Increasing R&D and Marketing Integration in the Fuzzy Front End to Stimulate and Support Radical Innovation

- Challenges and Opportunities in a Global Manufacturing Company

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Abstract

Title	Increasing R&D and Marketing Integration in the Fuzzy Front End to Stimulate and Support Radical Innovation - Challenges and Opportunities in a Global Manufacturing Company
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Issue of study	Large and mature companies often struggle with their capability of introducing radical innovations, as they can be in conflict with existing business model, processes and bureaucracy. A vital phase of the radical innovation process is the first phase, called the Fuzzy Front End (FFE). Scholars claim that the FFE activities are entailed with much complexity and uncertainty, yet crucial for a company's competitive advantage.
	Innovation success is highly dependent on the integration between R&D and Marketing, which tends to be low in large and mature companies. The effects of R&D and Marketing integration in the FFE, when aiming to support radical innovation, have been little academically explored. Some scholars claim that Marketing's involvement in radical innovation development tends to focus on current customers, which inhibits radical innovation. Other studies show that successfully integrating R&D and Marketing in FFE can provide substantial benefits and improve radical innovation capability. The case company of this study fits well to explore this area; a Global Manufacturing Company (GMC) with highly isolated R&D and marketing departments aiming to increase radical innovation capability.
Purpose	The purpose of this thesis is to find ways to stimulate and support radical innovation in the Fuzzy Front End for the case company. For reasons that will be evident after reading the pre-study, the study focuses on R&D and Marketing integration within this purpose. The study aims to contribute with knowledge to large and mature companies, and the GMC in particular.

Methodology   A qualitative case study with an exploratory approach was conducted, beginning with a pre-study, which helped to form research questions. The empirical data was collected mainly through semi-structured interviews, a workshop and survey, which was analyzed with support from three research fields: radical innovation, FFE and R&D and Marketing integration.

Conclusion   There are many indications to a high need for integration between Greenhouse (GH), the studied R&D department, and Marketing & Product Management (M&PM), the marketing department at the GMC. GH's technology push innovation strategy points to a high need for integration, due to not beginning with a market opportunity. A rapid competitive shift for the GMC and increased globalization, modern IT and faster product-life cycles indicate more uncertain environmental conditions, which also drives higher need for integration. The current integration is deemed very low, with sporadic infrequent meetings, lack of mutual incentives and goals and departments located in different countries. This indicates an integration gap. Previous research and employees' views point to an evident integration gap also for radical innovation, with a wide definition of radicalism, such as including innovations for existing technologies for new markets and vice versa.

Potential positive effects of increased integration between GH and M&PM were considered: helping to grasp market and technology opportunities earlier, making better business assessments for new opportunities and concepts as well as aligning goals and visions for the departments. Different organizational responsibilities and physical barriers were considered the most evident integration barriers between GH and M&PM. Likely effective mechanisms for reducing these barriers were deemed as changes in organizational structure, incentives and rewards, informal social systems and physical relocation and design.

Key words   Radical innovation, Fuzzy Front End, R&D and Marketing integration, Large and mature companies

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Acknowledgements

Acronyms

CO   Commercial Operations department

FEI   Front End Innovation department

FFE   Fuzzy Front End

GMC   Global Manufacturing Company, representing the case company

GH   Greenhouse R&D department

M&PM   Marketing and Product Management

NPPD   New Product and Process Development

R&D   Research and Development

SCM   Supply Chain and Manufacturing department

S&P   Strategy and Planning department

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1. Introduction

1.1   Background

Being innovative is frequently described as a key element or complement to your competitive advantage (Song & Montoya-weiss, 1998; Veryzer, 1998; Morris, 2013). Rapid information exchange, shorter product life cycles, globalization and increase in technological development pace puts pressure on companies to further explore new drivers of competitive advantage, rather than exploiting current ones (Kandampully & Duddy, 1999; Leifer, O'Connor, & Rice, 2001; Morris, 2011). This new, so-called, hypercompetitive landscape makes innovation key to be sustainably competitive (Kandampully & Duddy, 1999, D'aveni, 2002).

The innovation terminology has evolved alongside these developments and scholars distinguish between incremental and radical innovation (Song & Montoya-Weiss, 1998; Veryzer, 1998; Chandy & Tellis, 2000; Garcia & Calantone, 2002). Incremental innovations improve current processes, techniques or targeted market segments, while radical innovations are commercially beneficial new technologies for new markets, new to both the company and the marketplace (Garcia & Calantone, 2002).

Large and mature companies, who have relied heavily on incremental innovations to drive development, are in many cases under pressure to become more radically innovative (Leifer et al., 2001). The case company in this study is one of them. The company is a large global manufacturing company with a long history of being market leader and heavily relying on incremental innovation to drive profits and growth. The case company will further on be referred to as Global Manufacturing Company (GMC). This study aims to support the GMC in the ambition of increasing their capability of introducing radical innovations.

1.2   Issue of Study

The increased degree of radicalism from incremental to more radical innovations, meaning exploring new technologies and new markets, makes the process more uncertain, and difficult to control (Rohrbeck, 2014). The complex radical innovation process entails mastering technological, social and organizational factors with different perspectives (Reid & De Brentani, 2012; Rohrbeck, 2014).

An important part of the innovation process is the early phase, spanning from idea generation to the start of committing resources for product or technology development (Smith & Reinertsen 1991; Brem & Voigt, 2009; Ho & Tsai, 2011). This phase is referred to as the Fuzzy Front End (FFE) (Smith & Reinertsen, 1991). The FFE of the innovation process has been described as a phase crucial for companies' competitive advantage, but also the phase of the innovation process that is least explored academically (Poskela, 2007; Brem & Voigt, 2009; Verworn, 2009).

The FFE involves a great deal of uncertainty, uncontrollable factors and yet many important decisions are taken in this stage (Ho & Tsai, 2011; Reid & De Brentani, 2004). Leifer et al. (2001) emphasize that many assumptions are made in the FFE regarding how a technology will develop, how potential markets will unfold and what kind of response from the organization that is expected. The complexity of the FFE becomes even more complicated for large and mature companies, as the GMC. The uncertainty of introducing new technologies for new markets can be in conflict with existing processes, products and organizational capabilities (Leifer et al., 2001; Assink, 2006). It has been shown that large and mature companies can have trouble introducing radical innovations to the marketplace (Leifer et al., 2001; Assink, 2006).

A critical factor for innovation success is R&D and Marketing collaboration, since the innovation process is a cross-functional process where cooperation and communication is needed to be successful (Griffin & Hauser, 1996; Leenders & Wierenga, 2002; Song & Song, 2010; Brettel, Heinemann, Engelen & Neubauer, 2011). A dysfunctional collaboration between R&D and Marketing is also a common inhibitor of innovation capability in large and mature companies (Griffin & Hauser, 1996; Leenders & Wierenga, 2002; Assink, 2006).

There is, however, an academic debate on if and how to integrate R&D and Marketing, in the purpose of improving radical innovation capability (Griffin & Hauser, 1996, Leenders & Wierenga, 2002, Brettel et al., 2011; Christensen, 2013, Reid & De Brentani, 2004; Assink, 2006; Rohrbeck, 2014). Some argue that marketing input is not valuable, since Marketing tends to focus on existing customers and products (Christensen, 2013; Assink, 2006). There is also contradicting research, claiming that R&D and Marketing integration can support radical innovation in the FFE (Griffin & Hauser, 1996; Brettel et al., 2011; Rubera, Ordanini & Calantone, 2012). Marketing can support R&D development in FFE through, in example, providing knowledge on market trends, evaluation of ideas' commercial potential and a business perspective (Song & Xie, 2000; Rubera et al., 2012; Rohrbeck, 2014). Some claim that the ability to integrate R&D and Marketing in FFE is a key success factor to radical innovation capability (Griffin & Hauser, 1996; Rubera et al., 2012). R&D and Marketing integration is an umbrella term for describing degree of cooperation, interaction, communication, and collaboration (Rubera et al., 2012).

There is a very low, practically non-existing, integration between R&D and Marketing at the GMC. The GMC has an R&D department, Greenhouse, henceforth referred to as GH, operating in the FFE. The department has been given mandate to pursue radical innovation (Company internal document, 2014). Market & Product Management is the GMC's marketing department, referred to as M&PM. This study focuses on studying challenges and opportunities of increasing GH and M&PM integration, which can contribute to the academic discussion regarding R&D and Marketing integration for stimulating and supporting radical innovation.

1.3 Purpose

The purpose of this thesis is to find ways to stimulate and support radical innovation in the Fuzzy Front End for the case company. For reasons that will be evident after reading the pre-study, the study focuses on R&D and Marketing integration within this purpose. The study aims to contribute with knowledge to large and mature companies, and the GMC in particular.

1.4 Research Questions

In order to fulfill the purpose of the thesis, four research questions were stated:

- Is there reason to believe that increased integration between Greenhouse and Marketing & Product Management in the Fuzzy Front End would stimulate and support radical innovation?
- How would this integration affect Fuzzy Front End activities?
- What are the barriers for integration between Greenhouse and Marketing & Product Management?
- How can these barriers be reduced?

1.5 Delimitations

There are mainly three delimitations to the study. Firstly, the study is limited to investigate the potential on radical innovation, excluding the more frequent incremental innovation projects. The Greenhouse department (GH) has a mission to introduce both incremental and radical innovations, alike most R&D departments. The choice of not studying effects on incremental innovation can risk to sub optimize the departments output only for radical innovation. Therefore, this study possibly have to be further nuanced with research on possible effects on incremental innovation capability, depending on what the goal of proposed changes are for the R&D department. Secondly, the part of the innovation process empirically studied is the FFE. However, the implications for radical innovation of an entire process are taken into consideration. This is needed since radical innovations also have to successfully go through New Product and Process Development (NPPD) and Commercialization phase to become an innovation (Koen et al., 2001). The third limitation is to study R&D and Marketing integration as support and stimulation for radical innovation. This third delimitation emerged as a result from the pre-study and shaped the research questions.

The research questions inferred some additional delimitations and assumptions. The study does not study the M&PM capability of supporting radical innovation development, which is highly relevant for a successful output of increased integration. The assumption is made that M&PM with their business intelligence units, competitor intelligence functions and daily contact with customers and

consumers do have relevant transferable knowledge. M&PM well fit the description of marketing departments in the studied literature, which some of the conclusions are based on.

The third research question aims to study barriers for GH and M&PM integration. The empirical data, however, only involves empirical data from the GH employees' perspective. The first reason for this was that it was hard to obtain such data due to physical distance. Secondly, time limitation for getting this data would compete with a deeper understanding of GH employees' perspective. The case company tutors and the authors also regarded a deeper study of GH employees' perspective interesting. The study's results on barriers should therefore be seen from a GH perspective.

1.6 Disposition

Methodology
This chapter describes which research strategy, work process and methods that were used to fulfill the study's purpose. First, the pre-study method of semi-structured interviews is explained. Thereafter, the literature review as well as the semi-structured interviews, survey and workshop with GMC employees is discussed. The section concludes with discussing analysis method as well as empirical reliability, validity and generalizability.

Pre-study
This chapter begins with a background of the case company, its strategic situation as well as the radical innovation inhibitors present, mapped in Assink's (2006) framework for inhibitors of radical innovation in a mature company. An analysis is then presented, which results in forming the research questions.

