4); accomplish a common project understanding between the cross-functional team and the customer. The second order themes that resulted in this dimension were; create a common understanding of the project between the customer and the cross-functional team, M&S enables information sharing between the customer and cross-functional team, adaptation of

different roles in the cross-functional team, and balance the cross-functional team and customer requirements. These second order themes lead to the aggregated dimension as they display prerequisites that should be fulfilled, both within the cross-functional team as together with the customer.

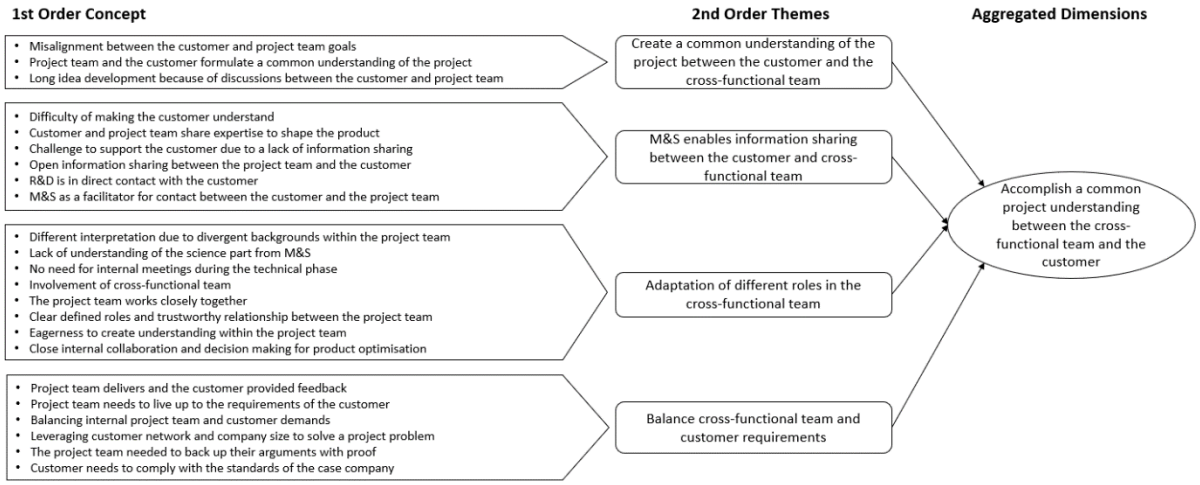

FIGURE 4 IDEA GENESIS

Create a common understanding of the project between the customer and the cross-functional team

The first order concepts are all focused around a mutual understanding between the customer and the cross-functional team, resulting in the second order theme 'create a common understanding of the project between the customer and the cross-functional team' (Table 13). Discussions between the customer and the project team in the idea genesis can take long (*"I think the discussions were ongoing for maybe even up to two years before we actually got a specific project plan and idea and concept." - Employee M, R&D*). Not having a common understanding between the customer and the cross-functional team resulted in working towards different goals (*"So that was a bit conflicting. Because we then had slightly different goals." - Employee M, R&D*). The goal for the project could also be formulated together (*"Early in the process we'll talk with the customer … So that we have a common understanding on what the project that we're about the start would look like" - Employee H, M&S*). Therefore, the first order concepts were all focused around a mutual understanding between the customer and the cross-functional team, resulting in the second order theme 'create a common understanding of the project between the customer and the cross-functional team'.

Representative quotes	2nd Order Theme
"So you come out with the joint set of expectations, that's very important." - Employee D, M&S	Create a common understanding of the project between the customer and the cross-functional team
"We have very different views on what the results look like" - Employee A, R&D	

TABLE 13 CREATE A COMMON UNDERSTANDING OF THE PROJECT BETWEEN THE CUSTOMER AND THE CROSS-FUNCTIONAL TEAM

M&S enables information sharing between the customer and cross-functional team

The second order theme is developed based on the contact between the cross-functional team and the customer (Table 14). M&S acted as a facilitator (*"And then to kind of help facilitate this. Because also here as I've talked about before to be aligned, R&D, commercial, product application, whatever, that important that is kind of our role." - Employee D, M&S)*, and R&D was in direct contact with the customer *("I had more direct contact with the customer." - Employee J, R&D)*. There was close contact with the customer (*"The customer communication is very good. Whenever it's needed there is a meeting between us and them." - Employee O, R&D*), and the idea was jointly optimised by the cross-functional team and the customer (*"All the teams from both the customer and the case company were involved in optimising the idea" - Employee M, R&D*). However, information was not shared openly all the time (*"They (customer) don't share a lot of information with us. So in that sense it's difficult to support them." - Employee A, R&D*), and sometimes it was difficult to get the customer to understand the idea (*"They don't really have a very good grasp of what it means, the benefits, the upsides and downsides, the complexity and so on." - Employee L, R&D*).

Representative quotes	2nd Order Theme
"My function, in that case, was just to make sure that we have the right people answering. And leading the conversation, delegating the responsibilities to other people." - Employee F, M&S	M&S enables information sharing between the customer and cross-functional team
"So I take all the technical questions" - Employee A, R&D	
"With our expertise and their expertise, we try to tackle what they want to achieve and what's actually feasible to do." - Employee A, R&D	
"Sometimes it gets a bit difficult. But keeping a transparent conversation at the end, we always have noticed becomes the best way." - Employee G, Other	

TABLE 14 M&S ENABLES INFORMATION SHARING BETWEEN THE CUSTOMER AND THE CROSS-FUNCTIONAL TEAM

Adaptation of different roles in the cross-functional team

The first order concepts represent quotes that relate to different functions within the cross-functional team, therefore, the second order theme of 'adaptation of different roles in the cross-functional team' covers these concepts (Table 15). Depending on the project, there was close contact within the cross-functional team (*"We work quite closely together." - Employee A, R&D*), or not that much contact (*"And then during the technical phase when everything was running, we didn't have that many meetings." - Employee E, M&S*). It appeared to be a challenge to merge the perspectives of R&D and M&S (*"From a R&D perspective you want an impact. From a marketing and sales perspective you want to have an easy to sell product in the end, so you want to have a cheap product as possible. And again, so someone had to compromise." - Employee N, M&S*). M&S also experienced difficulties with understanding the science aspects of the idea (*"On the commercial side, we don't have the knowledge. I do have very little understanding of the physical, or the biologic aspects. But I do understand the scope of it, I come from a different background." - Employee D, M&S*). Within the cross-functional team, they aimed at creating a common understanding (*"We tried to, talk it out until we get*

there. To explain, to where we understand each other." - Employee A, R&D), and trust on each others judgments (*"There are things where my opinion take precedence, or were I listen." - Employee A, R&D*).

Representative quotes	2nd Order Theme
"No, for me it was not easy to understand. Because it was a lot of application information, understanding the science part of the product." - Employee F, M&S	Adaptation of different roles in the cross-functional team
"By having meetings and presenting data, we shared information within the different functions." - Employee K, R&D	
"The other team members, they have been really supportive and fast. It's difficult and challenging. "- Employee P, M&S	

TABLE 15 ADAPTATION OF DIFFERENT ROLES IN THE CROSS-FUNCTIONAL TEAM

Balance cross-functional team and customer requirements

The second order theme represents balancing the requirements between the cross-functional team and the customer (Table 16). Working together with a customer leads to a number of demands from divergent perspectives. Both the cross-functional team (*"We force our customer to actually, if they're going to use our product, our brand, our product name, they need to comply with our rules." - Employee A, R&D*), and the customer put requirements on the other party (*"The role of the customer? I mean, they put some serious requirements on not only us, but also in our partners in order to make this happen." - Employee H, M&S*).

Representative quotes	2nd Order Theme
"We were arguing in meetings. In between, we had to collect and share proof of the impact. You can think that it's rather obvious, but we still collected evidence for it to convince them."- Employee M, R&D	Balance cross-functional team and customer requirements
"The challenges were just that, we were challenged with hitting the requirements."- Employee F, M&S	
"We didn't agree in some aspects with the customer."- Employee O, R&D	

TABLE 16 BALANCE CROSS-FUNCTIONAL TEAM AND CUSTOMER REQUIREMENTS

4.4 Idea Selection

4.4.1 Mutual Compromises From the Cross-Functional Team and the Customer

The aggregated dimension relating to the element of idea selection is 'mutual compromises from the cross-functional team and the customer'. Figure 5 displays how the aggregated dimension has been established. It is built out of three second order themes; Dissatisfaction within the project team when the customer decides on the idea, internal cross-functional team considerations regarding the idea, and joint decision making from the customer and the

cross-functional team. In the end, a mutual compromise between the company and the customer led to the decision where both parties were most satisfied with.

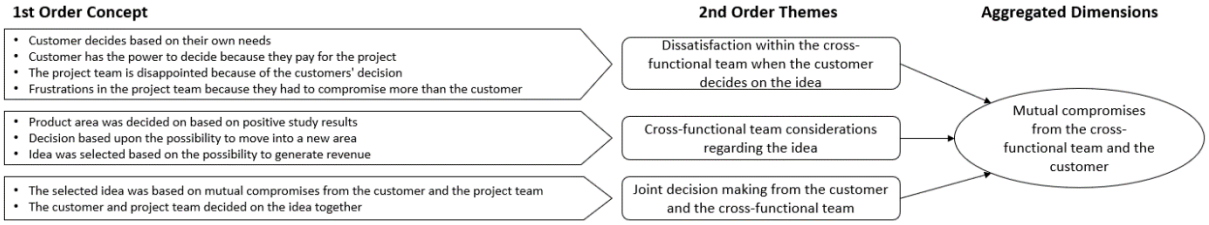

FIGURE 5 IDEA SELECTION

Dissatisfaction within the cross-functional team when the customer decides on the idea

This second order theme is established out of concepts that display one-sided decision making and the effect of that decision (Table 17). The customer has the power to decide on the idea, since they are paying for the project (*"It was, was mostly their (customer) decision, since they're paying."* - *Employee M, R&D*). The customer took their own needs in consideration within the idea selection process (*"It's optimised, or compromised into being something the fits into the customer budget and timelines basically." - Employee L, R&D*). The cross-functional team was disappointed by the decision that was made by the customer (*"The feeling in the project team about the idea was disappointment" - Employee M, R&D*).

Representative quotes	2nd Order Theme
"It's up to the customer to make the decision" - Employee A, R&D	Dissatisfaction within the cross-functional team when the customer decides on the idea
"So talking about compromises, all of a sudden time to market and also cost became more important than having the, what we believed, the most superior final product. And who would who made the most compromises? I think that, from our perspective, we really wanted to have a combination product, because we believe we have a higher likelihood of success with the combination." - Employee N, M&S	
"You don't get all the information, you don't really know what they base their decision on. And then they decided."- Employee P, M&S	

TABLE 17 DISSATISFACTION WITHIN THE CROSS-FUNCTIONAL TEAM WHEN THE CUSTOMER DECIDES ON THE IDEA

Cross-functional team considerations regarding the idea

This second order theme is compiled of concepts that show internal actions regarding idea selection (Table 18). The cross-functional team considered the product area due to positive study results (*"So we did studies …, we got nice results from that. And we also on that, they decided they will make a product for the market." - Employee J, R&D*), via the possibility to move into a new area (*"Everyone thought that it made sense to move into a new health segment" - Employee E, M&S*), or market potential (*"I put the numbers and the revenues into the budget, and said that I really believed that this could be something that's big business for us." - Employee F, M&S*).

Representative quotes	2nd Order Theme
"And so, and then, well, the reasoning around why we should do this was because I mean, …, it was a possibility to move to different areas." - Employee E, M&S	Cross-functional team considerations regarding the idea
"It was more like, this is an interesting area. And then this result was presented." - Employee E, M&S	

TABLE 18 CROSS-FUNCTIONAL TEAM CONSIDERATIONS REGARDING THE IDEA

Joint decision making from the customer and the cross-functional team

The third second order theme was identified to be joint decision making between the customer and the company (Table 19). The decision to pursue one idea was made jointly(*"The selection? It was all together. Finally we decided on what we should do." - Employee J, R&D*). The customer and the cross-functional team both compromised (*"By discussing, and just by talking. Trying to find compromise"- Employee K, Other*).

Representative quotes	2nd Order Theme
"After we finished the 'are they capable of doing the product themselves', at this point, it becomes more collaborative: go or no. Both the customer and the case company are deciding should we go forward in the project or not. How confident is the customer in the making the project go forward or not." - Employee G, Other	Joint decision making from the customer and the cross-functional team
"The selection? It was all together. Finally we decided on what we should do." - Employee J, R&D	

TABLE 19 JOINT DECISION MAKING FROM THE CUSTOMER AND THE CROSS-FUNCTIONAL TEAM

4.5 Concept and Technology Development

4.5.1 Match the Market and Science Expertise Within the Cross-Functional Team With the Expertise of the Customer

The aggregated dimension combines the difficulty of different perspectives that bring in different knowledge, with the role of knowledge exchange between the customer and the cross-functional team. Figure 6 illustrates how the aggregated dimension has been established. The second order themes that were identified are 'challenge of merging the market perspective with the scientific perspective in the cross-functional team' and 'integration of the customer and the cross-functional team'. These two themes come together in the aggregated dimension 'Match the market and science perspective within the cross-functional team with the expertise of the customer'.

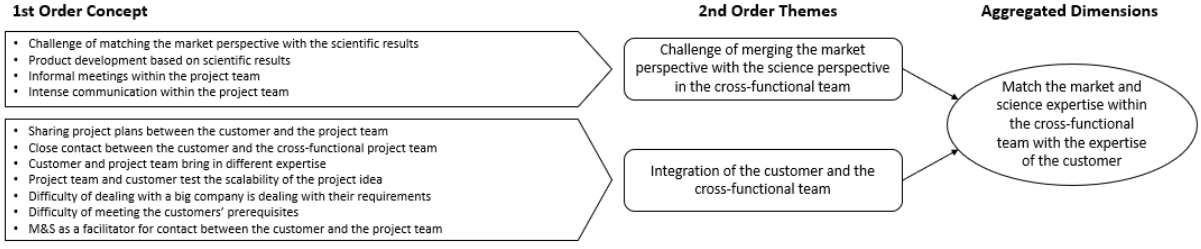

FIGURE 6 CONCEPT AND TECHNOLOGY DEVELOPMENT

Challenge of merging the market perspective with the science perspective in the cross-functional team

The second order theme captures the challenge within the cross-functional team that is part of this element; how do the market and science perspectives match (Table 20). There is integration in the cross-functional team in the form of set meetings or informal communication (*"Pre-meetings if we needed, corridor meetings if that was easier" - Employee N, M&S*). The product was further developed based on positive scientific results (*"I mean, it's really important when we launched this product. I mean, all it was based on positive clinical effect."- Employee C, Other*). The cross-functional team encountered the challenge to translate the scientific results into a message attractive for the market (*"It is always the balance between how the R&D people like to stick to facts. And the non R&D people are more willing and prepared to extend a result to a broader population." - Employee K, R&D*).

Representative quotes	2nd Order Theme
"I think that if you ask my R&D colleagues, they think that sales guys are a bit, we talked too much. We're not necessarily saying exactly what is in the study. But our job is to make it understandable for other people." - Employee D, M&S	Challenge of merging the market perspective with the science perspective in the cross-functional team
"So the challenge was, when we discuss how the results from the research would be interpreted and used by the other side." - Employee K, R&D	
"There was a more intensive communication period that was initiated" - Employee K, R&D	

TABLE 20 CHALLENGE OF MERGING THE MARKET PERSPECTIVE WITH THE SCIENCE PERSPECTIVE IN THE CROSS-FUNCTIONAL TEAM

Integration of the customer and the cross-functional team

The first order concepts are merged since they all relate to customer interaction (Table 21). M&S fulfils the role as a facilitator (*"And I was kind of facilitator" - Employee D, M&S*). There is an open dialogue between the customer and the cross-functional team (*"So we are basically keeping an open dialogue, weekly meetings, always having the marketing sales and application in touch with them. So we almost every week have calls with them." - Employee G, Other*), and direct R&D from the cross-functional team to R&D from the customer contact (*"In this phase it was between R&D our company and R&D in our customer." - Employee D, M&S*). However, the cross-functional team struggled living up to the requirements that the customer put on them (*"They made us change our supply format. Which put some serious conditions on logistics and production. So we needed to team up with our partners in order to, secure the project." - Employee H, M&S*).

Representative quotes	2nd Order Theme
"I'm absolutely sure, they (customer) have plans. They have a project timeline … They shared it with us." - Employee F, M&S *"It's coming from different worlds. Having insight into different areas, different sales channels, different regulatory requirements. So they brought in expertise that we don't have yet. And vice versa." - Employee N, M&S* *"In best case, you push them together. Because on the customer side there's always a team of 10, and it's always good to have the R&D, the application, as well as the commercial topics. So it's important that we stay close in close contact." - Employee H, M&S*	Integration of the customer and the cross-functional team

TABLE 21 INTEGRATION OF THE CUSTOMER AND THE CROSS-FUNCTIONAL TEAM

5 · Analysis and Discussion

First, the developed Grounded Theory Model is presented and explained. The structure of the rest of the chapter is according to the elements of the Front End of Innovation. Within every element, first, the data itself is analysed, whereby the second step is to link the data to the literature presented in chapter 2.

5.1 Grounded Theory Model

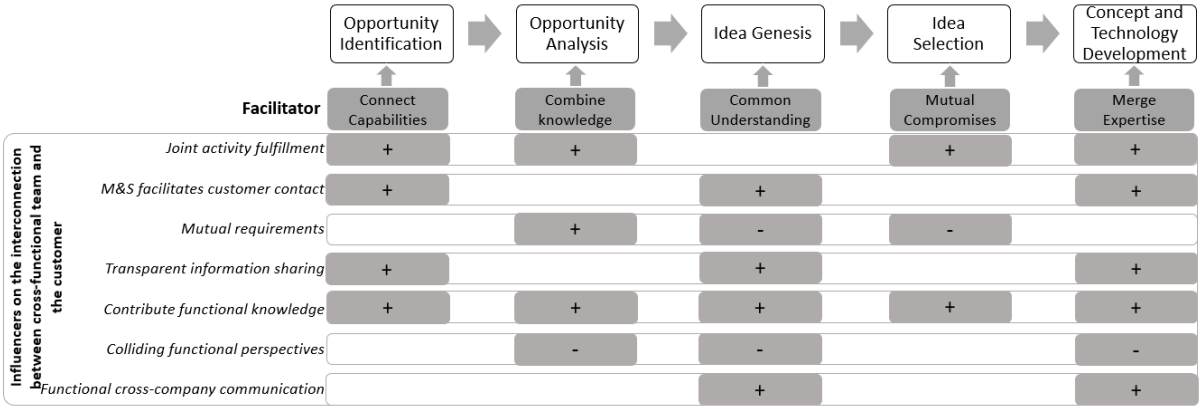

FIGURE 7 GROUNDED THEORY MODEL

Figure 7 visualises the developed Grounded Theory model. Based on the data it was distinguished how the integration between M&S and R&D together with the interconnectivity with the customer impacts the specific elements of the FEI. The model displays the different elements of the FEI, as described by Koen et al. (2001). Underneath, the facilitator is distinguished. The facilitator is the interconnection between the customer and the cross-functional team, this facilitator contributes to a successful outcome of the element. Furthermore, influencers are identified that enable the facilitator (+), or disable the facilitator (-). An in-depth discussion per element of how the influencers impact the facilitator, and how the facilitator contributes to the element is described.

5.2 Opportunity Identification

The interconnection between the customer and the cross-functional team to the opportunity identification element is connecting their capabilities.

5.2.1 Analysis

In most projects, the customer actively reached out to the cross-functional team, whereby they either had a predefined idea (*"It was the customer who initiated the project, they contacted us, and wanted to use our product."- Employee K, R&D*), or they had identified a new market they wanted to enter (*"A company wanting to move into a new market."- Employee N, M&S*). Furthermore, the initial contact from the customer is established via the M&S department of the company (*"They approached us, you know, for various reasons, if we could do something together. Then I forward that to our sales people, and then that sort of,*

you know, went back and forth. And then that's how the whole thing started."- Employee L, R&D). Therefore, M&S facilitates the first contact with the customer.

In advance to the first internal meetings, the R&D and M&S department individually prepared multiple opportunities relating to their functional background (*"So it was from R&D, but also from marketing and sales. So, we've prepared beforehand, try to read up on potential opportunities."- Employee M, R&D*). Resulting in R&D and M&S both providing their functional knowledge to the element.

The R&D and M&S departments integrated their identified opportunities, and the customer also prepared proposals for opportunities ("*People from both companies tried to read up in advance."- Employee M, R&D*). Moreover, the customer and the cross-functional team separately prepare to contribute to the element.

After, there was a combined effort when identifying the capabilities of both companies and merging the identified opportunities (*"Present both, first the two companies, and the product offering that we have, and what capabilities we have."- Employee H, M&S*). Merging the opportunities was challenging (*"It was to get the request from customer, get them a bit down to earth, and match that with our capabilities. What we wanted from the business point of view. So, my role was really to sort of merge the two companies interest."- Employee N, M&S*), due to the high number of divergent functional backgrounds, as both parties worked in a cross-functional team *("So it's a cross functional effort from our side. And the same thing goes from their side."- Employee L, R&D).* Transparent information sharing and open communication were key for merging the interests from the customer and the cross-functional team *("Very transparent information is being exchanged right from the beginning."- Employee G, Other*). Therefore, the customer and the cross-functional team both performed the activity of this element, and they openly shared information.

The data in this element shows that everything builds up to the moment where the customer and the cross-functional team can unite their capabilities to identify the opportunity.

5.2.2 Discussion

Combining the capabilities of the customer and the cross-functional team is distinguished to be the facilitator for the opportunity identification element.

A formalised process in the opportunity identification element allows for successfully capturing new ideas (Florén & Frishammer, 2012; Gama, Frishammer & Parida, 2019). A formalised process is distinguished on how to identify opportunities. The integrated M&S and R&D team and the customer prepare individually, later on presenting capabilities, and combining the initial identified opportunities.

The first step in the process was the customer reaching out to the company's M&S department with a predefined request. If this request is an already defined idea or market area, it might be rather incremental (Abrell et al. 2016). Since customers tend to be risk-averse, and have defined their own customer needs, thus addressing an existing market (Abrell et al. 2016; Enkel, Kausch & Gassmann, 2005). This finding is in line with Sawhney, Verona and Prandelli (2005), who mention the changing role of the customer over time, from the passive receiver towards the active customer. As the customer contacting the company results in establishing a two-way communication (Sawhney, Verona & Prandelli, 2005). The fact that the customer established the initial contact via the M&S department is corresponding with Griffin and Hauser (1996), stating that M&S is working with customer requests. Especially in a science-oriented company, the contribution of M&S to the FEI is by determining the company's capabilities (Schoonmaker, Carayannis & Rau, 2013), thus representing the company's capabilities by the first contact with the customer.

The next step was separate opportunity identification from M&S and R&D. The fact that both R&D and M&S identified opportunities is surprising, since only R&D often identifies the opportunities in a science-oriented company (Schoonmaker, Carayannis & Raj, 2013). However, by allowing both departments to focus on opportunities, the company increases the possibility to get input for incremental and radical ideas (Griffin & Hauser, 1996). Simultaneously, the customer was found to prepare individually as well. This internal preparation is crucial, as it encourages creativity in employees (Gama, Frishammer & Parida, 2019). Furthermore, involving the customer early on will positively impact the quality of generated ideas (Walsh, Lee & Nagaoka, 2016).

Thereafter, the cross-functional team and the customer combined their capabilities and discussed identified opportunities. A combined effort positively impacts the opportunity identification, as teams consisting out of different backgrounds are able to come up with a higher variety of ideas (Frishammer et al. 2016). The exchange of resources and knowledge is beneficial for joint efforts between companies to create lucrative innovation practices (Sherman, Berkowitz & Souder, 2005; He, Sun & Chen, 2016; Su, Chen & Wang, 2019). However, there is also a disadvantage of having a variety of functional backgrounds in teams. It is already a demanding process of merging the interests of the functional backgrounds, but the complexity increases as the customer and their interests are involved as well (Lovelace, Shapiro & Weingart, 2001). The key to merging these interests is transparent information sharing and open communication (Lovelace, Shapiro & Weingart, 2001).

5.3 Opportunity Analysis

The combined knowledge of the cross-functional team and the customer contributes to the opportunity analysis.

5.3.1 Analysis

The opportunity analysis can be seen in three steps; the individual departments integrate into the cross-functional team, the cross-functional team jointly assesses different aspects of the opportunity, and the customer and the cross-functional team together analyse the multiple opportunities.

The departments involved in the cross-functional team, namely M&S and R&D, contribute jointly to the opportunity analysis, since limited insights would be offered if only one department would have been involved (*"It's very difficult for us, for me to judge the scientific feasibility of the project."- Employee D, M&S*). Therefore, M&S delivers information regarding the market ("*And then I need to make my assumptions from the commercial side." - Employee D, M&S*), whereby R&D provides the scientific knowledge for the opportunity analysis ("*I was mainly involved in identifying if you can call it the scientific need for a product like that."- Employee K, R&D)*. Therefore, M&S and R&D both contribute their functional knowledge to this element.

However, a challenge in the cross-functional team is to align the diverging departmental backgrounds, as they tend to collide ("*It's a challenge when you work in cross functional project teams, where marketing and sales are very fluffy, … , it's always between your thumb and forefinger, whereby R&D is very here and now. … . So it's about getting those sort of, front and back end together."- Employee N, M&S)*, even to the extent whereby one department finds their contribution superior to the other departments contribution (*"Because it's quite often we end up being pure R&D based, you know, we do 90% of the business case, and we do our best guesses on everything and marketing and sales pitches in at the last minute." - Employee L, R&D*). To establish successful integration between the R&D and M&S department, open and transparent information sharing should be aspired (*"Normally, it's not us in research to think about if the project is valuable for the case company, we are not responsible for that."- Employee J, R&D*), and many cross-functional meetings are beneficial for creating a common understanding (*"Before we were actually done with a business case, there were quite close project meetings."- Employee E, M&S).*

After the integration between M&S and R&D is obtained, the cross-functional team needs to connect to the customer. It was a combined effort from the cross-functional team and the customer to evaluate the possible ideas (*"There were a lot of different ideas discussed. And then pros and cons. And then, external investigations, experts were asked, and in the end there was a conclusion made. There were R&D experts, the M&S, and then different departments from the customer, and different people here as well."- Employee N, M&S*), according to

multiple criteria that were established (*"Then we've discussed and try to evaluate in the meeting their ideas, according to specific criteria, to try to rank them all, to prioritise between them" – Employee M, R&D).* Therefore, the cross-functional team and the customer contribute to the activity of this element, and they both had mutual requirements that were taken into consideration.

5.3.2 Discussion

The combined knowledge of the cross-functional team and the customer is the facilitator for opportunity analysis. In this element a formalised process consisting out of three steps can be distinguished; the company's department's integration in the cross-functional team, the cross-functional team jointly contribute their knowledge, and the customer and the cross-functional team mutually analyse different opportunities. Florén and Frishammer (2012) point out that an established formal process is beneficial, since it will decrease decision-making time, therefore, increase time-to-market.

The role of M&S within the cross-functional team was delivering information on customer needs, preferences and market potential. This is in line with the literature, since M&S takes part in spotting and analysing market potential for incremental innovations, providing showcase material of already existing products, producing trend reports, and being in close contact with the customers (Griffin & Hauser, 1996). R&D's role within the cross-functional team was science focused, offering science knowledge and skills that were relevant in order to analyse the opportunity (Griffin & Hauser, 1996). R&D increases the competitive advantage of a company, through assessing the relevant technological capabilities of the company, complemented by M&S as they provide the necessary knowledge for assessing the market opportunities (Song, Thieme & Xie, 1998; Becker & Lillemark, 2006). This is in line with the combined effort of individual departments contributing functional knowledge that is beneficial for the FEI, such as identification of market opportunities, and distinguishing the necessary technology (Khurana & Rosenthal, 1998). Especially, the involvement of M&S and R&D in a cross-functional team has been identified as increasing the efficiency of the FEI process (Brettel et al. 2011).