Theory
The theoretical framework in this study consists of, and interlinks, three research areas: radical innovation, FFE and R&D - Marketing integration. Firstly, innovation and degrees of novelty are defined. Thereafter, FFE is explained and illustrated with the NCD-model. Finally, the area of R&D - Marketing integration is described in-depth, including its challenges and opportunities for stimulating and supporting radical innovation.

Case Study Data
This chapter consists of GH employees' views on challenges and opportunities with integration between GH and M&PM to stimulate and support radical innovation. Data is collected through semi-structured interviews, complemented with a survey and workshop. The chapter begins with describing the current integration. Thereafter, data results are mapped into integration barriers between GH and M&PM. Finally, employees' views on different mechanisms for reducing these barriers are presented.

Analysis

This chapter begins with analyzing factors to consider when opting increasing R&D and Marketing integration to stimulate and support radical innovation. Thereafter, an analysis of integration barriers is presented, which combines employee views and prior research to evaluate the strength of the different barriers. Conclusively, different types of mechanisms to reduce these barriers are evaluated.

Discussion

This chapter elaborates on what supports and contradicts the results as well as how they can be used. The possible implications of the chosen method on the results are also included. First, the findings pointing to that increased integration can support radical innovation are discussed. Thereafter, the chapter continues with results for how such integration can support radical innovation, the barriers to integration and the mechanisms for reducing barriers.

Recommendations to the Case Company

This chapter summarizes five recommendations to the case company, derived from the study's results. The authors recommend to make supporting GH and M&PM integration a management priority and to increase awareness of how this integration can stimulate radical innovation. The authors also propose forming an M&PM function with emerging business responsibility and placing an M&PM function physically close to the GH department. Conclusively, a recommendation of forming integration KPIs is presented.

Conclusions and Further Research

This chapter presents the conclusions of this study by responding to the posed research questions: if there is reason to believe that increased integration would stimulate and support radical innovation, integration effects on FFE activities, most evident integration barriers and how these barriers can be reduced. The claimed generalizations for these conclusions are also discussed along with potential further research.

2 Methodology

This chapter describes which research strategy, work process and methods that were used to fulfill the study's purpose. First, the pre-study method of semi-structured interviews is explained. Thereafter, the literature review as well as the semi-structured interviews, survey and workshop with GMC employees is discussed. The section concludes with discussing analysis method as well as empirical reliability, validity and generalizability.

2.1 Research Strategy

The overall research strategy was to conduct a qualitative case study. A qualitative case study is said to be plausible when the purpose is to understand a complex social phenomenon (Yin, 2003). The phenomenon of innovation has been described as: "Invention is a cognitive process, innovation is a social process" (Reid & De Brentani, 2004), which makes a case study fitting in that sense. The overall approach has been exploratory, and began with a pre-study to evolve relevant research questions. The FFE of an innovation process is entailed with a great deal of complexity and uncertainty (Koen et al., 2001). This can favor an initially exploratory research strategy that acquires nuanced data and is sensitive to unexpected conditions (Jacobsen, 2002). Choosing a clear theoretical foundation ahead could have risked forcing a frame not suitable for the most interesting existing empirical data. Yin (2003) recommends a pre-study when the issue is not clearly defined, which was the case in this study. Wahyuni (2012) claims that finding the interesting empirical data is important to increase chances of resulting in an academic contribution. Jacobsen (2002) also describes an exploratory approach as advisable for phenomenon the academia and the researchers have little prior knowledge of. The FFE of the radical innovation process is a phenomenon that fits this description (Poskela, 2007).

When conducting a qualitative case study, the implications of proximity to the studied individuals and groups have to be considered. The authors have been working closely with the GMC and there is a risk of becoming affected by the environment and employees views, to the extent that a critical view is lost (Jacobsen, 2002). The distance and holistic perspective to the study has been enhanced throughout the study by utilizing theoretical frameworks, previous studies as well as having a high awareness of the risk, which is a preferred approach according to Yin (2003).

2.2 Work Process

The study was divided into a pre-study followed by a case study and has been iterative of both theoretical and empirical research. Jacobsen (2002) claims that an iterative process and a combination of theoretical and empirical data collection are plausible and necessary when utilizing an exploratory approach. Figure 1 shows the overall work process for the study.
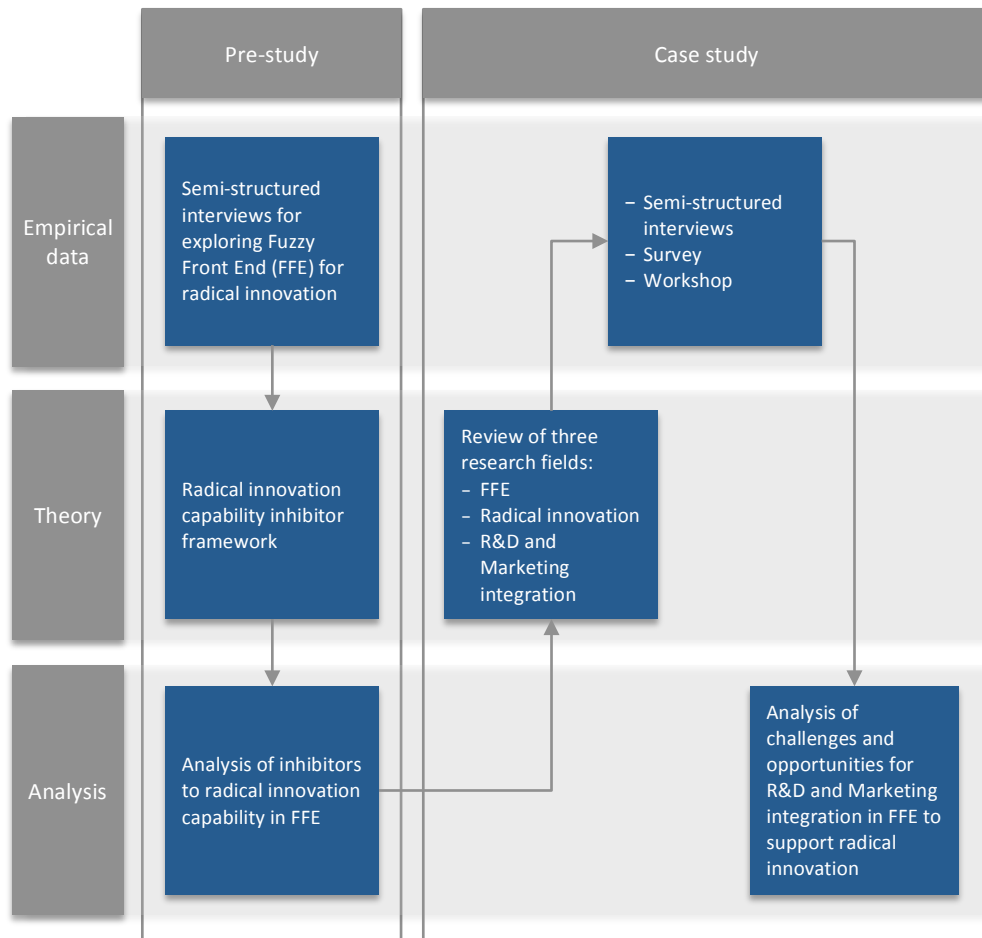
Figure 1 - The work process (The authors' own figure)

The pre-study aimed to explore the strategic situation and inhibitors of radical innovation at the GMC. Semi-structured interviews were held, with employees in GH and other parts of the organization involved in FFE. Interviewees expressed many inhibitors of radical innovation capability, which were categorized in a theoretical framework, which distinguishes 20 barriers for radical innovation capability. The framework was used as an analysis tool in order to decide what to further focus on in the study. The pre-study resulted in four research questions regarding R&D and Marketing integration, which marked the beginning of the case study.

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The case study aimed to provide answers to the research questions, through three steps, a literature review, empirical data collection and an analysis. The case study began with a literature review of: radical innovation, FFE and R&D and Marketing integration research. This review helped to provide answers to how prior research have solved these issues, as well as providing structure and a suitable language for discussing the issues. The case study continued with empirical data collection through semi-structured interviews, a survey and a workshop. This data helped to give an employee perspective on the issues and how possible ways to solve the issues would be practical in this case. The analysis combined patterns in theory, prior research and the empirical data. The conclusions aim to contribute to large and mature companies with highly isolated R&D and Marketing departments, and the GMC in particular, with providing answers to the posed research questions.

2.3   The Pre-study

2.3.1   Empirical Data Collection

Semi-structured Interviews

In order to explore the strategic situation and existing inhibitors for radical innovation, 14 semi-structured interviews were conducted at the GMC. A semi-structured interview has an open approach and is a suitable method when the aim is to achieve information about how the respondent and other persons behave, and which norms, values and opinions they have (Bryman & Bell, 2011). Furthermore, semi-structured interviews were appropriate for the pre-study since there was a need for open questions of a more general character. Open questions give according to Svensson and Starrin (1996) room for spontaneous information about phenomenon and attitudes, suitable in a study with an explorative approach. Asking follow-up questions to make the interviewees further elaborate on their replies was frequently used during interviews, called probing (Svensson and Starrin, 1996). Efficient probing aims to increase validity, since the respondents' elaboration on their answer helps decreasing probability of misunderstanding between interviewer and interviewee (Svensson and Starrin, 1996).

An interview guide was formed on the purpose of the study and developed step-by-step with input from both theory and supervisors, see appendix A. Svensson and Starrin (1996) emphasize the importance of testing the questions prior to the interview. Therefore, a trial interview by the authors was conducted. This trial interview helped to illustrate the importance of a structured introduction, as well as showing that some phrasings in the interviews could be misunderstood, which was corrected. During the interviews, both of the authors were present, one responsible for asking questions, the other one for taking notes. Jacobsen (2002) claims that focus on leading the conversation can be distracting for noticing interesting nuances of replies. The person not responsible for leading the conversation could therefore focus more on listening.

As a complement to notes, all interviews were recorded, after approval from the respondent. A shorter analysis and evaluation were conducted and documented after each completed interview, something that is recommended according to Svensson and Starrin (1996). This shorter analysis helped to discuss insights and perspectives, as well as consolidating data into a manageable size and structure. The analysis also included interview feedback and reflection, in order to increase the interviewers' consciousness and potential improvements in the interview procedure. Briggs (1987) recommended such interview awareness and reflection after interviews.

Choosing Interviewees

Possible interviewees were employees at the GMC, directly or indirectly linked to the FFE of the innovation process. The interviewees were chosen in collaboration with company supervisors. 14 interviewees were chosen as favorable interviewees, offering representation from three different divisions and ranks. 10 employees were chosen from GH, 1 from Strategy and Planning (S&P) and 3 from Front End Innovation (FEI). Employees from S&P provided a management perspective on the GH FFE, since their role entails coordination and strategic responsibility. FEI employees contribute through working with business model innovation, providing a possible other perspective on the GH innovation process. From GH both employees and managers were interviewed but due to confidentiality reasons, all are referred to as GH employees. There was some risk for a bias selection of interviewees, since they were not randomly suggested by the administration. It could, for example, mean that the company administration would want to pick employees from the organization that are positive to the current innovation process. However, since we discussed this potential bias explicitly with the company supervisors, there could also be an overrepresentation of employees negative to the current process. In hindsight and further research, these initial findings were found representative for other GMC employees' views, in those areas further studied.