Acknowledgement of the mutual contribution and assigned responsibilities within a cross-functional team, as well as openness and transparency, has a positive impact on the successful integration of the departments in the cross-functional team (Jassawalla & Sashittal, 1998). Without recognition and acknowledgement, it becomes challenging to align the different department perspectives.

The challenge of aligning the different functional perceptions of the departments for integration has been referred to as 'integration gap' (Gupta, Raj & Wilemon, 1985). This is because every department reasons according to their functional background, resulting in differences in interpreting the shared goals (Griffin & Hauser, 1996). Collaboration is essential

to create a common understanding of both departments, without this, discussions and misunderstandings will arise that slow down the integration process (Kohn, 2006). Cross-functional collaboration between different departments is beneficial in the FEI, in order to complement the internal resources and exchange knowledge (He, Sun & Chen, 2016). A mutual understanding was aimed to obtain within the cross-functional team, since extensive communication is beneficial for finding a joint solution (Lovelace, Shapiro & Weingart, 2001).

The different understandings of the corporate goals, based on the functional background, should be aligned to a certain extent in order to be able to integrate (Lovelace, Shapiro & Weingart, 2001). Another aspect to consider is the extended time being employed in order to align the divergent backgrounds capabilities, and create a common understanding. Extended communication will increase decision-making time, and decrease productivity, before the actual integration with the customer can start (Song, Thieme & Xie, 1998).

Finally, the customer and the cross-functional team evaluated the ideas. This finding complement research, as involving a diverse group of employees will offer different perspectives, which is beneficial for analysing all the aspects of an opportunity (Tsai & Hsu, 2014). In addition, the combined assessment of the feasibility of the project can help to spot shortcomings, and give insights to new possibilities, which have not been taken into consideration yet (Florén & Frishammer, 2012). Within this assessment, the customer is involved in a two-way dialogue with the cross-functional team, this increases knowledge sharing on both sides (Sawhney, Verona & Prandelli, 2005).

5.4 Idea Genesis

The aim of the idea genesis should be to create a common understanding, shared between the customer and the cross-functional team, as a common understanding will contribute to shaping the idea.

5.4.1 Analysis

Multiple connections between the customer and the cross-functional team can be found in the data, that all contribute in their own way to the creation of a mutual understanding.

In this element, M&S act as a facilitator for the conversation between the other part of the cross-functional team and the customer *("Idea from a customer. And then to kind of help facilitate this." - Employee D, M&S*). Although M&S does not contribute expertise themselves, they allow for an open flow of information where know-how can be shared between the customer and cross-functional team (*"With our expertise and their expertise" - Employee A, R&D*). The open flow of information is necessary for the cross-functional team to be able to support the customer (*"Sometimes it gets a bit difficult. But keeping a transparent conversation at the end, we always have noticed becomes the best way" - Employee G, Other*). In one of the projects there was a misalignment of the final goal of the project (*"So that was a bit conflicting. Because we then had slightly different goals" - Employee M, R&D*), resulting

in long discussions and a long idea genesis element (*"It took a long time … before we actually got a specific project plan and idea" - Employee M, R&*D). Therefore, M&S as a facilitator enables interconnecting with the customer, functional cross-company communication, and information sharing allows for creating a mutual understanding.

Within the cross-functional team, there was a close collaboration except for one project (*"It was a close collaboration" - Employee C, Other*). That project contained a high science level, resulting in not needing any internal meetings (*"And then during the technical phase when everything was running, we didn't have that many meetings." - Employee E, M&S*), since there was a lack of understanding from M&S (*"So for me, I do not always understand the trials and research that they do" - Employee H, M&S*). In the other projects they also experienced difficulties, since M&S did not understand the science part (*"No, for me it was not easy to understand" - Employee F, M&S*). However, they were eager to overcome these difficulties (*"We tried to, talk it out until we get there. To explain, to where we understand each other" - Employee A, R&D*). This could be explained since they trusted each other's input to the project (*"There are things where my opinion takes precedence, or were I listen" - Employee A, R&D*). Moreover, the R&D and M&S department contribute with their knowledge, however, the functional perspectives also collided.

While trying to obtain a mutual understanding, both requirements from the customer and the company had to be taken into consideration. A distinction can be seen between projects where the customers are big in size, and smaller customers. The bigger companies put requirements on the cross-functional team (*"So you need to solve that for us in one way or another" - Employee F, M&S*), the cross-functional team conducts all the work while the customer provides feedback via formal meetings (*"It was mainly we worked, and then we presented it for the customer, and they had comments" - Employee J, R&D*), and there was distrust from the customer in the cross-functional team ("*We had to collect and share proof of the impact" - Employee M, R&D*). With the smaller customers, either the cross-functional team put requirements on them (*"We force our customer to actually, if they're going to use our product, our brand, our product name, they need to comply with our rules" - Employee A, R&D*), or the customer and cross-functional team were balancing their requirements (*"So that optimisation is trying to find, I say to the sales team, you can't have them all. And to the customer as well. You can't get everything." - Employee A, R&D*).

5.4.2 Discussion

Creating a common understanding between the cross-functional team and the customer is distinguished by the collected data as an important enabler in this element. This is partly in line with Frishammer et al. (2016), who point out that it is key to create a mutual understanding throughout the team, however, the customer is not included in that research. A mutual understanding between the customer and the team is also beneficial, as a clear goal and vision should be formulated to manage customer relations (Matinheikki et al. 2016).

Therefore, creating a mutual understanding both within the cross-functional team, and with the customer is a preferred outcome in this element.

Usually, it is part of the task of M&S to be in direct contact with the customer (Griffin & Hauser, 1996). However, since it is a science-driven industry this inhibits M&S to fully contribute to the idea genesis (Becker & Lillemark, 2006), as they lack the knowledge to fully understand the product. Therefore, the role of M&S to facilitate the conversation between the R&D team from the customer and R&D from the company is beneficial for knowledge sharing, because both R&D department's have the same functional background (Griffin & Hauser, 1996), and it results in a more valuable relationship between the company and the customer (Sawhney, Verona & Prandelli, 2005). This might be highly relevant in a high-tech industry, where the level of knowledge should be high to have a thorough understanding of the product (Schoonmaker, Carayannis & Rau, 2012), since misinterpretation between the customer and the project team is a common disadvantage of customer involvement (Enkel, Kausch & Gassmann, 2005). However, a disadvantage of R&D to R&D contact is the lack of divergent perspective, as divergent perspectives could stimulate creativity (Song, Thieme & Xie, 1998). M&S as a facilitator for R&D to R&D contact influences the creation of a common understanding.

Having a formalised process in place leads to better utilisation of customer involvement (Gama, Frishammer & Parida, 2018). As there were long discussions due to disagreements, and the case company does not have a formalised process regarding the FEI, having this process could resolve this and an early mutual understanding can be established (Kock, Heising & Gemünden, 2014).

Within a cross-functional team, there are multiple perspectives (Tsai & Hsu, 2014), and close integration within the team can help bridge the distance between the perspectives and eliminate disagreements (Griffin & Hauser, 1996; Jassawalla & Sashittal, 1998). The realisation of different understandings within a team is beneficial for the innovation process, as it allows working towards the same goal (Jassawalla & Sashittal, 1998), it enables a positive environment for innovation within the cross-functional team (Sherman, Berkowitz & Souder, 2005), and it displays credibility and trust that helps tear down barriers in cross-functional collaboration (Song, Neeley & Zhao, 1996). Especially with a science-oriented project, since it increases the uncertainty within the project (Moenaert et al. 1995), making sure that there is no misinterpretation between the different departments within the cross-functional team is an important contributor to the idea genesis. In other words, understanding the divergent functional backgrounds within a cross-functional team and trust on each other's expertise will result in a common understanding.

During this element, it was a constant challenge to balance both the customer and the company requirements. Trust plays an essential part in managing a customer-company

relation while co-developing (Matinheikki et al. 2016). However, the customer showed signs of distrust, imbalancing the customer-company relationship. A bad relationship between both parties can harm the contribution customer involvement has on innovation (Gama, Frishammer & Parida, 2018). Therefore, balancing the requirements between both parties, where there is no unequal balance or distrust, is recommended to increase the positive impact customer involvement can have on innovation.

5.5 Idea Selection

The best contribution from the customer and cross-functional to the idea selection element is achieved when both have to compromise in the element.

5.5.1 Analysis

Two scenarios were seen in the data; one where the customer made the decision, and the other where there was mutual decision-making.

The customer decides on the idea, and although it was acknowledged that they had the power to do so by the cross-functional team ("*It's up to the customer to make the decision" - Employee A*), since they are paying (*"Part of that decisions is that they are covering all the cost in this" - Employee M, R&D*), it resulted in disappointment of the cross-functional team (*"The feeling in the project team about the idea was disappointment" - Employee M*), because the customer considered their own needs (*"Compromised into being something the fits into the customer budget and timelines basically." - Employee L, R&D*). Therefore, the fact that the customer and the cross-functional team both had requirements, but only the ones from the customer could be fulfilled, negatively impacts achieving mutual compromises.

In other projects, it was the case that the cross-functional team assessed the idea based on the fit with the project portfolio (*"It was a possibility to move to different areas." - Employee E, M&S*), whereby both the science *("We got nice results from that. And on that, they decided they will make a product for the market" – Employee J, R&D*) and market potential (*"I really believed that this could be something that's big business for us" – Employee F, M&S)* were assessed. Therefore, the M&S and R&D department contribute their functional knowledge to this element.

After, there was an equal relation between the customer and the cross-functional team as both compromised selecting the idea (*"By discussing, and just by talking. Trying to find compromise"- Employee K, Other*). Since the cross-functional team and the customer both decided on the idea, they mutually fulfilled the activity of this element.

Since the second approach led to less disappointment, a joint compromise is beneficial for this element.

5.5.2 Discussion

To a certain extent, it might be beneficial for the cross-functional team that the customer decides on the idea, as a benefit of customer integration in the FEI is that it is easier to distinguish customer needs (Florén & Frishammer, 2012). By letting the customer decide, the cross-functional team has the insurance that it complies with market needs (Florén & Frishammer, 2012). However, R&D often prefers radical innovations over incremental innovations, whereby radical innovations are more risky, as the market demand is difficult to estimate (Griffin & Hauser, 1996), while customers are more risk-averse and tend to prefer incremental innovations (Florén & Frishammer, 2012; Abrell et al. 2016), resulting in a mismatch with R&D. Elvers and Song (2016) also mention the limitation of customer involvement with an existing customer, as that limits the focus of the company. Furthermore, if the customer fully pays for the project, this results in an unequal interdependence between the customer and the company, negatively influencing the product innovativeness (Zhang & Zhu, 2019).

The other approach is internal assessment of the idea, by comparing it the current project portfolio and distinguish the added benefit of the new project (Kock, Heising & Gemünden, 2014). Whereby the influences of M&S and R&D can be distinguished, as the idea is both assessed on the market potential (Griffin & Hauser, 1996), and the possibilities from the science perspective (Griffin & Hauser, 1996). There is an equal interdependence with the customer, since the customer and the cross-functional team had to compromise (Zhang & Zhu, 2019), lifting the customer-company relation to a higher level (Sawhney, Verona & Prandelli, 2005), and positively impacting the product innovativeness (Zhang & Zhu, 2019).

5.6 Concept and Technology Development

The contribution to the element ‘Concept and Technology Development’ from the customer involvement and cross-functional team is by merging expertise.

5.6.1 Analysis

In this elements, the science part is developed by the R&D team, and the M&S department tried to translate the science into market needs (*Than my colleague from M&S took over, trying to make like more a customer friendly presentations” - Employee K, R&D*). However, this resulted in a clash between the perspectives of M&S and R&D (*“It is always the balance between how the R&D people like to stick to facts. And the non R&D people are more willing and prepared to extend a result to a broader population.” - Employee K, R&D*). In order to bring these perspectives together, there was intense communication within the cross-functional team (*“There was a more intensive communication period that was initiated” - Employee K, R&D*). Since R&D contributed their science knowledge, and M&S provided the market knowledge, it can be concluded that both departments contributed with their functional knowledge to this element. However, there was also the challenge of colliding perspectives between both departments.

Towards the customer, M&S facilitates the contact between customer and the cross-functional team (*And I was kind of facilitator" - Employee D, M&S*), where there is close communication between the two actors (*"At this stage of the project, where it's developing, there would be constant communication" - Employee G, Other*). There was a high level of knowledge exchange, as both actors shared expertise (*"So they brought in expertise that we don't have yet. And vice versa" - Employee N, M&S*). In this element, there was direct functional cross-company communication (*"In this phase it was between R&D our company and R&D in our customer" - Employee D, M&S*), explaining why M&S adopted the role as a facilitator. Therefore, constant communication, facilitated by M&S, will result in knowledge sharing on a high science-level, and further development of the idea.

5.6.2 Discussion

Gupta, Raj and Wilemon (1986) mention the 'integration gap' as the struggle between R&D and M&S; whereby both departments have different views and perceptions. M&S is more market-oriented and R&D is more science-oriented, and M&S is able to deal with higher levels of ambiguity than R&D (Griffin & Hauser, 1996). Sharing both perspectives is beneficial for the innovation process, as different types of knowledge contribute to the level of creativity within the team (Song, Thieme & Xie, 1998; He, Sun & Chen, 2016). Furthermore, the involvement of a cross-functional team is important for gaining insights into the effective and efficient usage a company's technological capabilities for the development of new products that meet market demands (Song, Thieme & Xie, 1998). Although there is the constant challenge of aligning the R&D and M&S perspective, the involvement of a cross-functional team has various benefits, as described above, for the element of concept and technology development.

In this element, M&S facilitates the contact between the cross-functional team and the customer once again, however, with the distinction that the M&S department contributes with their knowledge to the element. M&S plays a big role in translating consumer needs into technical solutions in a collaboration project regarding product development, but in a highly science-driven company, the specific scientific requirements prevent M&S from being too much involved in the actual product development activities (Becker & Lillemark, 2006). The sales part is mostly working with customer demands and pinpointing market potentials (Griffin & Hauser, 1996). The role of the customer is described to be active, as knowledge is shared both ways between the customer and the cross-functional team (Sawhney, Verona & Prandelli, 2005), the knowledge sharing process will positively impact the product performance (Lau, Tang & Yam, 2010). The difficulty that the cross-functional team is facing is to live up to customer requirements, displaying an unequal interdependence (Zhang & Zhu, 2019), and hindering innovation since the focus is on fulfilling the requirements, instead of mutual knowledge sharing (Sawhney, Verona & Prandelli, 2005).

5.7 CONCEPTUALISATION

There are a few findings that apply to the holistic view of the model that is interesting to point out.

Firstly, the insight that the two elements with the highest number of influencers are idea genesis and concept and technology development. This is explained based on the activities performed in the different element, as both elements relate to refining the idea and concept (Koen et al. 2001), and are therefore more complex to manage correctly.

A second realisation is the influencer 'contribute functional knowledge' that impacts every facilitator. This displays the importance of cross-functional knowledge, as in every element knowledge regarding the science and market are utilised. Therefore, having a cross-functional team consisting out of R&D and M&S is beneficial, since they possess the knowledge (Griffin & Hauser, 1996).

Lastly, the influencer that has both a negative and a positive impact is 'mutual requirements'. This influencer positively impacts the opportunity analysis, and it negatively impacts the idea genesis and idea selection. Again, this can be explained due to the nature of the activities of the elements. Since the opportunity analysis requires identifying what knowledge is necessary (Koen et al. 2001), and requirements provide a frame of reference. Whereby in the case of the idea genesis and idea selection, requirements negatively influences the creation of a common understanding, and mutual compromises, since requirements force both parties to give in, and put aside some of their needs to be able to work towards a common goal (Kahn & Mentzer, 1998).

6 · CONCLUSION

The aim of the thesis is to answer the research question: *"How does interconnection between the two success factors of 'integration of Marketing & Sales and Research & Development' and 'customer involvement' contribute to the individual elements of the Front End of Innovation?".* It became evident that there is a variation in the contribution of the interconnectivity between the integration of M&S and R&D and the customer to every individual element of the FEI. In this chapter, the results of the conducted study will be concluded.

This thesis contributes to knowledge regarding the FEI, with deepening the understanding of the interconnection between two success factors; the integration of M&S and R&D, and customer involvement. Based on an extensive literature review and data acquired from semi-structured interviews, a conceptual model was developed about the interconnectivity between the two success factors in the FEI. The model displays influencers and facilitators that lead to a successful contribution to the individual elements of the FEI.

First of all, this thesis shows that the individual elements of the FEI should be taken into consideration to create a deeper understanding of the FEI. The activities in every element are different, and therefore there is a need for a different approach. This thesis has identified one single facilitator for every individual element of the FEI. The elements of the FEI are; opportunity identification, opportunity analysis, idea genesis, idea selection, and concept and technology development (Koen et al. 2001), whereby the identified facilitators respectively are; connect capabilities, combined knowledge, common understanding, mutual compromises, and merge expertise. Within these facilitators a total of seven influencers were identified, these influencers impact the accomplishment of the facilitators. Only by considering the facilitators for every element, the complexity of the FEI can be observed adequately.

Furthermore, one of the most conspicuous findings of this research is the fact that processes can and should be established within the FEI elements. While previous literature described the FEI as vague, ambiguous, and difficult to manage, this thesis was able to demonstrate that certain processes in the individual elements can be established, and are beneficial to establish. This finding is helpful, considering the critical role correctly managing the FEI plays for later New Product Development success.

Finally, this thesis stresses the importance of collaborations. Successful contribution to the individual elements of the FEI is only obtained when the company and the customer work together, communicate, are open, and willing to compromise.

To conclude, this study distinguished to a detailed extent of how the interconnection between the two success factors contribute to the FEI elements. Facilitators are identified, influencers

that impact the facilitators are determined, and it is explained how the influencers impact the facilitators, and how the facilitators contribute to the element.

6.1 Theoretical Implications

The developed Grounded Theory Model aims at closing the identified knowledge gap between the interconnection of the two success factors; integration of M&S and R&D, and customer involvement in the FEI. The model distinguished particular facilitators for every element in the FEI and thereby provides in-depth insights into the interconnectivity between the two success factors.

In particular, the contribution to literature is a more differentiated outline of the actual interconnection of the success factors contribution to the FEI. This research contributes to reducing the ambiguity that is perceived in the elements of the FEI (Zhang, Cao & Doll, 2019).

One of the main contributions to existing literature is the identified complexity of the elements; idea genesis, and concept and technology development. This is in contrast to what Eslami and Lakemond (2016) point out, that the opportunity identification is perceived as the most complex, and where the highest interconnection between the customer and cross-functional team is needed.

Based on this research, processes can be established within the individual elements of the FEI. Processes allow for a more standardised way of working, that will reduce the uncertainty in the FEI, and contribute to commercial product success (Moenaert et al. 1995).

Florén et al. (2018) asked for more evidence and comprehensive conceptual frameworks based on the success factors that they had identified. Therefore, by creating an understanding of two of those success factors, new findings are presented.

6.2 Managerial Implications

This research concludes that the interconnection between the success factors of integration between M&S and R&D, and customer involvement becomes more and more relevant for successfully managing the FEI. Companies face the challenge that they are in need of beneficial frameworks of how to manage certain processes. Therefore, management of innovation demands for a clearer focus on the knowledge about the FEI, especially the interconnection between the two success factors within the different elements of the FEI. This study contributes to a more operational proficiency on how to facilitate the success factors to contribute to the different elements of the FEI.

Firstly, the research exposes the necessity of the proactive management of cross-functional teams and the customer involvement in the FEI to enable knowledge sharing, and contribution of different perspectives and expertise. For instance, companies that want to participate and

gain advantages from employing the integration of M&S and R&D and customer involvement, require relevant knowledge to effectively understand and access the processes for interconnection. More specifically, companies should systematically consider if the cross-functional team has the correct scientific capabilities, as well as market knowledge, to best contribute together with the customer to the FEI. This research attempted to provide the foundation for suitable management implications, as it portrays how the two success factors interconnect within the elements of the FEI.

Secondly, this study acknowledges that interconnection between both success factors in different elements of the FEI affect the development of a successful product in variable ways. Therefore, in order to assist the interconnectivity within the two success factors, specific organisational and managerial processes should be developed in each element of the FEI.

The identified facilitators offer diverging insights and practices, through which interconnectivity between customer involvement and cross-functional integration should be established. All five facilitators should be taken into consideration while trying to understand interconnectivity in the FEI. They contribute directly to the creation of valuable product outcomes in the FEI for both the customer and the company.

To conclude, the findings of this thesis assist companies to gain a competitive advantage, by successfully managing the individual elements of the FEI, and therefore creating a fruitful environment for product creation.

6.3 Limitations and Future research

There are a few limitations identified in this thesis, which will be elaborated on, and suggestions for future research will be given.

First, the data collection only relied on one data collection method, namely semi-structured interviews. Multiple methods, such as observations and unstructured interviews, are beneficial to create a holistic picture of the case, instead of facing the risk of viewing the case through the interviewee's eyes (Bryman & Bell, 2011). Therefore, this thesis missed out on the use of multiple data collection methods, resulting in a less thorough analysis.

Secondly, the study was carried out in a heavily science-oriented industry. Therefore, the thesis shows characteristics that are typical of a science-oriented industry. For example, the business case is developed in the opportunity analysis of the FEI, rather than the concept and technology development (Koen et al. 2001). Additionally, the observation that M&S works as a facilitator might be industry specific; due to the high scientific levels, the capabilities of M&S to understand the product might be limited (Becker & Lillemark, 2006). Therefore, R&D has a relevant role in filling the gaps. This might be different in a non-science industry. This affects the generalisability and applicability of the study to other industries. Future research relating

this topic is recommended to conduct in a different industry, to test the applicability to other industries.

Thirdly, this thesis assumes that employees working in the M&S and R&D department are representatives of their individual functional background. Meaning that we assume that an employee part of the M&S department, has the same perspectives as the M&S department as a whole. Therefore, further research might be beneficial. Additionally, integration literature often includes, aside from the M&S and R&D departments, also the manufacturing department (Brettel et al. 2011). However, since the case company only recently acquired a manufacturing plant, and the merge of the manufacturing plant with the case company is not yet completed, this department was left out in the analysis.

Fourthly, due to limited time and resource constraints, there were no customers interviewed. This results in an one-sided perspective from the case company, as the perspective of the customer was not offered. This is a limitation since customer involvement plays a big role in this thesis. For future research, it is recommended to include the customer, in order to develop an all-embracing research.

Fifthly, the aspect of generalisability is a limitation pointed out for a single case study (Bryman & Bell, 2011).

Lastly, although Koen et al. (2001) portray the FEI as non-sequential that is challenging to structure, Florén and Frishammer (2012) state the opposite by calling for processes within the FEI. This thesis detected clear patterns and the positive impact of a formal process on opportunity identification, opportunity analysis, and idea genesis. Therefore, researching the FEI as a process should be considered for future research.

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APPENDIX

APPENDIX A – DIVISION R&D/M&S DEPARTMENT

Criteria	Reference
Marketing & Sales	
Finding and accessing new markets	*Griffin & Hauser (1996)*
Working with customer demands	*Griffin & Hauser (1996)*
Distinguish market potential	*Griffin & Hauser (1996)*
Strong market orientation	*Sherman, Berkowitz & Souder (2005)*
Research & Development	
Long-term research directions	*Griffin & Hauser (1996)*
Design of future products	*Griffin & Hauser (1996)*
Scientifically-oriented	*Souder & Sherman (1993)*
Long-term planning	*Sherman, Berkowitz & Souder (2005)*

APPENDIX B – INTERVIEW GUIDE

(1) General Information

Functional title:
How long in firm:
How would you describe your function within the case company?
How would you describe the tasks of the department in the case company?

(2) Project-questions

What was the project about?
What was the aim of the project?
Did the goal of the project change over time?
If so, why?
Would you classify this project as market oriented or research oriented?
Why?
Which other departments were involved?
Could you shortly describe the chronological order of the project, from when the idea originated, to when the decision was made to scale up the project?

(3) Front End of Innovation

Opportunity Identification

Who initiated the project?
How was the contact between the customer and the project team while coming up with new ideas?
What was the contribution of the customer while coming up with new project ideas?
How was the contact between the members of the project team while coming up with new ideas?
What was your contribution within the project team while coming up with new ideas?
Did the project team or customer have to compromise more than the other for deciding on one idea?
If so, why?

Opportunity analysis

What type of information did you think was important to obtain, to assess the value of the possible project idea?
What type of information did you give regarding the possible idea?
What challenges did you encounter when sharing this information?
What type of information did the other team members give regarding the possible ideas?
What difficulties did you encounter while understanding this information?
How was this information shared?
What type of information did the customer give regarding the possible idea?
How was the information shared between the customer and the project team regarding the possible idea?
What challenges did you encounter when sharing this?

Idea genesis

How did you optimise the idea?
Who was involved in this optimisation?
While optimising the idea with the project team, what where challenges you were encountering?
How where these tackled?
Which challenges did you encounter working with the customer to optimise the idea?
While optimising the idea, how was your functional interests aligned with the project idea?
While optimising the idea, how was the customer interest aligned with the project idea?

Idea selection

How was the decision made to continue or kill the idea?
How was the customer involved in the decision making regarding continuing or killing the idea?
How did the final choice of the project align itself with your functional goals?
What was the general feeling within the project team about the decided idea that was decided on?

Concept and technology development

How did you proceed after the idea was selected?
How was the business case made?
How was the knowledge acquired to make the business case within the project team?
    Which department contributes what type of knowledge?
How did the customer participate in developing the business case?

(4) General questions

What were for you the benefits that you have not mentioned yet of working together with this project team?
What were for you the difficulties that you have not mentioned yet of working together with this project team?
What were for you the benefits that you have not mentioned yet of working together with this customer?
What were for you the difficulties that you have not mentioned yet of working together with this customer?
Did the other department act as a middle man between your department and the customer?
    If so, why?
    What was the context of this situation?