2.3.2   Choosing Theoretical Framework

After collecting the empirical data from the pre-study, the authors decided to delimit the further study. The reason for this was mainly because of the time frame and complexity of the company's radical capability inhibitors. The issues were simply overwhelming, both theoretically and empirically, and the authors considered delimitation as necessary. A theoretical framework was used for the purpose of delimiting the study. The authors chose to adopt Assink's (2006) framework "Inhibitors of disruptive capability" consisting of different barriers for radical innovation. The framework was used as an analysis tool for mapping and getting a clearer synthesis of the empirical data. This helped to guide how to proceed further in the study. The rationale for using Assink's (2006) framework was its explicit connection to large and mature companies. From a first glance at the framework, practically all barriers spotted in the GMC seemed to be represented. Further validation of the use of the framework was achieved through seeing citations at Google scholar (160), as well as positive reactions from university and company tutors.

2.3.3   Analysis of Empirical Data

The empirical data was categorized within the different barriers, which provided a better overview of the concentration of replies for each barrier. This helped indicate which the most evident barriers were at the GMC. Another relevant factor increasing suitability for further research was a low awareness and focus at the GMC. The delimitation process began with defining most evident cluster of barriers and thereafter choosing a barrier within that cluster. To better understand how to study the chosen barrier, the authors utilized a preliminary literature review as well as expert consultation through university and company tutors. The preliminary review, consultation and discussion between the authors resulted in the research questions regarding R&D and Marketing integration. The forming of these research questions is further elaborated on in the end of the pre-study.

2.4   The Case Study

2.4.1   Literature Review

Theoretical Fields

The theoretical research aims to integrate three, in some cases overlapping, theoretical fields: radical innovation, FFE and R&D and Marketing integration. This is illustrated in figure 2, including key previous research utilized in this study.
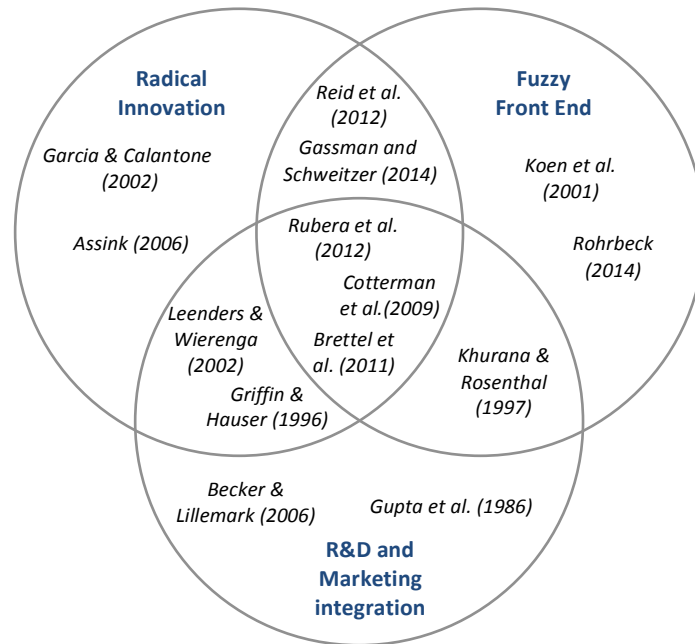
Figure 2 - Conceptual overview of the study's literature review, interlinking three research fields (The authors' own figure)

The literature review focuses on the overlapping areas of the three research fields. The master thesis' research questions lie, mainly, within the section where all fields overlap. The review is, however, wider in order to reach a more comprehensive understanding.

Sources and Search Words

Theory was found on Google scholar, Lund University library database and in magazines, consultant reports as well as from different innovation forums. Scrutiny of articles was made by reviewing amounts of citations at Google Scholar and type of journal. Some sources were merely used for inspiration. The main search words used in various combinations and through various synonyms were: Innovation, innovation process, radical innovation, Fuzzy Front End, Market sensing and foresight, Cross-functional collaboration, R&D and Marketing interface, R&D and Marketing integration.

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Radical Innovation Definition

Since the study aims to pursue improvement potential for radical innovation, the term had to be clearly defined. There are quite many ways to describe radical innovation as well as the degree of radicalism. The innovation typology developed by Garcia and Calantone (2002) was chosen as terminology for the study. The work is well cited (1572 citations on Google scholar) and represents a thorough review of conventional research. Since the case involves studying a highly technically specialized unit and a research question regarding R&D and Marketing integration, the phrased definition with a marketing and technology perspective was suitable. The radical innovation definitions were also complemented with studies on radical innovation projects and their properties (Leifer et al., 2001; Brettel et al., 2011).

Fuzzy Front End - NCD-model

The choice of the New Concept Development model, henceforth NCD model (Koen et al., 2001), to illustrate the FFE was based on the amount of citations on Google scholar (430) and on recommendations from university tutors. The model puts the FFE in an organizational context, suitable for our purpose.

R&D and Marketing Integration

To define R&D and Marketing integration, a structure was adopted from the article "Integrating R&D and Marketing: A review and analysis of the Literature" by Griffin and Hauser (1996). In this article, Griffin and Hauser (1996) have summarized much of the literature regarding R&D and Marketing integration and do not only speak of the aspects of the integration, but also propose ways to define barriers and mechanisms to reduce these, suitable for the study's research questions. The framework was also appropriate since it discusses integration from an innovation perspective. It is published in the Product Innovation Management journal. The article is well cited (1220 citations and Google scholar), but the main issue was that it is quite old (18 years old). The risk of this was mitigated through complementing the framework with more contemporary research.

2.4.2 Empirical Data Collection

Triangulation

The empirical data collection methods varied between different types of qualitative methods. The use of different sources, Yin (2003) defines as triangulation, which can help to increase both reliability and validity. Bell (1993) also claims it can be suitable, in a case study, to vary between different methods to confirm interpreted views from employees. Four methods were used, consolidated data from pre-study, semi-structured interviews, a survey and a workshop, which are described in this section. The core of the analysis utilized interview data, and workshop and survey were used as a complement.

Consolidated Pre-study Data

The relevant parts from the pre-study data were consolidated and supported the analysis. The risk of utilizing this data is that it was not explicitly collected for the

posed research questions, which risked putting data out of context. When unsure, transcriptions were used to interpret to the context, which increases validity and reliability.

Semi-structured Interviews

To be able to answer the research questions, semi-structured interviews were used as a data collection method. These interviews were conducted in the same manner as described in the pre-study (2.3.1 - semi structured interviews), and the reasons for choosing this method are similar. The main difference, from the pre-study interview guide, was that the questions were more directly related to the formed research questions, see appendix B. After the authors had conducted 10 interviews, not much new input was given, and thereby the authors decided to move on to other data collection methods for confirming these results.

The terminology of Griffin and Hauser's (1996) framework for barriers and methods was used in the interviews, as well as in the survey and workshop. Even though the terms are understandable intuitively, they can be interpreted in many different ways, which creates a risk. To reduce misapprehension effects, a glossary was sent out, with a short description from the framework to read before the interview, survey and workshop.

Choosing Interviewees

Interviewees were chosen from the list of employees initially presented from company tutors and 7 GH employees were interviewed. 5 of the chosen GH interviewees were involved in the first interview round, while 2 were new. In order to gain a management perspective, two managers from S&P were also interviewed. In total 12 interviews were held, three of the employees were interviewed twice. For a complete review of interviewees and interviews, see the Oral sources section in the reference chapter. Interviewees were chosen partly based on the authors' perception of the interviewees' openness and willingness to share information to the study's purpose. An advantage of having a good relation is that the interviewee can be comfortable and open when discussing possible changes to the current way of doing things. Briggs (1987) claims that a crucial aspect of achieving valid and reliable data is to have a trustworthy and open relationship to the respondent. Such choice of interviewees can, however, imply a biased selection towards being positive towards change. This risk was mitigated through having an awareness of the risk, and thereby choosing interviewees with seemingly different perspectives on current process and level of GH and M&PM integration.

Survey

The survey was conducted mainly to complement and confirm some of the findings from the semi-structured interviews. The survey form comprised 10 questions, directly derived from Griffin & Hauser's (1996) framework, see appendix F. The questions regarded five different barriers for R&D and Marketing integration and five different mechanisms for reducing these barriers, framed for the purpose of

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stimulating and supporting radical innovation. Bryman & Bell (2011) emphasize simple administration and non-implied effects on respondents as advantages of the survey method. The survey was an efficient method to reach all employees in GH, especially the ones that did not participate in interviews and the workshop. However, the survey was also suitable for the employees participating in the workshop since it introduced them to the calling questions and gave them opportunity to answer individually without being affected by interviewer or other participants. The survey was not statistically analyzed, but rather used as a qualitative complement to interview findings. The survey was sent to all 17 employees in GH and had 9 responses.

Workshop

A workshop was regarded plausible, as a complementary method, since there were some differing views, both in interviews as well as in the survey. The workshop aimed to create discussions, to achieve a better understanding of the posed research questions. Putting together a focus group can be favorable when the interaction itself can help understand the posed research questions (Bryman and Bell, 2011). Bryman and Bell (2011) argue that focus group methods can help participants to build on each other's knowledge base. The case study's research questions were used as calling questions for the workshop, which was sent along with the glossary document. The document was sent to ensure their understanding of the terminology, even though some of them had answered the survey. There were eight participants in the two-hour workshop. The size of the group was in line with what Bryman and Bell (2011) consider desirable, namely 6-10 participants, which made the facilitation manageable and still many perspectives present.

The workshop was facilitated by one of the authors, who did not participate in the discussion, but sat along, listened and took notes. The groups in the workshop were also, in various ways, responsible for the documentation. The authors formed a workshop method partly with help from focus group process guidelines, adopted from Gaizauskatie (2012). He proposes to begin the workshop with making sure the purpose is very clear to everyone and recommends presenting some discussion guidelines, which was included in the introduction. Workshop design included both individual spawning and group discussions, which increases chances of everyone contributing to the workshop (Gaizauskatie, 2012). The schedule and process are described in appendix D. Feedback from participants on the workshop process was positive, some would, however, have preferred longer discussions.

Choosing Participants

Five of the participants were employees from GH, one from S&P and two from FEI. Participants were chosen through matching calendar-free time for the 17 employees in GH as well as others in first interview round who had expressed a strong interest to the subject.

2.4.3 Analysis

The literature review, including frameworks adopted from Gupta, Raj and Wilemon (1986), Koen et al. (2001) and Griffin and Hauser (1996), provided a foundation for analyzing the empirical data of interviews, workshop and survey results. In the first phase of the analysis, the integration gap framework (Gupta et al., 1986) helped to categorize factors driving integration needed and current integration, for evaluating a potential integration gap in the GMC. Thereafter, empirical data on employee views on how R&D and Marketing integration is said to support radical innovation was matched with prior research and categorized in the NCD-model adopted from Koen et al. (2001).

In the second phase of the analysis, the strength of the barriers between GH and M&PM integration in the GMC were evaluated. Griffin and Hauser's (1996) framework with five barriers of integration between R&D and Marketing, which was complemented with contemporary research, provided the language and systematization for this analysis. The collected empirical data for each barrier was consolidated and compared to research on such barriers. Differences and similarities between empirical data and theory could hence be highlighted, which helped to better understand the nature of the barriers. The strength of the barriers was mainly evaluated through employee interview responses, complemented with workshop and survey results.