APPENDIX C – CRITERIA FEI ELEMENTS

Criteria	Reference
Opportunity Identification	
Identify an opportunity	*Khurana & Rosenthal, 1998; Koen et al. 2001*
Opportunity Analysis	
Acquire additional information about the opportunity	*Koen et al. 2001*
Idea Genesis	
Idea becomes more concrete	*Koen et al. 2001*
Description of the idea	*Frishammer et al. 2016*
Risk estimation	*Florén & Frishammer, 2012*
Uncertainty reduction	*Florén & Frishammer, 2012*
Idea Selection	
Decide on which idea to pursue	*Koen et al. 2001*
Concept and technology development	
Write a business case	*Koen et al. 2001*
Estimating the uncertainty of the technology	*Koen et al. 2001*
Market analysis, technological assessment	*Khurana & Rosenthal, 1998*
Define product qualifications and test it	*Khurana & Rosenthal, 1998*
Define needed resources	*Khurana & Rosenthal, 1998*
Risk assessment	*Khurana & Rosenthal, 1998*

APPENDIX D – FUNCTION QUOTES

Quote	Department	Interviewee	FEI
I'm responsible for R&D, and specifically for product management and clinical studies.	R&D	Employee M	Function
Our department is responsible for research and development obviously, so make sure that we provide the documentation and the proof for our products.	R&D	Employee M	Function
The function is marketing.	M&S	Employee E	Function
I focus on communication.	M&S	Employee E	Function
The task is to make sure that we have an assortment that we could sell and communicate to our customers and our offering to potential customers and prospects.	M&S	Employee E	Function
My function is in research.	R&D	Employee J	Function
Both defend the business, and do studies that support existing products, and do new research, and new products.	R&D	Employee J	Function
I've been working with product development since I started here.	Other	Employee C	Function
So we are running that type of project when we are looking into new applications or changes in the application.	Other	Employee C	Function
We also have this part with all the customer and sales support.	Other	Employee C	Function
My function is quite broad, working in this position globally. … The task is to hit the numbers of the budget, bring in the income.	M&S	Employee F	Function
We're coming up on four years now	R&D	Employee A	Function
I'm in charge of science background.	R&D	Employee A	Function
So which are responsible for what clinical features and research science that we have.	R&D	Employee A	Function
The main objective is to develop new business. In the process of doing that, you approach new markets, new customers, existing offerings or with new offerings. With existing go to market models, or with new go to market models. Or commercial approaches.	M&S	Employee H	Function
We have a value of our business and we want to grow and expand that business in terms of a value. But also in terms of getting knowledge of footprint in this segment globally.	M&S	Employee H	Function
I work with, one developing or analysing different application methods. And two, to talking to customers to understand their needs and and fill in with our product portfolio.	Other	Employee G	Function

The departments task is taking science to the market. So we are the bridge between the marketing and sales and the research and development.	Other	Employee G	Function
Which is problem solving when new products have been made. And this is a typical case for a product going wrong, and how do you fix it? And that's exactly where my role comes in.	Other	Employee G	Function
Occasionally, there has been the role of supporting the marketing and sales colleagues, with questions coming in from customers.	R&D	Employee K	Function
Our role is to generate clinical data, generate data that really support the marketing of the products. Yes, existing products, but also new products, new possibilities.	R&D	Employee K	Function
First priority is to get more customers. And second priority priorities to grow the customers we already have.	M&S	Employee D	Function
My role as as, as in sales is very often to be a project leader for the customer, to make sure that their departments are running in parallel, because I can find an R&D guy that is very interested in my product. He can start projects, because he has his own budget. But sometimes you notice that he has no linkage into marketing.	M&S	Employee D	Function
So we end up in the project manager role even if we're not necessarily very good at it. But we need to take that, so I was kind of a facilitator, and then also kind of pushing our people a little bit.	M&S	Employee D	Function
My function within R&D today is, it's divided into three parts actually. So it's it's a scientific communication and support to marketing and sales. Scientific support to help to bridge between R&D, marketing and sales, translate our science into something that marketing and sales can use, you know, pitches to customers, and potentially, sometimes even to consumers in the end. So that's the one part. Second part is everything relating to patents, which I'm also responsible for. Third part is basically that I'm a resource into all our projects, like the scientific research into our product.	R&D	Employee L	Function
Responsible for generating revenues, promoting our products, finding distribution partners in different areas of the world. Initiating discussions, signing agreements, making sure that the products have been launched, doing key account management, and in some instances as well, supporting the customer throughout the launch process	M&S	Employee N	Function
We always need a clear go to market route. You need to understand the market dynamics. You need to understand where and how to launch the product. Because return on investment is key. It doesn't matter whether you have a brilliant idea, and you invest millions and millions and they don't want to buy it.	M&S	Employee N	Function

Working with current customers, managing the current business, developing new portfolios for customers, finding new customers.	M&S	Employee P	Function

APPENDIX E – GENERAL QUOTES

Quote	Department	Interviewee	FEI
It was more market oriented	R&D	Employee M	General
To some extent, the additional expertise that they have. And being a company active in a different market. So those are benefits obviously.	R&D	Employee M	General
There is a challenge with working with such big companies. And when we are such a small company, because we are very different. They have a lot of processes, and everything takes a long time.	R&D	Employee M	General
And they have different priorities, because they're working in so many areas. So it's really hard to get focus and attentation.	R&D	Employee M	General
It's always nice to work together in a way. And its good because you need to have some different complementing kind of projects.	R&D	Employee J	General
When we have a customer, because then you really have to move into how these customer wants to do it. When you're not having a customer, than you can do what you think is best for you to do.	R&D	Employee J	General
Difficulties was really well, when we couldn't fulfil their wishes.	R&D	Employee J	General
It's always interesting to see what the customer wishes, so I like that.	R&D	Employee J	General
It was the case company in collaboration with a customer, and there are clinical studies performed on the positive effects of the product.	Other	Employee C	General
During this project, this was a product development, it was clinical studies and it was work from a marketing perspective with market study.	Other	Employee C	General
It started as a research oriented project.	Other	Employee C	General
Of course, it was, that we should launch the product. But into that work we needed proof. And there was, I mean, planning for the clinical studies to see the effect. That was a really important part of the project.	Other	Employee C	General
We learned a lot on what is important. Into the case company we evaluated that.	Other	Employee C	General
I think a very important thing is that really early in an R&D project have the function that could see if it's possible to produce this, and the functions that could say is it possible to sell it.	Other	Employee C	General
To have a project leader, and that could involve the proper people during the chain, I mean the proper timing. … To involve them when it's reasonable.	Other	Employee C	General
I believe its always its like short timelines.	Other	Employee C	General
The project is, we have one big customer here.	M&S	Employee F	General

We have had weekly meetings for two years.	M&S	Employee F	General
The benefit is interaction with skilled people is the best way you can work. Getting all the skills from different teams and put that into one team.	M&S	Employee F	General
You get answers quicker and more direct when you work with the customer closely.	M&S	Employee F	General
Through this process we created a new product, new product description.	M&S	Employee F	General
We have tried to with the customer have weekly meetings. So where we will sit down, and discuss what's going on at the moment.	R&D	Employee A	General
So at this point, sales and market is left out. So they are usually involved in the beginning. And then there's usually a big taking off for the products, then there's a big technical part in the middle. And then once that's done it goed back out to marketing and sales where they try to figure out the price and how you are going to launch it.	R&D	Employee A	General
So as a team, you're stronger than an individual.	R&D	Employee A	General
And that you come with different backgrounds. I think communication is at times difficult.	R&D	Employee A	General
That you speak different languages and you don't quite understand that you are coming from very different needs.	R&D	Employee A	General
So we try to put sales as the gatekeeper in most of the projects.	R&D	Employee A	General
The aim of this project was to develop a combined product with the customer	M&S	Employee H	General
The goal has been the same. It still is the same. Of course there's been some, a lot of changes being made. But the final, or the end product has remained the same.	M&S	Employee H	General
They're not super flexible the big ones (customer).	M&S	Employee H	General
Definitely the business case. And the commercial model has changed, they are being constantly fine tuned and refined. But the end product remains the same, all the time.	M&S	Employee H	General
We start off, at some point, we include application, and at some point, the driving force or the prime force facing the customers is moved back into sales.	M&S	Employee H	General
It was extremely customer specific, it's a pure application project, so it was market oriented.	Other	Employee G	General
The R&D team was involved, the marketing and sales where involved.	Other	Employee G	General
It is a customer driven project. Something they want going forward.	Other	Employee G	General

The benefits of working with the project team here that is so open and you can have face-to-face communication with them, as part of just email, is that there is a very easy flow of information.	Other	Employee G	General
There is a huge chance of miscommunication when it's just through emails.	Other	Employee G	General
What I like in the project team is that it works as a team, nobody really takes the fall for anything as an individual, it's always we have decided all these decisions made together.	Other	Employee G	General
We answer questions from the customer, we try and have a meeting, or it is by forward emails.	Other	Employee G	General
All the people working are in such different area of expertise, you need them, I couldn't just work with application with the customer. It's really difficult to work without that input from quality and sales.	Other	Employee G	General
More different opinions to solve. Everybody would have, within any project there's always a different perspective.	Other	Employee G	General
Benefits of working with the customer are that you learn a lot about your own product. Because they ask you questions that you would not have asked otherwise. That's good information that I could use for our next customer and so on.	Other	Employee G	General
A customer that's extremely stringent about what they want and the requirements. I've had questions that I never thought of then you start solving, and then you have that knowledge, and you have that information	Other	Employee G	General
A drawback of the work with the customer is, we don't know everything about our products, so it's a learning curve.	Other	Employee G	General
It's very difficult to explain to an engineer what our field is about.	Other	Employee G	General
We are usually the middleman between other departments and the customer. So it's M&S or PA usually taking information from the different teams and putting it to the customer.	Other	Employee G	General
I don't think the project goal changed over time.	R&D	Employee K	General
It became as a research oriented since this project was not initiated, because the marketing asked for those type of project. But it was initiated within the R&D group, but then it has become a marketing oriented project, because of the positive results and because of the healthy populations that can be addressed.	R&D	Employee K	General

When you work together in a team, and you have colleagues from different departments, it is a very positive experience that you, you learn by listening and the discussions around how to solve issues.	R&D	Employee K	General
And also to learn from the preparation of the presentation, marketing material. How things can be presented, in a more marketing oriented way, or a marketing friendly way. And not only from a core research.	R&D	Employee K	General
The effort to try and kind of control or keep the right enthusiasm, or your call it on what is presented on how the data is presented to the customer. Not to exaggerate too much with what we have. And interpret it in the right way.	R&D	Employee K	General
When you work with a customer in a project together, you learn from each other's way of thinking and planning.	R&D	Employee K	General
The initial goal is still the same.	M&S	Employee D	General
They're always both in our company, but I think they're this is more market oriented, than scientific oriented.	M&S	Employee D	General
So it's close communication. It's it's really about relationship, and a mutual understanding.	M&S	Employee D	General
That's the way R&D is, you have you build a hypothesis, and you try to build it as good as possible. And then you need to scientifically deliver on that hypothesis.	M&S	Employee D	General
But of course, we also lifted it, not only from a scientific perspective, but also addressed it in commercial terms.	M&S	Employee D	General
To do the commercial side, agreement, negotiations, it's much easier to do that if you have kind of an input and an understanding of what how the project is running from R&D side.	M&S	Employee D	General
There were no problems working with the customer, since they were communicating so closely, and so well.	M&S	Employee D	General
It's always good to be close to the customer. The closer you get, the better it is. For understanding the customer, it's very difficult to get feasibility. Customers are very bad at sharing, what are there thoughts. They come to you with a questions. For us, it's important to understand kind of the bigger picture.	M&S	Employee D	General
It's always very fruitful to be close to a customer. Both from how you manage that particular customer, but also you learn.	M&S	Employee D	General
When you when you have insights and how they run these processes, you get an understanding of how their work internally and how what what makes them tick.	M&S	Employee D	General

it's always a great learning to be involved in a co-development process, also within our own within our own organisation. Because normally, the contacts are, I think, between sales and marketing and R&D maybe even more superficial.	M&S	Employee D	General
The goal of the project, it has been a little bit going back and forth.	R&D	Employee L	General
We've had, obviously r&d, M&S and obviously our CEO has been involved.	R&D	Employee L	General
Having to repeat the same thing over and over and over again, and, you know, their lack of interest of addressing certain things, you know, early on, just sort of closing your eyes and later and later and later	R&D	Employee L	General
We've had project meeting. So, so and so information sharing has not really been a challenge internally.	R&D	Employee L	General
We are trying to be a little bit more positive about it, and think about it from the view of point, that we are learning things.	R&D	Employee L	General
We have had long tradition in R&D working together, because we do believe we have different background, different knowledge and so on. And that's the strength of the whole thing obviously.	R&D	Employee L	General
Meaning that marketing and sales are short term, it's very difficult for them to change their mindset. You know, they have to deliver numbers next quarter, next six months, whatever that is their main focus.	R&D	Employee L	General
They don't feel that they can actually dedicated time to think more long term, because every R&D based project is going to be long term. Even if it's a short one from our side, it's still going to take a couple of years,	R&D	Employee L	General
All the work we do in advance, we never know what's going to end up with it. So we are used to living with long term, high risk. You know, most of the time, even the things that we consider to be low risk, might be considered to be high risk with someone else if you're outside of R&D.	R&D	Employee L	General
In general terms, I do believe it's good for us to work with customers, because we keep learning things. The benefit is that we take whatever we learn from customer x. And then we use that when we work with customer, y.	R&D	Employee L	General
This specific customer, obviously, it's been confusing them a little bit, distracting and problematic.	R&D	Employee L	General

Yes, it did change, not in the big picture, because the big picture is still there. But the way to get that changed quite a lot.	M&S	Employee N	General
It's more research oriented, for the time being. There is, of course, a goal to get to market.	M&S	Employee N	General
Working cross functional project teams, is always beneficial because you get insight from many disciplines. So I think that's crucial when it comes to developing new ideas and materialising.	M&S	Employee N	General
It's making sure different interests are met.	M&S	Employee N	General
I've learned a lot more about the challenges and the market that I'm working with.	M&S	Employee P	General

APPENDIX F – OPPORTUNITY IDENTIFICATION QUOTES

Quote	Department	Interviewee	FEI	1st Concept
The customer initiated the project.	R&D	Employee M	1	Customer initiated project
People from both companies tried to read up in advance.	R&D	Employee M	1	Equal preparations from the customer and the project team in advance
So it was from R&D, but also from marketing and sales. So, we've prepared beforehand, try to read up on potential opportunities.	R&D	Employee M	1	Equal preparations of the project team for opportunity identification
Then compiled draft proposals … and presented those at the meeting.	R&D	Employee M	1	Equal preparations of the project team for opportunity identification
They wanted to find something unique for the positioning on the market.	R&D	Employee M	1	Customer wants a market oriented product idea
I was coordinating everything, making sure that we, we had the meetings, that we made progress, and that we, in the end, had clear proposals to share with the customer.	R&D	Employee M	1	Equal preparations of the project team for opportunity identification
The customer was duplicating with R&D, marketing and sales people. And then they also had regulatory expertise in the whole team.	R&D	Employee M	1	The customer and the project team had a cross-functional team
So we had really a close collaboration with a customer. And they were also very nice to work with because they wanted new things all the time.	R&D	Employee J	1	Merging the interests from the customer and the case company
We made some suggestions and then they had to say, is this okay? Or not? But they had suggestions.	R&D	Employee J	1	Via presenting both companies and their capabilities they try to identify an opportunity
I think it came from the market more, to the research part. And then the research part had to develop something that could fit the market.	R&D	Employee J	1	Customer wants a market oriented product idea
To reach more markets, I believe was one of the reasons.	Other	Employee C	1	Customer wants a market oriented product idea
The launch we had on the partner conference was to show all the research results. And the customer contacted us via the partner conference.	Other	Employee C	1	Customer initiated project
They wanted to have their product combined with our product, because there product was in decline, and adding our product could add functional benefit.	M&S	Employee F	1	Customer wants a market oriented product idea

So we went there and discussed the opportunities and our capabilities and products.	M&S	Employee F	1	Via presenting both companies and their capabilities they try to identify an opportunity
It's market-oriented. They see a gap in the market that they can fill.	R&D	Employee A	1	Customer wants a market oriented product idea
So we were contacted by the customer. … And already at that point, they knew what they wanted to do.	R&D	Employee A	1	Specific project request from the customer to the project team.
There is a contact being established with the customer. And this contact is established through sales.	M&S	Employee H	1	Customer initiated the project via sales.
Present both, first the two companies, and the product offering that we have, and what the capabilities we have.	M&S	Employee H	1	Via presenting both companies and their capabilities they try to identify an opportunity
The customer contacted me, I'll have some initial calls with the customer.	M&S	Employee H	1	Customer initiated the project via sales.
So to start with sales, pretty early application and research development has been part of this project. And I would say that the quality department has been there as well. Or not from the start, but always in parallel.	M&S	Employee H	1	Cross-functional project team of the company
Initially, when the customer calls, when we discuss with a customer, one of the first questions is; what is the opportunity?	M&S	Employee H	1	Discuss project opportunities between the customer and the project team
We did the matchmaking way to the assessment. And we said, these are our capabilities. And based on what we know, with the customer, this project could typically lead to potential sales, and they bought into them.	M&S	Employee H	1	Via presenting both companies and their capabilities they try to identify an opportunity
Which was driven by their need, that they just wanted our product combined with their product.	Other	Employee G	1	Specific project request from the customer to the project team.
So getting them, the most important people to get involved are the marketing and sales team, because they are the first contact to customers	Other	Employee G	1	Customer initiated the project via sales.
It's very clear communication of what is possible, and what is not. Very transparent information is being exchanged right from the beginning.	Other	Employee G	1	Discuss project opportunities between the customer and the project team

First stage is during the first initial conversation about the project itself, when we know something doesn't work, this already a no go, and we say sorry, we don't this.	Other	Employee G	1	Via presenting both companies and their capabilities they try to identify an opportunity
In the next stage, where we think there's potential for this project to work, we then go in to see the customer abilities, are they able to make the product what there resources are.	Other	Employee G	1	Discuss project opportunities between the customer and the project team
It was the customer who initiated the project, they contacted us, and wanted to use our product.	R&D	Employee K	1	Customer initiated project
We had both telephone meetings and through email. So it wasn't so crucial to have the physical meetings in the beginning.	R&D	Employee K	1	Transition from non-physical meetings to physical meeting between the customer and the project team
I've tried to involve all the different actors and departments early on	R&D	Employee K	1	Cross-functional project team of the company
This was a thing coming from my customer.	M&S	Employee D	1	Customer initiated the project via sales.
This really comes out of a true commercial discussion.	M&S	Employee D	1	Customer wants a market oriented product idea
It's actually their idea (Customer).	M&S	Employee D	1	Customer initiated project
But from the beginning, it came from a commercial and marketing identified opportunity.	M&S	Employee D	1	Customer wants a market oriented product idea
When it was first discussed it was face to face. We met their R&D team presented our research and capabilities. They did the same.	M&S	Employee D	1	Discuss project opportunities between the customer and the project team
They approached us, you know, for for various reasons, if we could do something together. Then I forward that to our sales people, and then that sort of, you know, went back and forth. And then that's how the whole thing started.	R&D	Employee L	1	Specific project request from the customer to the project team.
The main driving force is not science, the main driving force is business or market that they would like to put a new product in a new market. That means that timelines have been limited, resources have been limited.	R&D	Employee L	1	Customer wants a market oriented product idea
So it's a cross functional effort from our side. And the same thing goes from from from their side.	R&D	Employee L	1	The customer and the project team had a cross-functional team

It was a joint effort from that point. We had a lot of internal discussions. You know, everybody was allowed to pitch in, so that was cross-functional as well. We had input from from sales, we had from product development, and we had from a lot of it from from research basically.	R&D	Employee L	1	Equal preparations of the project team for opportunity identification
A company wanting to move into a new market.	M&S	Employee N	1	Customer wants a market oriented product idea
So we saw that we could actually learn about a new field by joining forces with the customer, for us. I mean, both short, medium and long term to generate more revenues.	M&S	Employee N	1	Via presenting both companies and their capabilities they try to identify an opportunity
So I think it was that we came from two different worlds. And, you know, in the end, it takes some time, then the, your worlds would merge.	M&S	Employee N	1	Discuss project opportunities between the customer and the project team
From the beginning, it was marketing and sales. So at that time, I was responsible for marketing sales. So it was a customer of mine. Then, of course, since it became obvious that we wanted to do joint development, R&D came on board as well, because we needed to make new products, or new formats of the product.	M&S	Employee N	1	Cross-functional project team of the company
They reached out, they wanted to do an for our industry specific product, we presented our capabilities.	M&S	Employee N	1	Via presenting both companies and their capabilities they try to identify an opportunity
Yeah, that was phone calls, emails. And then we set up a meeting.	M&S	Employee N	1	Transition from non-physical meetings to physical meeting between the customer and the project team
It was to get the request from customer, get them a bit down to earth, and match that with our capabilities. What we wanted from the business point of view. So, so my role was really to sort of merge the two companies interest.	M&S	Employee N	1	Merging the interests from the customer and the case company
The customer approached us that they had something.	R&D	Employee O	1	Customer initiated project
This is early early stage, it was just me. That's quite often how a project starts here, not with a full team or a business case.	R&D	Employee O	1	Customer initiated the project via sales.
The idea was originally from the customer. Me and the agent had gone to meet with the customer and presented the concept.	M&S	Employee P	1	Customer initiated the project via sales.

APPENDIX G – OPPORTUNITY ANALYSIS QUOTES

Quote	Department	Interviewee	FEI	1st Concept
They (the customer) wanted to combine an existing product with something else, to increase the chances of success, but also to make it more unique because the product is already out there.	R&D	Employee M	2	Customer and project team together gathered and evaluated the ideas
Then we've discussed and try to evaluate in the meeting their ideas, according to specific criteria, to try to rank them all to prioritise between them.	R&D	Employee M	2	Customer and project team together gathered and evaluated the ideas
They were more focused on how can we make this unique and interesting, from a market perspective?	R&D	Employee M	2	Customer and project team together gathered and evaluated the ideas
Originally, in this innovation workshop, I think we, we came up with an equal number of ideas, more or less. And then we narrowed those down.	R&D	Employee M	2	Customer and project team together gathered and evaluated the ideas
So the R&D was bringing in the science, the rationale for the combination opportunities and so on.	R&D	Employee M	2	R&D provides science knowledge for the opportunity
Whereas the marketing and sales people were then bringing in the market aspects of the business case and the numbers and values to it. How to find a unique position.	R&D	Employee M	2	M&S is focused on the market aspects of the business case
Before we made a decision to invest in the study, …, then it was up for business case.	M&S	Employee E	2	Project team develops the business case to decide whether it's worth investing
So there was an opportunity from R&D, and then that was of course, evaluated whether it's a potential area that we want to move into.	M&S	Employee E	2	Project team assesses the commercial potential of the opportunity
So we asked all those questions in the business case. How big is the market? How big of a challenge? Is this for the consumer, for the women and the men? And what is, what do they do today? And then we could see that there is quite a big gap.	M&S	Employee E	2	M&S is focused on the market aspects of the business case

So first the aim was to make sure that we had a product. … And sales to validate. But this is interesting market.	M&S	Employee E	2	M&S is focused on the market aspects of the business case
So that was sort of the upside of the, we thought that we could actually and make new products and attract new, different customers.	M&S	Employee E	2	Project team assesses the commercial potential of the opportunity
And I think, working on the business case, and then gathering the, the marketing bits and pieces for the business case.	M&S	Employee E	2	M&S is focused on the market aspects of the business case
I took the discussions with customers, and then pull that information back in the project. … I was representing marketing and sales.	M&S	Employee E	2	M&S is focused on the market aspects of the business case
Before we were actually done with a business case, there were quite close project meetings.	M&S	Employee E	2	Project team assesses the commercial potential of the opportunity
We tried to develop a product. But of course, they also wanted some more data also, so we also initiatied one study then.	R&D	Employee J	2	On request of the customer, additional information was gathered
We have every month meetings, so it was really natural to ask: Do you have something new?	R&D	Employee J	2	The cross-functional project team and the customer are assessing the feasibility of the project
They had some kind of idea what kind of people that we sell the product to. And then, they wanted to have a study done on this kind of population.	R&D	Employee J	2	On request of the customer, additional information was gathered
Normally, it's not us in research to think about if the project is valuable for the case company, we are not responsible for that.	R&D	Employee J	2	R&D provides science knowledge for the opportunity
Together with our R&D team, we looked into what is important, what is important when developing a product form an R&D perspective	Other	Employee C	2	R&D provides science knowledge for the opportunity
There was a business case and it was one sales person, and one from R&D being the ones that writing this business case.	Other	Employee C	2	Project team develops the business case to decide whether it's worth investing
Because we're asking for this what scope of business are we talking about? What kind of plans do you have?	M&S	Employee F	2	M&S is focused on the market aspects of the business case

And we said that this could be a major business for us.	M&S	Employee F	2	M&S is focused on the market aspects of the business case
So normally, we would sell until we get a certain marging. … We can either say no thanks at this stage, because the margin is too low, or we say that we take it and move further, because it's going to be good top line revenues.	M&S	Employee F	2	M&S is focused on the market aspects of the business case
We wanted to know of course, the scope of the business, how much could this be worth.	M&S	Employee F	2	M&S is focused on the market aspects of the business case
There's two parts. It won't be feasible from a finance point of view to fit what they do today, and they're competing with cheaper products. So our product is going to be more expensive to start off with.	R&D	Employee A	2	R&D provides science knowledge for the opportunity
Volumes of course, it's always important to get them from the customer. … So what's the size and the scope of the business.	R&D	Employee A	2	R&D provides science knowledge for the opportunity
What we talk about before we start is, how much is it going to cost us to do the development?	R&D	Employee A	2	Project team has to consider the trade-off between the benefits and invested resources
Once we have a handshake there, whether we should go for a project, once we have that common understanding, we have done the traditional screening and feasibility, we we try to involve application into discussions	M&S	Employee H	2	Customer and project team together gathered and evaluated the ideas
So I would say that the first part of this project was we were merely interacting between company and customer. We were kind of simulating this project in labscale. Is it doable? Is it feasible? Can it be done? The interaction was mostly between myself, the research department, and the counterteam (Customer)	M&S	Employee H	2	The cross-functional project team and the customer are assessing the feasibility of the project
That was done jointly with the customer. As I said, we follow a sales process. I mean, initially, initially, when the when the customer calls, when we discuss with a customer, one of the first questions is what is the opportunity? They came up with, they came up with volume that	M&S	Employee H	2	Customer and project team together gathered and evaluated the ideas

they wanted to commercialise. And I could of course then calculate backwards how much supply I needed to ship-in. And then I got an early understanding that this was worth pursuing or not.				
We communicate regularly, on daily basis in informal meetings.	M&S	Employee H	2	Project team has good communication
Volume potential. Final packaging. I mean, what is, what is the actual final product? If you have all these parameters you can very early determine what the scope for the business is.	M&S	Employee H	2	M&S is focused on the market aspects of the business case
Whenever we decide to do a study, we start with doing a business case. Marketing, R&D are involved in writing and producing that business case.	R&D	Employee K	2	Project team develops the business case to decide whether it's worth investing
And when doing the business case, we involve people from both the marketing department trying to do an evaluation of the current market status and what other products are there in the market that we would compete with, and how many consumers could be addressed. And the R&D that need to calculate the cost of goods, production, etc, etc. R&D is more responsible, primarily for the research part, like background information, and what is currently available when it comes to to, to literature, on other products, on other strains. And then we have the scientific revenue, proposed product concept, and efficacy of the proposed product concept is addressed from the research department. The commercial potential with cost of goods and pricing that the marketing officer was responsible for with different, so they got the information from the operations, profitability, possible profitability, regulatory aspects.	R&D	Employee K	2	The cross-functional project team and the customer are assessing the feasibility of the project
The application in business areas, is a part that the colleagues from the marketing and sales department.	R&D	Employee K	2	M&S is focused on the market aspects of the business case