The last part in the analysis aimed to evaluate suitable type of mechanism for stimulating integration. Griffin and Hauser's (1996) framework put forth a structure for this with five areas of mechanisms, which were nuanced with more contemporary research. To evaluate suitable integration mechanisms, different perspectives were taken into consideration: prior research on effectiveness of mechanism, employees' attitude to mechanism, barriers reduced by mechanism, and the strength of barriers evident at the GMC.

2.5 Empirical Reliability, Validity and Generalizability

It is naturally hard to gain a high amount of reliability since the intensive and qualitative study design makes it harder to repeat the study and reach the same result (Jacobsen, 2002). To address reliability issues, Bell (1993) claims that upholding a thorough documentation of process and interviews is important, which has been done throughout the study. Interviews were both recorded and transcribed. Interview guides, survey form and workshop process are presented in appendix A, B, D and E. Construct validity has also been increased by using data triangulation and by interview technique (Yin, 2003). According to Yin (2003), an intensive approach with nuanced qualitative data, which gives a deeper understanding of the research questions, makes the study's validity strong. The study's iterative approach and interviews with probing have increased the probability of measuring what intends to be measured (Jacobsen, 2002). The transparency of a thorough interview guides towards tutors, both at university and

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host company, has also increased chance of asking questions suitable for fulfilling the purpose of answers becoming as reliable and valid as possible (Bell, 1993). The study's validity was also increased by the establishing a theoretical foundation (Yin, 2003).

The workshop and survey results are, according to authors, in themselves not particularly valid. Some of the participants were not properly familiar with the terminology, despite all actions taken to ensure this. Some post-it were, in example, put in the "wrong" place, with regards to definitions, which of course has implications for validity of voting results. This is, however, not a big issue for this study's proposed results, since the workshop and survey results are merely used as complement, to get a better nuance of the interview data.

The study's conclusions are mainly based on empirical data from GH employees, which very well could be externally valid to represent views of R&D employees in large and mature companies with highly isolated R&D and Marketing functions. The data is, however, not considered externally valid for other organizational contexts, such as cross-functional teams or small organizations. The data is not either deemed externally valid for service innovation processes.

3 Pre-study

This chapter begins with a background of the case company, its strategic situation as well as the radical innovation inhibitors present, mapped in Assink's (2006) framework for inhibitors of radical innovation in a mature company. An analysis is then presented, which results in forming the research questions.

3.1 Introduction to the Case Company

3.1.1 Background of the Case Company

The GMC is an international European company, which has development, manufacturing and sales within the organization. The company operates in more than 170 countries around the world and have 23 000 employees, and is not quoted on the stock exchange (Company website, 2014). The GMC provides products and services to both industrial customers and end consumers (Company internal document, 2014). The GMC is a market leader with an entrepreneurial foundation and a history of introducing radical innovations.

3.1.2 Strategic Situation

The company operates on an increasingly competitive market, which is challenging both in terms of declining margins and differentiation (Company internal document, 2014). This situation puts pressure on the GMC, who no longer can rely on incremental improvements of current products and services in order to stay competitive on the market (Company internal document, 2014).

There seems to be a consensus among the employees, regarding a change of strategic focus in the company. Employees have seen a shift the last 10-15 years, from the entrepreneurial foundation, to a more exploitative nature, culture and administration of the organization. Market leadership with incremental innovations, process and organizational efficiency driving high profitability have made exploitation the new foundation of the company. The organization has, in step with the increase in size, according to interviewees, developed excessive amount of processes, hierarchy and bureaucracy. The R&D division is described as optimized to provide incremental innovations with focus on process optimization and cost reduction.

The interviewees also agree on an ongoing shift in the competitive situation. The GMC operates on a tough market and the main threat is spelled Chinese companies, who copy concepts and steal market share with a consolidated portfolio. Practically all the interviewees emphasized a necessary shift in focus from process efficiency, cost leadership to value driven disruptive innovation as a key success factor to compete and survive on the market.

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3.1.3 Innovation Distinction at the Case Company

According to S&P employees, the shift in the strategic situation has led to increased management priority to support a shift from cost and process efficiency to value driven, more radical innovation. One action, taken a few years ago, was to clearly distinguish two types of innovations, 1.1 and 2.0 innovations. 1.1 innovations are improvements on existing technologies or products, often raised from a need, either from customer or other divisions in the company (Company internal document, 2014). 2.0 innovations are innovations with leaps in differentiation and quality improvements, shaping new technology platforms (Company internal document, 2014).

Employee Perception of 1.1 Innovations

Employees describe 1.1 innovations as the GMC's core business, and a fruitful source to profitability. One interviewee said that 1.1 innovations are improvements of currently used technologies. Some interviewees described 1.1 innovations as version and variant developments. Version refers to performance improvements of a product or technology, whereas variant development means making a new variant of an existing product or technology. One of the employees says that the customer cannot no longer assimilate the improvements and the product portfolio is already too complex. Soon there will be nothing left to improve or no more variants can be made.

Employee Perception of 2.0 Innovations

The employees have different definitions of 2.0 innovations. Interviewees agree that 2.0 innovations imply major changes, and that 2.0 innovations involve more risk. Some, however, argue that 2.0 innovation for the company does not necessarily mean any radical changes for the customer, while others interpreted 2.0 as innovations new to both the customer and the company.

"Innovations creating new markets with new technologies have only occurred 4-5 times in the long history of the GMC"
(GH employee, 2014)

One employee emphasizes the importance of a distinction and says that different types of innovation require different team leaders and teams. The employee explained it by saying that 2.0 innovations need a visionary leader that truly believes in the idea and can sell it, whereas 1.1 requires more of a "football coach-leader". Even though not all the interviewees were familiar with the term 2.0, there seemed to be a consensus regarding that a focus on innovation of radical character is crucial in order to fight the competition.

3.1.4 Organizational Divisions

The GMC is organized in three divisions: R&D, Supply Chain and Manufacturing (SCM) and Commercial Operations (CO). In this thesis, the departments that will be

referred to within the R&D division are: the Greenhouse department (GH), Strategy and Planning department (S&P) and Front End Innovation department (FEI). S&P is a strategic support function to GH and other R&D departments. Marketing & Product Management (M&PM) is a department within the Commercial division. These departments are organized within the three divisions in accordance to Figure 3. To simplify, the figure only includes departments referred to in this thesis.
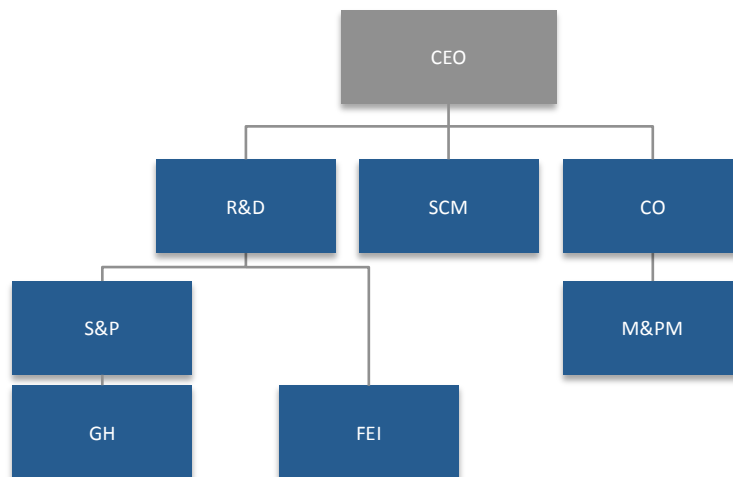
Figure 3 - Organizational divisions in the GMC (The authors' own figure)

Greenhouse Department (GH)

GH handles the 2.0 innovations projects at the GMC (Company internal document, 2014). 2.0 projects often start in GH, but projects can also be transferred to GH from other parts of the organization, if they are regarded as 2.0 projects. GH consists of 17 employees, split into two functions with different expertise areas (Company intranet, 2014). GH employees are development engineers and specialists with substantial experience within their field. An employee described their mission as "create technology leadership for the GMC in the marketplace" (GH employee, 2014). Besides the 17 employees in the GH department, there are some employees in other departments working with GH activities. These employees are also referred to as GH employees.

"Greenhouse's mission is to scout, create, test and evaluate concepts based on new technologies and ideas"
(Company internal document, 2014).

Marketing and Product Management (M&PM)

M&PM is a marketing department within the commercialization organization with around 90 employees, handling product portfolio management, customer relations as well as business and competitor intelligence (Company internal document, 2014). M&PM is a department "responsible for marketing and product management with full accountability for product lifecycle to maximize market share and product

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profitability" (Company internal document, 2014). In the M&PM organization there are currently two employees that are responsible for communicating with GH.

Strategy and Planning (S&P)

Strategy and Planning is a strategic department within the R&D division with 2 employees, which acts as a strategic support function for GH and other R&D departments in the division (Company intranet, 2014). S&P is responsible for driving the processes to create, maintain and coordinate technology roadmaps within the division (Company intranet, 2014).

Front End Innovation (FEI)

Front End innovation (FEI) consists of six employees and is a department working mainly with breakthrough business model innovations, defined as "innovation with significant business potential" (Company intranet, 2014). The Front End innovation department develops concepts, products or services including their business case (Company intranet, 2014). The main job is to develop a portfolio of potential breakthrough innovations and also execute projects. The department also aims to support other breakthrough innovation projects across the organization (Company intranet, 2014).

3.1.5 The GMC Innovation Process

This study focuses on the innovation process that begins with GH studies or projects. GH operates in the early phase of the innovation process, referred to as the Front End (Company internal document, 2014). According to GH employees, there is some collaboration with S&P, FEI and M&PM during this phase. Subsequently, GH projects move on, according to S&P and GH employees, to the responsibility of SCM for product development and manufacturing. Thereafter the commercialization of the products takes over where M&PM are responsible.

3.2 Inhibitors of Radical Innovation at the Case Company

During the interviews, respondents described a wide set of issues related to the capability of introducing radical or so called 2.0 innovations. These issues were synthesized and mapped into the framework adopted from Assink (2006). Assink (2006) argues that inhibitors of radical capability can be split into five clusters of barriers, Adoption cluster, Risk cluster, Mindset cluster, Nascent cluster and Infrastructural cluster, described in Table 1. The framework was used as an analysis tool for delimiting the study.