They had to add information about applications and business areas, that unique selling position.				
We also have to do a risk evaluation of both the part related to marketing and sales, but also the research part.	R&D	Employee K	2	Project team has to consider the trade-off between the benefits and invested resources
The M&S team assesed the value of the project. I was mainly involved in identifying if you can call it the scientific need for a product like that.	R&D	Employee K	2	R&D provides science knowledge for the opportunity
The business case has to be ready before you take that make the decision to go on and start planning to clinical study. So we had an approval of the business case, and then we started to planning the study.	R&D	Employee K	2	Project team develops the business case to decide whether it's worth investing
So they they actually came to us with a bag of money and said that, we would like to do this, if you can support this one with the other half, we would be interesting to do it.	M&S	Employee D	2	Customer and project team together gathered and evaluated the ideas
Okay, what can be the our relationship, the financing of the project, and scope commercially. But then it was very much left with the R&D department, because it's very complex. So from a scientific point of view, it's it's new to us. We needed to have new network, for example, we didn't have this scientific networks within this field before.	M&S	Employee D	2	R&D provides science knowledge for the opportunity
Since it is so technically and scientifically difficult or demanding, very early, we had a direct contact with between the customer R&D department and our R&D department. So the one in charge of our R&D had a direct contact with the customer.	M&S	Employee D	2	Project team R&D to customer R&D are in direct contact because of scientific complexity
With the help of us, they actually did an internal business, presented this to their management, and actually got the funding internally approved. So they had quite a quite a big, we had a big input, because they were not scientifically very	M&S	Employee D	2	Project team delivers input for the customers internal business case

developed. They had a lot of ideas on how to clinically document these possible effects.				
We have a very clear perspective on our industry. And they don't. And this this kind of relationship is also a relationship between R&D departments.	M&S	Employee D	2	Project team R&D to customer R&D are in direct contact because of scientific complexity
We want to do what the customer asks us to, but we, we need to understand that this is feasible, that it can be upscaled, once if we get positive results.	M&S	Employee D	2	Project team assesses the commercial potential of the opportunity
It's very difficult for us, for me to judge the scientific feasibility of the project.	M&S	Employee D	2	Challenge to align the functions of M&S and R&D in the project team
And then I need to make my assumptions from the commercial side.	M&S	Employee D	2	M&S is focused on the market aspects of the business case
They needed our help to build the business case. since we shared investment.	M&S	Employee D	2	On request of the customer, additional information was gathered
I mean, we always have to weight the benefits that potentially, you know, the science and the marketing and sales and the cost involved in this.	R&D	Employee L	2	Project team has to consider the trade-off between the benefits and invested resources
Already in the beginning, you should sit down and try to identify it, as far as you can, potential showstoppers. And really identify them and try to solve them in one way or another.	R&D	Employee L	2	Customer and project team together gathered and evaluated the ideas
So internally, I think we had some very good discussion.	R&D	Employee L	2	Project team has good communication
We actually develop the business case, where we would put it together, we do our market research, we do our IP searches, we look at the science behind it, likelihood of success, indication, consumer needs, all those things. And then we put it up for a decision in the end.	R&D	Employee L	2	Project team develops the business case to decide whether it's worth investing
Because it's quite often we end up being pure R&D based, you know, we do 90% of the business case, and we do our best guesses on everything and marketing and sales pitches in at the last minute.	R&D	Employee L	2	Challenge to align the functions of M&S and R&D in the project team

It's a challenge when you work in cross functional project teams, where marketing and sales are very fluffy, because who can know, product is out in the market in five years, everything could have happened, you know? A volcano could have erupted. No, but it's always between your thumb and forefinger, whereby R&D is very here and now. You know, the clinical studies starts tomorrow, what claim are we're going to target. So it's about getting those sort of, front and back end together.	M&S	Employee N	2	Challenge to align the functions of M&S and R&D in the project team
Meetings, preparation meetings before customer meetings.	M&S	Employee N	2	Project team assesses the commercial potential of the opportunity
It was done in a workshop, or actually two workshops. I think it became, in the end where a lot of different ideas were discussed. And then pros and cons. And then, external investigations, experts were asked, and in the end there was a conclusion made. There were R&D experts, the M&S, and then different departments from the customer, and different people here as well.	M&S	Employee N	2	Customer and project team together gathered and evaluated the ideas
We had lots of discussions with our customer.	R&D	Employee O	2	Customer and project team together gathered and evaluated the ideas
We're sitting so close, there were no regular updates, we talked a lot to each other.	R&D	Employee O	2	Project team has good communication
M&S person did the market need and together with them we identified the risks.	R&D	Employee O	2	M&S is focused on the market aspects of the business case
There is an agreement that you don't start a project without someone from M&S involved.	R&D	Employee O	2	M&S is focused on the market aspects of the business case
They did not contribute that much while coming up with the new idea, but they gave an acceptance that they wanted this product. They gave input in the requirements.	M&S	Employee P	2	Customer and project team together gathered and evaluated the ideas
We needed to see what was the scope, how much could the customer sell. Future potential of	M&S	Employee P	2	M&S is focused on the market aspects of the business case

product. How much could we charge.				
Meetings in the corridor, quick meetings sometimes.	M&S	Employee P	2	Project team assesses the commercial potential of the opportunity
We have had meetings, and also communication via email and try to pursue them to go with the original product.	M&S	Employee P	2	The cross-functional project team and the customer are assessing the feasibility of the project
Better understanding of the other persons tasks and jobs, what's important for them to make a success is something I learned.	M&S	Employee P	2	Project team has good communication

APPENDIX H – IDEA GENESIS QUOTES

Quote	Department	Interviewee	FEI	1st Concept
However, in the project, so far, it turned out to be quite a lot of, a lot of challenges with this combination approach to do regulatory and the development, because there's so many requirements, and you need to control everything and to document everything.	R&D	Employee M	3	Balancing internal project team and customer demands
The contact with the customer was good I would say, it took a long time. I think the discussions were ongoing for maybe even up to two years before we actually got a specific project plan and idea and concept.	R&D	Employee M	3	Long idea development because of discussions between the customer and project team
So the information was shared in regular meetings. Monthly. And we had a common folder, where we have shared documents	R&D	Employee M	3	Open information sharing between the project team and the customer
And they (customer) wanted to get things going faster, wanted a result fast, and they were not so concerned about actually identify a product that will have an impact.	R&D	Employee M	3	Misalignment between the customer and project team goals
So that was a bit conflicting. Because we than had slightly different goals. We wanted to develop a product that worked, and they wanted to develop the product faster.	R&D	Employee M	3	Misalignment between the customer and project team goals
All the teams from both the customer and the case company were involved in optimising the idea	R&D	Employee M	3	Customer and project team share expertise to shape the product
We were arguing in meetings. In between, we had to collect and share proof of the impact. You can think that it's rather obvious, but we still collected evidence for it to convince them.	R&D	Employee M	3	The project team needed to back up their arguments with proof
And there we were, a team, me and R&D were involved.	M&S	Employee E	3	Involvement of cross-functional team
And then during the the technical phase when everything was running, we didn't have that many meetings.	M&S	Employee E	3	No need for internal meetings during the technical phase
It was mainly we worked, and then we presented it for the customer, and they had comments.	R&D	Employee J	3	Project team delivers and the customer provided feedback
I had more direct contact with the customer.	R&D	Employee J	3	R&D is in direct contact with the customer

It was close collaboration with R&D. …. And we looked at the results together, and had our conclusions, and had decisions together. What way should we go, and how should we formulate the product.	Other	Employee C	3	Close internal collaboration and decision making for product optimisation
Then we tested whether our product could be combined with theirs.	M&S	Employee F	3	Customer and project team share expertise to shape the product
There was also a logistics problem to be solved. Because at the very early stage, they said to us, … , okay, so you need to solve that for us in one way or another.	M&S	Employee F	3	Project team needs to live up to the requirements of the customer
Okay, we said, how do we solve this? Then the customer said to us; "your competitor XX is a co manufactur." They are an extremely big competitor to us. The customer said; "they can help you, so you say to your competitor that we are your customer, and because we are a big customer to your competitor, they will try to solve this for you."	M&S	Employee F	3	Leveraging customer network and company size to solve a project problem
No, for me it was not easy to understand. Because it was a lot of application information, understanding the science part of the product.	M&S	Employee F	3	Lack of understanding of the science part from M&S
The challenges were just that, we were challenged with hitting the requirements.	M&S	Employee F	3	Project team needs to live up to the requirements of the customer
A lot of parameters were given to us.	M&S	Employee F	3	Project team needs to live up to the requirements of the customer
They asked us questions outside what we have stated in our technical data sheets. We didn't know that before, so we did tests.	M&S	Employee F	3	Project team needs to live up to the requirements of the customer
The requirements were though.	M&S	Employee F	3	Project team needs to live up to the requirements of the customer
My function, in that case, was just to make sure that we have the right people answering. And leading the conversation, delegating the responsibilities to other people.	M&S	Employee F	3	M&S as a facilitator for contact between the customer and the project team
So I take all the technical questions.	R&D	Employee A	3	R&D is in direct contact with the customer
It's a 100% driven by them, what they want.	R&D	Employee A	3	Project team needs to live up to the requirements of the customer

They are quite strict in what they want to achieve.	R&D	Employee A	3	Project team needs to live up to the requirements of the customer
I'ts also something that hasn't been done before. So you can't, you don't have information that you're relying on from the market or so.	R&D	Employee A	3	Difficulty of making the customer understand
We haven't quite met them, in that sense that they haven't changed their requirements. We say we should maybe change the requirements. But they're quite strict and still pushing here.	R&D	Employee A	3	Project team needs to live up to the requirements of the customer
Regularly none of them understand the situation. They come from their market position.	R&D	Employee A	3	Different interpretation due to divergent backgrounds
We force our customer to actually, if they're going to use our product, our brand, our product name, they need to comply with our rules.	R&D	Employee A	3	Customer needs to comply with the standards of the case company
They don't want to claim anything. But they see that they have to in case somebody starts to digging around. … It's for the risk of being sued.	R&D	Employee A	3	Customer needs to comply with the standards of the case company
We work quite closely together, we're a small company.	R&D	Employee A	3	The project team works closely together
There are things where my opinion take precendence, or were I listen. I come with the technical part, that is my responsibility. And the contract and the price discussion that's the sales responsability.	R&D	Employee A	3	Clear defined roles and trustworthy relationship between the project team
We tried to, talk it out until we get there. To explain, to where we understand each other.	R&D	Employee A	3	Eagerness to create understanding within the project team
They (customer) don't share a lot of information with us. So in that sense it's difficult to support them.	R&D	Employee A	3	Challenge to support the customer due to a lack of information sharing
We have been quite open, we have shared the results from the project trials.	R&D	Employee A	3	Open information sharing between the project team and the customer
With our expertise and their expertise, we try to tackle what they want to achieve and what's actually feasible to do.	R&D	Employee A	3	Customer and project team share expertise to shape the product
We have very different views on what the results look like.	R&D	Employee A	3	Misalignment between the customer and project team goals
Because we come from different backgrounds, we interpret things very differently. The complexity is high in this area.	R&D	Employee A	3	Different interpretation due to divergent backgrounds

So that optimisation is trying to find, I say to the sales team, you can't have them all. And to the customer as well. You can't get everything.	R&D	Employee A	3	Balancing internal project team and customer demands
Early in the process we'll talk with the customer, we try to understand what the volume opportunity is, try to define the targeted product and the target market segment, we try to define who the, what the product would typically look like. So that we have a common understanding on what the project that we're about to start would look like.	M&S	Employee H	3	Project team and the customer formulate a common understanding of the project
The role of the customer? I mean, they put some serious requirements on not only us, but also in our partners in order to make this happen.	M&S	Employee H	3	Project team needs to live up to the requirements of the customer
Requirements from the customer were both commercial and technical, very application specific.	M&S	Employee H	3	Project team needs to live up to the requirements of the customer
With the customer we had weekly or bi-weekly calls.	M&S	Employee H	3	Open information sharing between the project team and the customer
They (customer) shared what was shareable. And I appreciate and understand that everything cannot be shared, but they weren't hiding things.	M&S	Employee H	3	Open information sharing between the project team and the customer
So for me, I do not always understand the trials and research that they do. But I know why they need to do it. So that's the Yes. And then the no is that it's sometimes beyond my competence level.	M&S	Employee H	3	Lack of understanding of the science part from M&S
The customer always put requirements on us, and challenges. And if you ask me, all of them are relevant, all of them are realistic.	M&S	Employee H	3	Project team needs to live up to the requirements of the customer
Telephone conferences, emails, all the interactions that we have. Obviously, we meet as well with the customer.	M&S	Employee H	3	Open information sharing between the project team and the customer
With the customer it was trial and error. Of course, they have other priorities that they needed to look into. Sometimes if they changed, they need to reprioritise.	M&S	Employee H	3	Project team needs to live up to the requirements of the customer
Once we've done the initial discussions and idea generation, all the tough questions start coming. And this is where we now, this is when we need to make the customer understand.	M&S	Employee H	3	Difficulty of making the customer understand

So when I came in, we had run one basic trial. Where we found there were some problems with the product not being at the place where we wanted to be. It didn't meet the customer required.	Other	Employee G	3	Project team needs to live up to the requirements of the customer
First thing was to get the marketing and sales team within the case company to understand why I'm suggesting these different trials, because if our team is on board, it is easy to convince another team.	Other	Employee G	3	Eagerness to create understanding within the project team
So that was the first step for the new trials to get a completely new setup. One, which was not what the customer wanted, the customer had a different trial plans send to us.	Other	Employee G	3	Open information sharing between the project team and the customer
So we have meetings held where we have all the question and answer sessions, about the new trial, why we're doing what we're doing. And get that understood at our level of the company. And then have that communicated to the customers.	Other	Employee G	3	Eagerness to create understanding within the project team
So it is a struggle to get the customer understand, yes, you want all these things, but we need to look into what you need, not what you want.	Other	Employee G	3	Different interpretation due to divergent backgrounds
The results that we have are sent as raw data to them, for them to be able to see mix and match, and analyse it themselves if they want.	Other	Employee G	3	Open information sharing between the project team and the customer
Sometimes it gets a bit difficult. But keeping a transparent conversation at the end, we always have noticed becomes the best way.	Other	Employee G	3	Open information sharing between the project team and the customer
The new trial plan that presented forward from our side, has been approved, has been accepted by the customer as well.	Other	Employee G	3	Project team delivers and the customer provided feedback
We have face to face communications quite a bit, to make them understand.	Other	Employee G	3	Difficulty of making the customer understand
They described to us what they wanted to do. We didn't have any impact or ideas on how they would do their study, they're experts within that field.	R&D	Employee K	3	Customer and project team share expertise to shape the product
We had communication and decide what the product would look like, how much product they wanted to have.	R&D	Employee K	3	Customer and project team share expertise to shape the product
I think nobody had to compromise when it comes to the study. No, it was just a matter of discussion and concluding.	R&D	Employee K	3	Project team and the customer formulate a

				common understanding of the project
By having meetings and presenting data, we shared information within the different functions.	R&D	Employee K	3	Close internal collaboration and decision making for product optimisation
They (customer) were mainly informing us about things they need.	R&D	Employee K	3	Project team needs to live up to the requirements of the customer
So you come out with with the with the joint set of expectations, that's very important.	M&S	Employee D	3	Project team and the customer formulate a common understanding of the project
Communication. They had, If not weekly calls, bi-weekly calls. And more intense in the special phases.	M&S	Employee D	3	The project team works closely together
Idea from a customer. And then to kind of help facilitate this. Because also here as I've talked about before to be aligned, R&D, commercial, product application, whatever, that important that is kind of our role.	M&S	Employee D	3	M&S as a facilitator for contact between the customer and the project team
When you get into this cooperation, of course, it's finding the balance between the two parties (customer and company)	M&S	Employee D	3	Project team and the customer formulate a common understanding of the project
On the commercial side, we don't have the knowledge. I do have very little understanding of the physical, or the biologic aspects. But I do understand the scope of it, I come from a different background.	M&S	Employee D	3	Lack of understanding of the science part from M&S
Once you kind of start the project and kind of build the business case, no matter how developed that business case is, then it goes into kind of a clinical phase, which is kind of a black box	M&S	Employee D	3	Lack of understanding of the science part from M&S
But the clinical processes is very much a kind of a black box to us.	M&S	Employee D	3	Lack of understanding of the science part from M&S
A challenge was how to get a mutual understanding. They wanted the world, and I couldn't give them to that.	M&S	Employee D	3	Project team and the customer formulate a common understanding of the project
We had multiple meetings discussing this. So that was an ongoing discussion, before we decided. (customer and company)	R&D	Employee L	3	Customer and project team share expertise to shape the product

The contribution of the customer was very limited, actually. They did have some input. More or less qualified.	R&D	Employee L	3	Project team delivers and the customer provided feedback
They don't really have a very good grasp of what it means, the benefits, the the upsides and downsides, the complexity and so on.	R&D	Employee L	3	Different interpretation due to divergent backgrounds
We could be in a meeting, and they're back to the full back position, which they know by heart, and then we have to remind them again. But you remember, we talked about this a month ago.	R&D	Employee L	3	Different interpretation due to divergent backgrounds
From a R&D perspective you want an impact. From a marketing and sales perspective you want to have an easy to sell product in the end, so you want to have a cheap product as possible. And again, so someone had to compromise.	M&S	Employee N	3	Different interpretation due to divergent backgrounds
We worked very much both in parallel and then connecting. So it was homework, connecting, homework, connecting. So I would say that the information that we gather internally, they did the same on their end. And then we exchange information.	M&S	Employee N	3	Customer and project team share expertise to shape the product
Sharing information, protocols presentation, and then we have bigger meetings where we gather the whole project team and their project team as well.	M&S	Employee N	3	Customer and project team share expertise to shape the product
We didn't agree in some aspects with the customer.	R&D	Employee O	3	Project team delivers and the customer provided feedback
The customer communication is very good. Whenever it's needed there is a meeting between us and them.	R&D	Employee O	3	Open information sharing between the project team and the customer
The other team members, they have been really supportive and fast. It's difficult and challenging.	M&S	Employee P	3	Involvement of cross-functional team
The customer wanted to have more ingredients. We didn't find anything, we tried to pursued them that it will cost more time. They agreed in the end.	M&S	Employee P	3	Misalignment between the customer and project team goals

APPENDIX I – IDEA SELECTION QUOTES

Quote	Department	Interviewee	FEI	1st Concept
So it's, it's like doubling the effort with the combination product …. So in the end, they decided to let go of the combination approach.	R&D	Employee M	4	Customer decides based on their own needs
In the end, I think we had to compromise most, because, from the scientific perspective, we really wanted to go with the combination, and also, from the market aspect, that we believe that there would be a great advantage of having the combination to make it more unique. Whereas the customer, they focused on all the challenges with the development aspects, that it would be twice as difficult, basically. Due to that, they gave up on the combination idea.	R&D	Employee M	4	Customer decides based on their own needs
Part of that decision is that they are covering all the costs in this.	R&D	Employee M	4	Customer has the power to decide because they pay for the project
It was, it was mostly their decision, since they're paying.	R&D	Employee M	4	Customer has the power to decide because they pay for the project
The feeling in the project team about the idea was disappointment, that they don't understand, or they don't consider it important enough to fight for the combination, but that they're giving into the easier approach.	R&D	Employee M	4	The project team is disappointed because of the customers' decision
It was more like, this is an interesting area. And then this result was presented.	M&S	Employee E	4	Product area was decided on based on positive study results.
And so, and then, well, the reasoning around why we should do this was because I mean, …, it was a possibility to move to different areas.	M&S	Employee E	4	Decision based upon the possibility to move into a new area
Everybody believed in this. Everyone thought that it made sense to move into a new health segment and at the evidence shown in the studies.	M&S	Employee E	4	Decision based upon the possibility to move into a new area
So we did studies …, we got nice results from that. And we also on that, they decided they will make a product for the market.	R&D	Employee J	4	Product area was decided on based on positive study results.
The selection? It was all together. Finally we decided on what we should do.	R&D	Employee J	4	The customer and project team

				decided on the idea together
I put the numbers and the revenues into the budget, and said that I really believed that this could be something that's big business for us.	M&S	Employee F	4	Idea was selected based on the possibility to generate revenue
There hasn't been compromises, there's only been one option. In the end, it's always the customer that makes the decision.	R&D	Employee A	4	Customer decides based on their own needs
It's up to the customer to make the decision.	R&D	Employee A	4	Customer decides based on their own needs
The customer makes the final decision if a product goes forward or not, it's their product.	Other	Employee G	4	Customer has the power to decide because they pay for the project
After we finished the 'are they capable of doing the product themselves', at this point, it becomes more collaborative: go or no. Both the customer and the case company are deciding should we go forward in the project or not. How confident is the customer in the making the project go forward or not.	Other	Employee G	4	The customer and project team decided on the idea together
By discussing, and just by talking. Trying to find compromise	R&D	Employee K	4	The customer and project team decided on the idea together
But the final decision, if you put it like that has been on the customer side, how the product should look. Because they had been more concerned about this then we did.	R&D	Employee L	4	Customer decides based on their own needs
I think we compromised more than the customer. There has been a lot of frustration internally, obviously, a lot of frustration.	R&D	Employee L	4	Frustrations in the project team because they had to compromise more than the customer
Now it's it's an idea optimised based on regulatory requirements and cost and time. Again, in my view, it's not optimised to give the best possible efficacy. It's optimised, or compromised into being something the fits into the customer budget and timelines basically.	R&D	Employee L	4	Customer decides based on their own needs
We have both compromised. Now we are, now we're sort of taking a leap into, once we have sort of the deal signed and where we started the the actual work together.	M&S	Employee N	4	The selected idea was based on mutual compromises from the customer and the project team

So talking about compromises, all of a sudden time to market and also cost became more important than having the, what we believed, the most superior final product. And who would who made the most compromises? I think that, from our perspective, we really wanted to have a combination product, because we believe we have a higher likelihood of success with the combination.	M&S	Employee N	4	Customer decides based on their own needs
It was a joint decision, because they were, it's actually their project. So if they'd said, no, it could have been no.	M&S	Employee N	4	Customer decides based on their own needs
They are buying the product from us. So it's not really our final decision. We are contributing with our product expertise, and we can do as much as we can.	M&S	Employee N	4	Customer has the power to decide because they pay for the project
You don't get all the information, you don't really know what they base their decision on. And then they decided.	M&S	Employee P	4	The project team is disappointed because of the customers' decision

APPENDIX J – CONCEPT AND TECHNOLOGY DEVELOPMENT QUOTES

Quote	Department	Interviewee	FEI	1st Concept
First, that was the clinical process, and then somewhere towards the end, when we were discussing, okay how should we then launch this product? And how should we sell it? And how much would it be? And how should it be positioned a bit more in detail? And then it was more towards marketing. What do we do with this result? How do we present ourselves? How do we communicate the results?	M&S	Employee E	5	Challenge of matching the market perspective with the scientific results
So definitely R&D as well. Because we, I mean, how do we translate? That is a big sort of discussion of course, how do you translate the results? And how do we want it? What can we actually say?	M&S	Employee E	5	Challenge of matching the market perspective with the scientific results
It challenges us. It's really words back and forth. That's a struggle. … But I tried to say, well, maybe we could say this, this sounds really good and attractive to the consumer. Well, no, because it may be this and this. And then we sort of work together to make sure that we have something that makes sense, but still is valid, on a scientific base.	M&S	Employee E	5	Challenge of matching the market perspective with the scientific results
So the new product was built up on this research.	R&D	Employee J	5	Product development based on scientific results
I mean, it's really important when we launched this product. I mean, all it was based on positive clinical effect.	Other	Employee C	5	Product development based on scientific results
I'm absolutely sure, they (customer) have plans. They have a project timeline … They shared it with us.	M&S	Employee F	5	Sharing project plans between the customer and the project team
The bigger the company you're dealing with, the more more gates and more parameters you need to control.	M&S	Employee H	5	Difficulty of dealing with a big company is dealing with their requirements
Once they had established a project that they kind of believed in, and that they decided, yes, we want to do this, we needed to move into the investor decision phase. Is this scalable, can you do this?	M&S	Employee H	5	Project team and customer test the scalability of the project idea
They made us change our supply format. Which put some serious conditions on logistics and production. So we needed to team up with our partners in order to, secure the project.	M&S	Employee H	5	Difficulty of meeting the customers prerequisites

But we are we we are not really hitting the requirements. So, we're trying to refine it. But we have not been able to refine it just yet.	M&S	Employee H	5	Difficulty of meeting the customers prerequisites
This is where all the product assessment is done. The stability discussions, the what if's, the document sharing, the clarifications on whatever. This is when, this is when the where the customer starts executing the project on their side.	M&S	Employee H	5	Close contact between the customer and the cross-functional project team
In best case, you push them together. Because on the customer side there's always a team of 10, and it's always good to have the R&D, the application, as well as the commercial topics. So it's important that we stay close in close contact.	M&S	Employee H	5	Close contact between the customer and the cross-functional project team
So we are basically keeping an open dialogue, weekly meetings, always having the marketing sales and application in touch with them. So we almost every week have calls with them.	Other	Employee G	5	Close contact between the customer and the cross-functional project team
It comes with why, how, when in a very clear a detailed report. Everything written down is always better than telling it to them, it's very difficult to make a customer, especially if not used to working with such a product, to understand what we mean by saying a lot of things.	Other	Employee G	5	Sharing project plans between the customer and the project team
At this stage of the project, where it's developing, they would be constant communication.	Other	Employee G	5	Close contact between the customer and the cross-functional project team
A customer, comes back and be like, we didn't know we were going to do this. And then you go back. And you when you have something written down and signed off it's always easier. So report and communication.	Other	Employee G	5	Sharing project plans between the customer and the project team
When the results from the study presented to us, then there was a more intensive communication period that was initiated	R&D	Employee K	5	Intense communication within the project team
When the studies, the planning of the study was initiated, then we had a lot of meetings with the team. We visited them, in order to have more efficient, interactive discussions on several aspects.	R&D	Employee K	5	Close contact between the customer and the cross-functional project team
We made the idea concreter with looking at the area where there was a positive result of the study and that was decided to do something with it.	R&D	Employee K	5	Product development based on scientific results

Than my colleague from M&S took over, trying to make like more a customer friendly presentations and also extend the idea to a broader population	R&D	Employee K	5	Challenge of matching the market perspective with the scientific results
It is always the balance between how the R&D people like to stick to facts. And the non R&D people are more willing and prepared to extend a result to a broader population.	R&D	Employee K	5	Challenge of matching the market perspective with the scientific results
So the challenge was, when we discuss how the results from the research would be interpreted and used by the other side.	R&D	Employee K	5	Challenge of matching the market perspective with the scientific results
We need to find the balance. Everybody knows that you need to say a little bit more. Perhaps than what you would like to, based on the clinical date.	R&D	Employee K	5	Challenge of matching the market perspective with the scientific results
That it was understood and interpreted in a correct way by our colleagues that prepared the material.	R&D	Employee K	5	Challenge of matching the market perspective with the scientific results
They think. I think that if you ask my R&D colleagues, they think that sales guys are a bit, we talked too much. We're not necessarily saying exactly what is in the study. But our job is to make it understandable for other people. That normally means, that they are very digital, the scientific world is very digital, either you seeing the effects or you haven't seen the effects.	M&S	Employee D	5	Challenge of matching the market perspective with the scientific results
We say 'them and us', that is not to alienate people, but to to illustrate that we are different. But R&D always, when presenting a study, always end with the fact that we still need to do more clinical work. They never finish, and then you don't finish when getting new knowledge. You learn more, and you need to understand more, but we need to launch.	M&S	Employee D	5	Challenge of matching the market perspective with the scientific results
Then they present the results. Then we need to come in and say, based on this, how can we design a product? Or the offering? Do we need to tweak it?	M&S	Employee D	5	Challenge of matching the market perspective with the scientific results
Than we have discussions. Depending on how qualified I am personally in those discussions, or we as a department in those discussions. In this phase it was between R&D our company and R&D in our customer.	M&S	Employee D	5	M&S as a facilitator for contact between the customer and the project team
And I was kind of facilitator	M&S	Employee D	5	M&S as a facilitator for contact between the customer and the project team

Normally you have this, that you have a reporting, they had a bi-weekly call, R&D with their R&D, to report the developments, and to have any discussions.	M&S	Employee D	5	M&S as a facilitator for contact between the customer and the project team
Same challenges that we had from the beginning, we are coming from different worlds.	M&S	Employee N	5	Challenge of matching the market perspective with the scientific results
Then the project team, the project leaders, they made their project plan, which was done in parallel, of course. And then the different activities were initiated.	M&S	Employee N	5	Sharing project plans between the customer and the project team
The customer project leader who presented a project plan, and we came with our comments and a project plan is always on the debate.	M&S	Employee N	5	Sharing project plans between the customer and the project team
Pre meetings if we needed, corridor meetings if that was easier, sending around drafts. Very informal.	M&S	Employee N	5	Informal meetings within the project team
It's coming from different worlds. Having insight into different areas, different sales channels, different regulatory requirements. So they brought in expertise that we don't have yet. And vice versa.	M&S	Employee N	5	Customer and project team bring in different expertise