Table 1 - Description of cluster of barriers (Assink, 2006)

Cluster of barriers	Description
Adoption cluster	A successful product portfolio, bureaucracy and an organization built around efficiency and incremental innovations can inhibit the adoption of new radical ideas. *Barriers: Existing successful products, successful business model, lacking organizational dualism, excessive bureaucracy and status quo stifling*
Risk cluster	High risk and uncertainty in the marketplace, a risk adverse climate and an unrealistic revenue and ROI expectation can inhibit necessary risk-taking in radical projects. *Barriers: High risks and uncertainty, lacking realistic revenue & ROI expectation, risk adverse climate and unwilling to cannibalize own investment*
Mindset cluster	An inability to unlearn, obsolete mental models and not having the required competences for new technologies and markets can inhibit the proper mindset to develop radical innovations. *Barriers: Inability to unlearn, path dependency and dominant design, obsolete mental models, theory-in-use and lacking distinctive competencies*
Nascent cluster	A lack of nurture and stimulation of creativity, lack of market sensing and foresight and process mismanagement can inhibit the capability to generate and develop radical ideas. *Barriers: Lacking creativity, lacking market sensing & foresight, senior management turnover and innovation process mismanagement*
Infrastructural cluster	The lack of necessary infrastructure, for, in example, standards, production, channels and networks can inhibit radical innovation development. *Barriers: Lacking mandatory infrastructure*

3.2.1 Cluster Analysis

Choosing which cluster to focus on for further research included mainly two aspects. Firstly, each cluster was evaluated on the basis of how evident they were at the case company. This was mainly done through seeing how many respondents referred to issues and by interpreting how evident the interviewees regarded barriers in respective cluster. Secondly, a low awareness and focus from the company also made the cluster more relevant to study. Employees most frequently referred to Adoption and Nascent cluster, scoring these clusters slightly higher than the other two clusters. Regarding the company's focus, the different clusters did not vary much. The GMC was interpreted as slightly more aware of the Adoption cluster and thus already conscious about reducing such barriers, which reduced the relevance for this case. The analysis resulted in showing highest relevance for the Nascent cluster and this cluster was hence chosen to investigate further. Since the other clusters are not highly accounted for in the rest of the study, the Nascent cluster is the only cluster presented here. For Assink's (2006) description and empirical responses for the other clusters, see appendix C.

3.2.2 Nascent Barrier Cluster

Respondents indicate that many of the barriers in the Nascent cluster exist. Table 2 presents a theoretical description of each barrier in the cluster and the synthesized responses from the interviewees.

Table 2 - Theoretical description and synthesized responses of nascent barrier cluster

Barrier	Theoretical description	Synthesized responses
Lacking creativity	Large companies often lack the capability to motivate employees with creative minds that have new and break-the-rules ideas (Assink, 2006). Standard business routines hinder the creative process and during uncertain conditions organizations tend to rely upon historical experience and only search for solutions in the existing area of knowledge (Unsworth, 2001).	Employees claimed there is a will to make big changes but that many lose interest because of the high resistance within the GMC organization. Many said that new ideas are not encouraged and that there is no innovative climate. "There is a more innovative climate at the Swedish Social Insurance Agency" Some GH employees said that working with radical innovation is not motivating since the chances of such a product actually making it to the market is so slim, in relation to incremental innovation projects.
Lacking market sensing and foresight	The capabilities needed for radical innovations are a good approach of making sense of influences from the marketplace early in the development, without being shortsighted (Trott, 2001; Assink, 2006). Radical innovations are project with long time horizon, which increase the uncertainty. Potential market and future customers are not conscious about their needs or preferences, why it can be hard to analyze markets that yet not exist (Mullins, Sittig & Brown, 2000; Assink, 2006).	Development engineers rarely, if ever, meet customers or consumers anymore, said to be partly a function of that engineers become more and more specialized, rather than being fostered as generalists. Input on customer and consumer does not effectively transfer from the marketing department, M&PM. Some say there is a dysfunctional R&D and Marketing collaboration. "There is a long distance between GH and M&PM, both physically and mentally". "M&PM are only thinking of the short-term, it is not relevant for us who are working with radical innovation".
Senior management turnover	If management is exchanged during the long-term projects it can create substantial challenges for the team and organization, challenges often related to commitment that can cause significant impacts (Rice et al., 2000).	Some worry about the top management structure and say that the professional top- management, who manage the GMC today, do not have the same willingness to take risks, in the way the more active owner family used to.
Innovation process mismanagement	During the initial phase of an innovation process the team's individuals are as important as the process itself, as a team only can be truly creative when the chemistry is optimal (Stevens and Burley, 2003).	Some employees imply that R&D departments responsible for radical development do not have the necessary business mind capabilities present for introducing radical innovations. Opinions differ regarding who should be responsible for the idea in different phases.

3.2.3 Nascent Barrier Analysis

The Nascent barrier cluster consists of four barriers and further delimitation was needed to reach a manageable scope. The analysis was based on the same aspects as in the cluster analysis, namely, strength of presence and lack of awareness and focus at company. Regarding strength of presence, the senior management turnover did not seem to be a strong inhibitor, since employees practically never referred to it, and senior management turnover was said to be long. The Lacking market sensing and foresight scored high in this sense, responses related to a market, business perspective and marketing collaboration was frequently cited as an issue. The company's awareness and focus differed slightly. There are projects working on innovation climate, interpreted as related to creativity barrier. The senior management turnover was recognized and there seemed to be a high awareness of this risk. In addition, there are also projects referring to balance between formalization and freedom in GH. However, there were few indications of projects aiming to better balance the marketing and technology perspective in GH, why the lacking market sensing and foresight barrier was interpreted as quite high. The score resulted in the decision to focus on the barrier Lacking market sensing and foresight.

3.3 Forming Research Questions

There are many ways to approach the Lacking market sensing and foresight barrier. The authors decided to let responses from GH employees and company tutors indicate the most effective way to attack the issue. A key issue, found regarding this barrier, was that the integration with the marketing department was practically non-existent. The desired market sensing and foresight knowledge and competence in GH ought to be present in Marketing and Product Management (M&PM) with business and competitor intelligence units as well as daily contact with customers and consumers. Both employees and company tutors also confirmed this notion. M&PM's responsibility was said to have responsibility to provide marketing input for GH development, but that the collaboration was dysfunctional. A brief literature review and consultation with university experts showed that R&D and Marketing integration to support radical innovation was a little explored dilemma in academia.

This emerged into four research questions:
- Is there reason to believe that increased integration between Greenhouse and Marketing & Product Management in the Fuzzy Front End would stimulate and support radical innovation?
- How would this integration affect Fuzzy Front End activities?
- What are the barriers for integration between Greenhouse and Marketing & Product Management?
- How can these barriers be reduced?

4 Theory

The theoretical framework in this study consists of, and interlinks, three research areas: radical innovation, FFE and R&D - Marketing integration. Firstly, innovation and degrees of novelty are defined. Thereafter, FFE is explained and illustrated with the NCD-model. Finally, the area of R&D - Marketing integration is described in-depth, including its challenges and opportunities for stimulating and supporting radical innovation.

4.1   Innovation

Innovation can be described as something new and original, in whatever field, that breaks into society and means something revolutionary for people (Frankelius, 2009). Garcia and Calantone (2002) defines innovation as "an iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention" (p. 112), a definition that will be used in this study. This definition emphasizes that innovation should be seen as an iterative process of ideas that are developed and result into something valuable. An invention is described as a discovery that does not go further than the laboratory (Garcia & Calantone, 2002). To be an innovation, an invention must be placed in the marketplace, create value for the user and return economic value for the company (Garcia & Calantone, 2002). The object of innovation refer to what the innovation process result in, for example new products or services, new ways of working (processes) or new business models (Assink, 2006).

4.1.1   Incremental and Radical Innovation

There are many definitions of innovation and degree of novelty (Garcia & Calantone, 2002; Assink, 2006). Incremental, radical, breakthrough and disruptive innovation are just a few examples of terms for the product's innovativeness that can be found in the literature (Garcia & Calantone, 2002; Assink, 2006). Incremental innovation refers to innovation with a lower degree of novelty (Tidd & Bessant, 2009). Such innovation remains within the boundaries of existing market and technology processes (Assink, 2006). Radical, breakthrough and disruptive innovation are all innovations with a higher degree of novelty. Leifer et al. (2001) defines radical innovation as "a product, process or service with either unprecedented performance features or familiar features that offers significant improvements in performance or cost that transform existing markets or create new ones" (p. 102). Garcia and Calantone (2002) present a similar definition, "innovations that embody a new technology that results in a new market infrastructure (p. 120).

To nuance the newness of innovation, Garcia and Calantone (2002) have created a framework where innovations either embody a new technology or a new market, which can be new on both a micro or macro level. The market dimension can infer

new marketplaces to evolve or new marketing skills, whereas the technology dimension means the innovation may lead to a changes in current technology, new R&D resources or processes. A micro perspective implies that the innovation is only new for the company or the customer, whereas a macro level means it is new to an industry or the world. Through these definitions, the framework divides innovation into four different types of innovations, incremental, really new and radical innovations, illustrated in Figure 4.

Market

Really new	Radical
Incremental	Really new

macro

micro

micro *macro* Technology
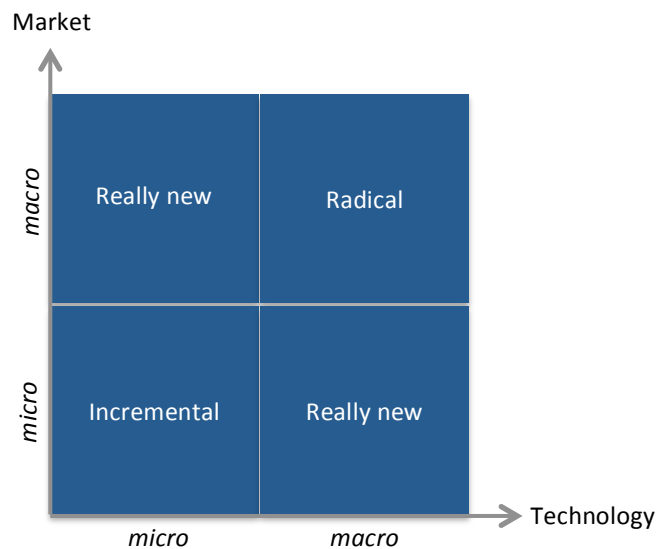
Figure 4 - Degree of innovation novelty (Garcia & Calantone, 2002)

Incremental innovation refers to marketing and technology discontinuities on micro level. Such innovations can be defined as "products that provide new features, benefits, or improvements in the existing technology in the existing market" (Garcia & Calantone, 2002, p. 123). Really new innovations are innovations that can cause technology and/or marketing changes on micro level and also one of them on macro level, but not both (Garcia & Calantone, 2002). A radical innovation causes market and technology discontinuity in the world or industry as well as automatically implying changes for the firm. In this study, radical innovation will be defined as all innovations that cause any changes on macro level (really new and radical), i.e. all innovations except incremental innovations.

Radical Innovation Project Properties
Leifer et al. (2001) backtracked 12 radical innovation projects in large and mature high-tech companies, such as IBM, Polaroid and Texas instruments. The projects did have things in common. Firstly, they had very long life cycles, often a decade or longer. They also had stops and starts, deaths and revivals and were full of unpredictable exogenous events. Leifer et al. (2001) claim that opportunity recognition for potential radical innovation cannot be an organizational process, but a creative act by an individual. In 10 of their 12 radical innovation projects studied,

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low- to mid-level research managers were pointed out as the ones recognizing opportunities.

Reid and De Brentani (2012) claim that radical innovation projects differ from incremental innovation projects through being "bottom-up". This means that radical innovation often spring from individuals and teams in the organization, rather than being ordered. Orders for incremental projects can come internally within the organization or externally from a customer (Reid & De Brentani, 2012). It is not unusual that radical innovation projects start without top-management support and thereafter, when revealed, come as a surprise, which makes the project stand still (Khurana and Rosenthal, 1997; Reid & De Brentani, 2012).

4.1.2 Market Pull and Technology Push

A distinction is often made between two different types of innovation strategies, market pull and technology push (Brem & Voigt, 2009). Market pull means that unsatisfied customer needs trigger a demand for problem solving (Brem & Voigt, 2009). Technology push relies on application push of a technology by developers that aims to result in commercial use for new know-how, which does not require a direct need (Brem & Voigt, 2009). Technology push strategies tend to be more common in industries less influenced by culture and taste, such as the pharmaceutical industry (Becker & Lillemark, 2006). Jaruzelski and Dehoff (2008) make a similar distinction between different types of innovation strategies: technology drive, need seeking and market reading. Technology drive companies are said to rely on internal R&D efforts to seek and meet unarticulated needs. Need seeker companies rely on direct customer feedback and to be first on the market with breakthrough innovations. Market readers are said to focus on incremental change and adapt, in a second-mover manner, to customer preferences and market standards (Jaruzelski and Dehoff, 2008).

4.1.3 Innovation Process

Veryzer (1998) argues that many researchers have different definitions of the innovation process, but that the basic progression and phases are very similar. In Veryzer's (1998) description of the innovation process, an innovation sequentially goes through strategic planning and concept generation, pre-technical evaluation, technical development and thereafter commercialization. According to Koen et al. (2001), the innovation process can be divided into three parts, illustrated in Figure 5. The innovation starts in the early front end, where typical activities are to gather and define opportunities, get inspiration and develop concepts (Koen et al., 2001). The process continues with committing resources, aligning teams, setting specifications and developing the product or technology in the New Product and Process Development phase (Koen et al., 2001). Subsequently, the product is put on the market in the commercialization phase (Koen et al., 2001).
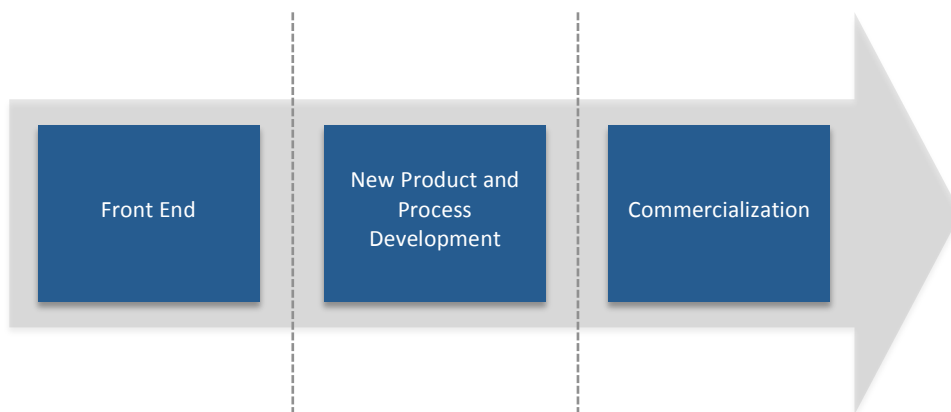
Figure 5 - The innovation process (Koen et al., 2001)

4.2 Fuzzy Front End

This study defines the Front End of the innovation process as the Fuzzy Front End (FFE). The FFE is a term introduced by Smith and Reinertsen (1991). The FFE comprises everything from an opportunity or inspiration, until substantial resources are committed to begin a product or technical development process (Smith & Reinertsen, 1991). The "fuzziness" in the term practically means that the mechanisms in this early phase are hard to grasp, control and understand (Smith & Reinertsen, 1991). According to Koen et al. (2001), FFE is often very experimental and uncertain. More characteristics of FFE are presented in Table 3.

Table 3 - Fuzzy Front End characteristics (Koen et al., 2001)

Fuzzy Front End characteristics	
Nature of work	Experimental, chaotic, difficult to plan
Commercialization date	Unpredictable
Funding	Variable, many projects bootlegged
Revenue expectations	Often uncertain, sometimes with a great deal of speculation
Activity	Both individual and team in areas to minimize risk and optimize potential

The area of FFE has been undergoing research aiming to provide clarity and trying to unveil the mystery of "managing the unmanageable" as Gassman and Schweitzer (2014) phrase it. Studies indicate that the FFE is the most complex phase of the innovation process but often offers the greatest opportunity to improve the total innovation capability (Reid & De Brentani, 2004). Koen et al. (2001) also aim to provide clarity to the terminology and create a common language to the FFE. Therefore, Koen et al. (2001) introduced the New Concept Development model (NCD), which is frequently referred to in FFE research and further described in the next section (Reid & De Brentani, 2004)

4.2.1 NCD-model

The NCD in Figure 6 shows different activities conducted in the FFE. Koen et al., (2001) do not mean to define the FFE as a sequential process, but rather a set of activities highly iteratively interacting (Koen et al., 2001). One activity is to find opportunities, which can be new market opportunities, but also technologies. Another activity involves coming up with ideas, at some point resulting in the activity idea selection and finally the activity of concept and technology development. A finished concept that is aligned with a development process marks the end of the FFE (Koen et al., 2001). Executive-level support and organizational culture is said to power the elements of the model, and is referred to as an "engine". Koen et al. (2001) also describe how influencing factors consist of factors affecting decision-making of the two inner parts, activities and engine. Such influencing factors are organizational capabilities, business strategy as well as the outside world of channels, customers, competitors and enabling sciences (Koen et al., 2001). In the section below each activity in NCD are described in detail and supplemented with other research connected to the activities.
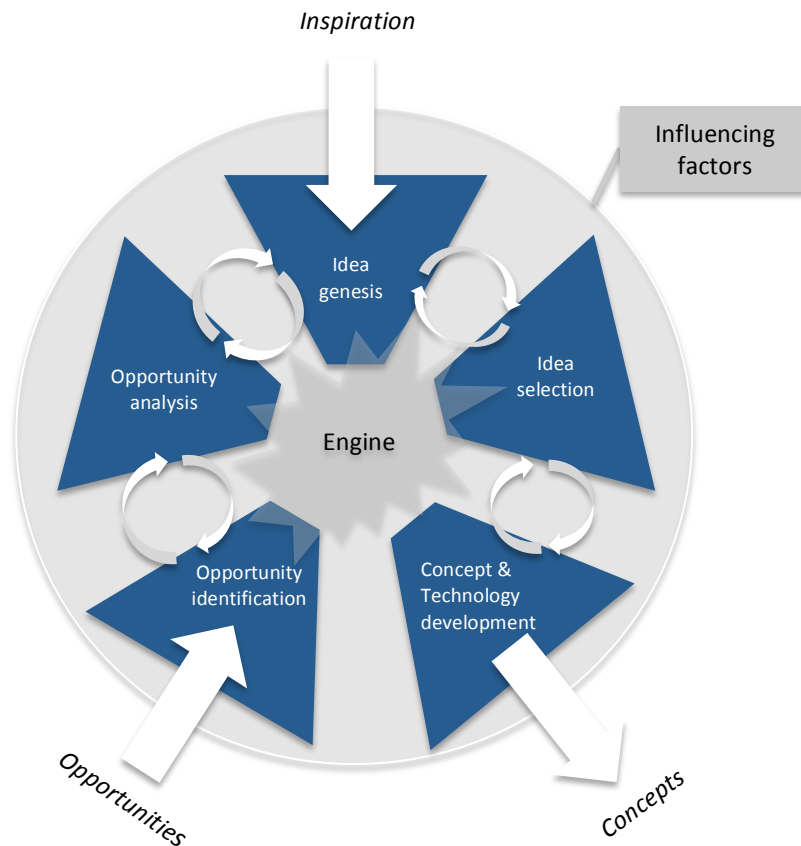
Figure 6 - The New Concept Development model (Koen et al., 2001)

Opportunity Identification

Opportunity identification in the FFE is when organizations, formalized or ad hoc, aim to identify new opportunities for innovation (Koen et al., 2001). The opportunities can be both business and technology opportunities, and infer incremental as well as radical changes for the company and marketplace (Koen et al., 2001). Paap and Katz (2004) claim that an innovation starts with a connection between a need and the technology to address that need, which is combined to form an idea. Koen et al. (2001) argue that both formal and informal process of communication and creativity can be used to identify opportunities. Such formal processes can be creativity tool and techniques (brainstorming, mind-mapping and lateral thinking) as well as problem-solving techniques (causal analysis, fishbone diagrams, process mapping, theory of constraints). Informal opportunities refer to: ad hoc sessions, water cooler/cyberspace discussions, senior management input or individual insights (Koen et al., 2001).

Opportunity Analysis

Analyzing and assessing opportunities in an early stage of the FFE is associated with a great deal of uncertainty (Poskela, 2007; Reid & De Brentani, 2004; Koen et al.,

2001). Such analysis and assessment can be made through assembling focus groups, conducting market studies and/or scientific experiments (Koen et al., 2001). Other tools for evaluating opportunities involve appraising the culture and strategy alignment and doing rough business assessments (Reid & De Brentani, 2004). Competitive and trend analysis are also recommended in this phase (Koen et al., 2001).

Idea Genesis

The activity of coming up with ideas is not usually a light bulb, "aha experience" and even in the rare cases when it its, the flash of light is just the beginning (Leifer et al., 2001). Ideas are described as possibly coming from the natural curiosity of a scientist or engineer, or stimulated by a challenging problem (Leifer et al., 2001). Koen et al. (2001) also explains generation as an evolutionary and iterative process where ideas are constantly developed, combined, refined and upgraded. Contact with customers/users and linkage with other teams, companies and institutions is said to enhance this activity (Koen et al., 2001).

Idea Selection

A critical activity in the FFE is to choose between ideas. Koen et al. (2001) say that idea selection can span from individual gut feeling choice to rigid portfolio methods. According to Koen et al. (2001) formal processes are hard to implement due to limited information and understanding of ideas at this early stage. However, it is a debated subject, which Poskela (2007) addresses in his article 'Formalization of the Front End phase of the innovation process - competitive advantage or path to downfall'. The results from this study indicate that process formalization is positively correlated to concept excellence. The study also points out that the positive relationship is even higher when market uncertainty is high (Poskela, 2007). Gassmann and Schweitzer (2014) nuance this by saying that a balance between formal and informal processes is the key to successful idea selection, not the degree of formalization itself.

Concept and Technology Development

This concluding activity of the NCD is associated with developing a formal project proposal and a business case (Koen et al., 2001). The business case should be based on estimates on market potential, customer needs, investment requirements, competitor assessments and risks. The business case's formality varies according to the nature of project (Koen et al., 2011). Project proposals and prototypes can iteratively be tested in this phase to reduce technical uncertainty prior to establishing a formal project proposal (Koen et al., 2001).

4.3   R&D and Marketing Integration

4.3.1   R&D and Marketing Integration Terminology

R&D and Marketing integration is a widely recognized term within the innovation literature (Griffin & Hauser, 1996; Khurana & Rosenthal, 1997; Kahn & Mentzer,

1998; Brettel et al., 2011). The term "integration" has been used as an umbrella term to describe cooperation, interaction and communication, and collaboration (Rubera et al., 2012). Rubera et al. (2012) define integration as "the magnitude of interaction and communication, the level of information sharing, the degree of coordination, and the extent to which R&D and Marketing have a common vision and collective goals during a development project" (p. 767). In this study, this definition is used to define R&D and Marketing integration.

There can be different degrees of R&D and Marketing integration (Rubera et al., 2012). Kahn and Mentzer (1998) suggest that the level of integration can be described by interaction, only exchange of information, and collaboration, which includes development of mutual goals and resource sharing. According to Kahn & Mentzer (1998), low degree of integration can imply interaction between departments, but that they act more or less independent. When integration intensifies to a higher level, collaboration is developed between the departments (Kahn & Mentzer, 1998). Khurana and Rosenthal (1997) make a similar categorization in the article 'Integrating the Fuzzy Front End of New Product Development'. Integration emerges in three maturity stages, awareness, being an "island of capability" and subsequently, the ultimate goal, an integrated capability (Khurana & Rosenthal, 1997). The goal of an integrated capability, according to Khurana and Rosenthal (1997) consists of a strong collaboration, communication and preferably also through cross-functional teams.

4.3.2   R&D and Marketing Integration to Support Innovation

Integration and Innovation Success Relationship
A positive relationship between R&D-Marketing integration and innovation success is well established in innovation literature (Gupta & Wilemon, 1990; Moenaert et al., 1995; Song et al., 1997; Kahn & Mentzer, 1998; Song & Xie, 2000; Cotterman et al., 2009; Brettel et al., 2011; Rubera et al., 2012). R&D and Marketing integration is considered a critical factor for innovation success since the innovation process often is a cross-functional process, where different departments have to cooperate to be successful (Gupta & Wilemon, 1990).

Integration Gap
Gupta et al. (1986) have developed a conceptual framework to better understand the need for R&D and Marketing integration and its relation to innovation success. The integration gap between R&D and Marketing is the discrepancy between the degree of integration ideally required, and achieved integration (Gupta et al., 1986). The perceived need for integration depends on a firm's innovation strategy and its environmental uncertainty, such as rapid shifts in competition and/or technology. Veryzer (1998) claims that a technology push strategy requires a higher degree of integration than a market pull strategy, since the market opportunity is not involved from the beginning. There are also studies indicating that pursuing an innovation strategy with the ambition of being first with products on the market, is likely to require higher R&D and Marketing integration (Gupta et al., 1986; Fain, Kline and

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Duhovnik, 2011). Integrating marketing perspective becomes essential when no competitor has preceded launch of products (Fain et al., 2011). The integration achieved in companies is determined by two factors. Firstly, organizational factors such as structure, reward system and senior management's attitude and emphasis on need for R&D and Marketing integration (Gupta et al., 1986). Secondly, individual differences between R&D and Marketing managers, for example regarding professional orientation, time orientation, types of products/projects preferred and their tolerance for ambiguity. The framework is illustrated in Figure 7, which shows how an integration gap affects innovation success. This framework has been tested by Fain et al. (2011) in several case studies. These studies confirmed the framework's relevance and validated that innovation success is influenced by level of R&D and Marketing integration.
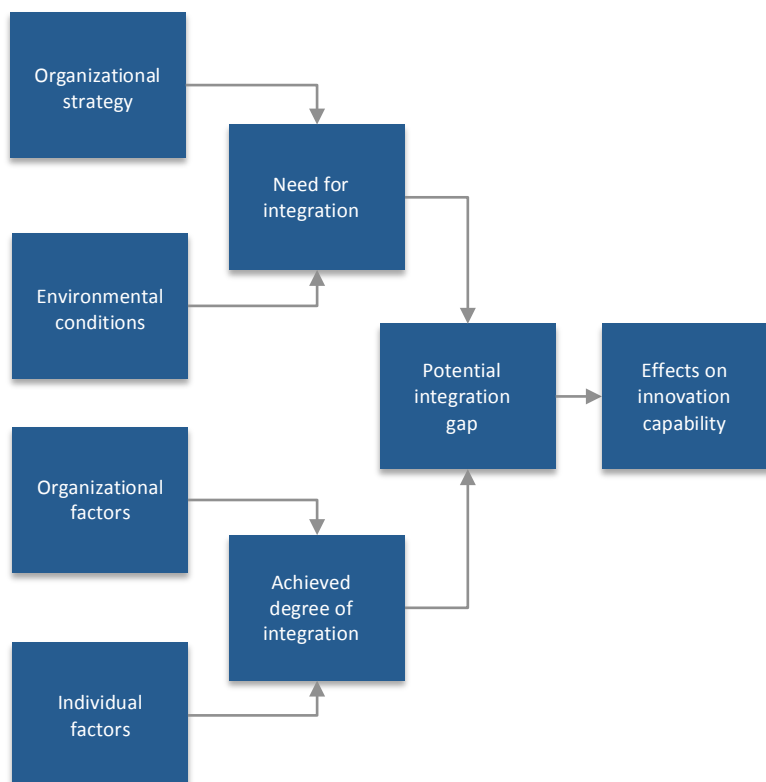
Figure 7 - R&D and Marketing integration gap framework (Gupta et al., 1986)

Integration Effects

Rubera et al. (2012) show that R&D and Marketing integration can lead to shorter development processes, cost reductions, joint contributions to overall organizational goals, improved quality, faster time to market, and commercial success. R&D has often many different routes to explore so in order to reduce the risk of exploring alternatives that will not generate benefit, Marketing can provide guidance consistent with market needs (Rubera et al., 2012). According to Song & Xie (2000) integration helps to guide engineering design, through market assessments and

when addressing potential major customers or potential competition. Becker and Lillemark (2006) state that marketing experts are most effective through helping R&D departments to form necessary conditions to meet for partly developed projects, rather than specific goals to begin with.

Rohrbeck and Gemünden (2011) claim that marketing departments' foresight for market trends can be valuable input for R&D department development in order to better understand the long-term market situation. Rohrbeck (2014) claims that companies must have the ability to innovate on the basis of early trend signals, thus involve both internal and external actors in discussions of the future, to be an organization that grasp opportunities in time.

"When technological and market competence are co-developed, the chances of market success improve"
(Rubera et al., p. 777, 2012)

Kim and Wilemon (2002) claim that increased R&D and Marketing integration can build relationships, create mutual understanding and enhance idea transfer between departments. Scholars also claim that R&D and Marketing integration can stimulate alignment between product concept and company strategy (Frishammar and Florén, 2008). Despite many claimed positive effects of integration, there can be high costs associated with integration. Research shows that increased frequency of meetings and investments in different mechanisms for integration, such as physical relocation of departments, can infer costs (Song et al., 1998; Brettel et al., 2011). This is also supported by Gupta et al. (1986), who show that cross-functional cooperation can prolong decision-making processes.

4.3.3 R&D and Marketing Integration in FFE to Support Radical Innovation

Even though the research is quite consistent on R&D and Marketing integration as a support to innovation success, it is not equally consistent with regards to radical innovation (Song & Xie, 2000; Christensen, 2013). Song and Xie (2000) argue that a high degree of product innovativeness increases the need of marketing input. At the same time, involving Marketing in development of radical products may not only provide information and new perspectives, it can also constrain the product design (Song & Xie, 2000). Since Marketing has a shorter time horizon and more focus on profit than R&D (Griffin & Hauser, 1996), Marketing may favor lower costs and shorter development time at the expense of technological innovativeness (Song & Xie, 2000). Christensen (2013) argues that a too high degree of integration can imply that firms fail to develop disruptive technologies if short-term marketing perspective comes to dominate the technology development.

There is research showing a positive relation between R&D and Marketing integration in the FFE and radical innovation success (Cotterman et al., 2009; Brettel et al., 2011; Rubera et al., 2012). Brettel et al. (2011) performed a study of cross-

functional integration and its innovation performance impact on 50 incremental and 68 radical innovation projects with a distinction between the development and commercialization phase. Brettel et al. (2011) find significant positive association between R&D and Marketing integration for both incremental and radical projects. However, during the development phase, including the FFE, the impact of integration was deemed lower for radical projects than for incremental projects.

Rubera et al. (2012) have also investigated the relation between degree of integration and innovation success, depending on the research activities nature, which is divided into exploration and exploitation. Exploiting existing technology and/or market knowledge tends to result in incremental innovation (Andriopoulos & Lewis, 2009). On the contrary, exploration refers to exploration of new market and/or technology knowledge, which can result in radical innovations (Andriopoulos & Lewis, 2009). The study shows that the optimal level of integration is dependent on type of innovation activities, which is illustrated in Figure 8 (Rubera et al., 2012). Exploring both marketing and technological competence is called pure exploration and exploiting both competences results in pure exploitation (Rubera et al., 2012). The study shows that a high level of integration between R&D and Marketing leads to success in all cases, despite for pure exploitation activities. In terms of pure exploration activities, high integration was shown beneficial for market success, but there was also an implied process failure due to slower process and more resources demanded than expected (Rubera et al., 2012). Even though Rubera et al. (2012) aim to generalize correlations between R&D and Marketing integration and innovation success, they emphasize that innovation success is highly contextual and company specific.
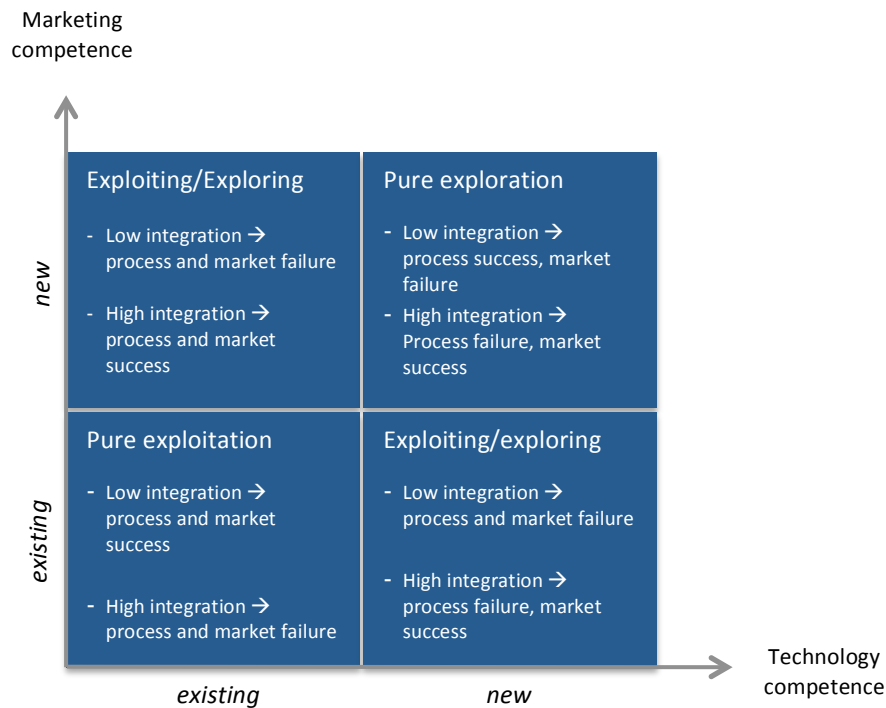
Figure 8 - Performance outcomes depending on level of integration for different types of innovation activities (Rubera et al., 2012)

Rubera et al. (2012) argue that incorporating Marketing in FFE increases the business perspective early in the process, which leads to increased chances of innovation success. A study conducted by Cotterman et al. (2009) also shows that companies with historical successful radical innovation have integrated marketing and technology practices to collaborate early in the innovation process. Both marketing and technology groups, and also senior management, are highly involved in the innovation process and the members work in highly integrated cross-functional teams, often co-located in a single facility.

> *"Successful breakthrough innovation depends on integrating marketing and technology functions"*
> (Cotterman et al., 2009)

4.3.4 Barriers for R&D and Marketing Integration

Effective integration between R&D and Marketing is challenging to accomplish (Griffin & Hauser, 1996; Becker & Lillemark, 2006; Calantone & Rubera, 2012). Griffin and Hauser (1996) claim that over time, R&D and Marketing often grow apart and become less aware of the other's contribution. R&D and Marketing integration is especially difficult in large and mature companies (Griffin & Hauser, 1996; Leenders & Wierenga, 2002; Assink, 2006) and in companies relying on a technology push strategy (Becker & Lillemark, 2006).

Griffin and Hauser (1996) have identified and categorized five barriers for successful integration between R&D and Marketing. These barriers are related to personality, cultural thought worlds, language, organizational responsibilities and physical barriers, illustrated in Figure 9.
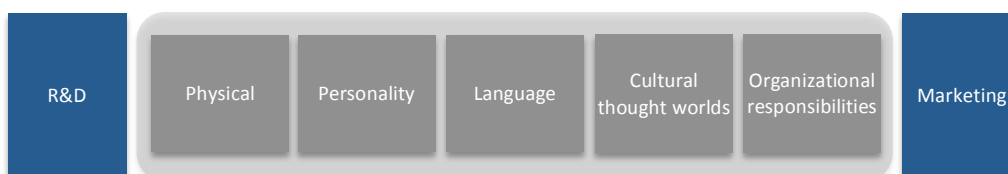
Figure 9 - Barriers to integration between R&D and Marketing (Griffin & Hauser, 1996))

Personality Barrier

There can be personality differences between employees in R&D and Marketing, which creates barriers for integration (Griffin and Hauser, 1996). Employees in the two departments often have different personalities that can turn them into stereotypes with different goals and aspirations, needs and motivational drivers, which are listed in Table .

Table 4 - Stereotype goals, needs and motivational drivers for R&D and Marketing employees (Griffin & Hauser, 1996)

	R&D	**Marketing**
Goals	- Knowledge as a source of value to mankind - Research for research's sake - Peer evaluation and recognition	- Activities relevant to the firm's objectives - Organizational recognition
Needs	- Autonomy - Peer recognition - Creative environment - Support for advancing knowledge in society	- Plans, procedure, policies and processes - Organizational recognition - Team work - Increased organizational status
Motivational drivers	- Service to mankind - Patents, publications and professional recognition - Freedom to solve problems and advance knowledge	- Rewards and sanction system with pay and advancement through organization

Xie, Song and Stringfellow (2003) agree that differences in goals between R&D and Marketing are well recognized as a barrier to integration. Goal incoherence refers to the extent employees of R&D and Marketing aim for different goals and use

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different decision criteria (Xie et al., 2003). The drivers of motivation can also differ between the departments (Griffin & Hauser, 1996). R&D is often motivated by publications and advancement of their discoveries, whereas Marketing is concerned with organizational survival and growth (Griffin & Hauser, 1996).

A study of personality differences between R&D and Marketing managers at 167 high-tech firms showed that differences were not particularly evident (Gupta et al., 1986). However, according to Griffin and Hauser (1996) such stereotypes can create barriers, even though the personality differences do not exist. Keaveney (2008) studied this phenomenon closer in the article 'An attribution theory approach to marketer-engineer conflict in high-technology companies'. Keaveney (2008) supports the notion of existing barriers due to employee perception of differences in personality, regardless of the actual differences.

Cultural Thought World Barrier
The barrier of cultural thought worlds refers to the different backgrounds employees in R&D and marketing departments often have (Griffin & Hauser, 1996). Different schools and training approaches result in various worldviews (Dougherty, 1992). Griffin and Hauser (1996) have compiled a list of differences in cultural thought worlds, see Table 5. According to Gupta et al. (1986), the most common difference is time-orientation. In the development phase, R&D typically explores long-term ideas, whereas Marketing aims for short-term profits, which may lead to conflicts (Xie et al., 2003).

Table 5 - Differences in cultural thought worlds between R&D and Marketing (Griffin & Hauser, 1996)

Dimension	R&D	Marketing
Time orientation	Long	Short
Project preferred	Advanced	Incremental
Ambiguity tolerance	Low	High
Departmental structure	Low	Medium
Bureaucratic orientation	Less	More
Orientation to others	Permissive	Permissive
Professional orientation	Science	Market
Professional orientation	More	Less

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These differing views can be reinforced in the culture of the departments and turn them into two different worlds (Dougherty, 1992). The different departments are often trained to see the problem through their own lenses (Wind, 2005). This can imply that departments develop self-contained communities with own goals (Griffin & Hauser, 1996). Dougherty (1992) explains such a community as "a community of persons engaged in certain domain of activity who have a shared understanding about that activity"(p. 182). Such communities can forget they are working for the same corporation as other departments, with mutual corporate goals (Griffin & Hauser, 1996). In order to gain a fruitful cooperation it is important to understand and appreciate the other department's thought world (Griffin & Hauser, 1996).

Language Barrier
Connected to different cultural thought worlds are also language barriers (Griffin & Hauser, 1996). Both R&D and Marketing often use an own set of terms and definitions, which can cause misapprehensions (Griffin & Hauser, 1996). Subtle differences in language do often imply vastly different solutions, which can affect the project's success. In addition, level of details often differ between the departments and might obstruct the understanding, thus unnecessary frustration can occur (Griffin & Hauser, 1996).

Organizational Responsibility Barrier
Different task priorities and responsibilities between departments is, according to Griffin and Hauser (1996), a common organizational difference that creates barriers for integration. Functional success measurements that are unsupportive for integration, and lack of integration support from management, are two other examples of organizational barriers between R&D and Marketing (Dougherty, 1992; Griffin & Hauser, 1996). These barriers are often designed and controlled by top management (Griffin & Hauser, 1996).

Physical Barrier
Another barrier to integration is the physical design and location of the R&D and marketing departments (Pinto, Pinto & Prescott, 1993; Griffin & Hauser, 1996; Van den Bulte & Moenaert, 1998). It is not unusual that the departments are located on separated sites, which implies isolation (Griffin & Hauser, 1996). According to Peters (1991), employees are most likely to interact and communicate when physical settings encourage them to. Long physical distances can make face-to-face meetings inconvenient and not as natural, which leads to decision-making delays (Griffin & Hauser, 1996). Possibilities for informal chats and coffee break conversations decrease dramatically when the departments are separated and formal meetings are required in order to have an interchange (Brettel et al., 2011). According to Griffin and Hauser (1996), physical barriers may also reinforce other barriers negatively, such as language and cultural thought world barriers.

4.3.5   Mechanisms to Reduce Integration Barriers

Griffin and Hauser (1996) have compiled six general types of mechanisms for achieving functional integration between R&D and Marketing: Relocation and physical facilities design, Personnel movement, Informal social systems, Organizational structure and Incentives and rewards. Griffin and Hauser (1996) presents which integration barriers the integration mechanisms will overcome according to Figure 10. The relationship between these mechanisms and overcome barriers has also been studied by Leenders and Wierenga (2002). This study confirmed the interrelations presented by Griffin and Hauser (1996) as well as finding significant correlations between all integration mechanisms and overcome barriers.
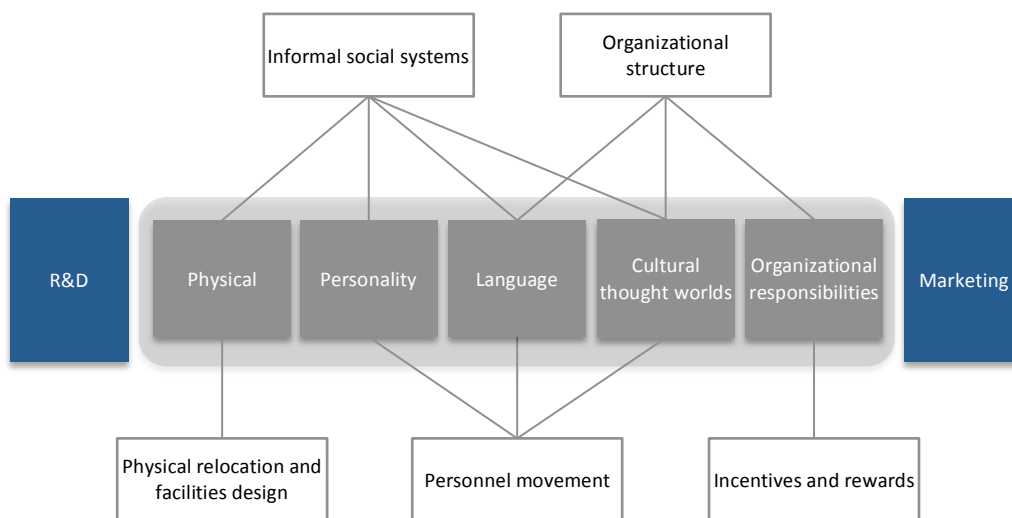
Figure 10 - Integration mechanisms' linkage to integration barriers (Griffin & Hauser, 1996; Leenders & Wierenga, 2002)

Relocation and Physical Facilities Design

Relocation can be made to reduce physical barriers distance between R&D and Marketing (Griffin & Hauser, 1996). According to Griffin and Hauser (1996), increased physical proximity does not in itself generate communication and cooperation, but provides circumstances for better integration. In a study of Pinto et al. (1993), authors claim that better physical proximity has a substantial effect on cross-functional integration. Office location and physical design do have a significant impact on frequency and nature of the interaction among employees (Pinto et al., 1993). Communication is enhanced when groups are working in non-territorial spaces with access to informal meeting places (Allen, 1984: Griffin & Hauser, 1996). Chrysler is one example of a firm that have co-located cross-functional development groups, which increased the level of communication (Lutz, 1994). In addition, a study of Leenders and Wierenga (2002) also shows a strong positive correlation between low physical distance and integration. Physical redesign must be complemented by other methods to foster relationships and encourage cooperation (Allen, 1984;

Griffin & Hauser, 1996). Even though most studies show this positive correlation, a study of Van den Bulte and Moenaert (1998), showed no significant effect on integration when R&D and marketing departments were physically separated. Leenders & Wierenga (2002) argue that the mechanism of relocation and physical facilities design does not have significant effect if a strong informal communication already is in place, which could explain such results.

Personnel Movement
Another mechanism said to improve integration between R&D and Marketing is personnel movement (Roussel, Saad and Erickson, 1991; Griffin & Hauser, 1996; Leenders & Wierenga, 2002). This is an approach to blur the distinction between departments through employee rotation, which can stimulate information transfer, but also knowledge about department cultures (Griffin & Hauser, 1996). According to Griffin and Hauser (1996), personnel movement can reduce personality, thought world and language barriers. Moenaert, Souder, De Mayer and Deschoolmeester (1994) show that role flexibility stimulates information flow between R&D and Marketing. The managers in this study were often, however, very skeptical to such role flexibility, and some of them had no belief in putting a Marketing employee in the R&D department. Leenders and Wierenga (2002) argue that a job rotation among R&D and Marketing employees does not have positive significant impact on level of integration. It is not easy to transfer R&D and Marketing employees between departments, since skills and knowledge widely differ (Leenders & Wierenga, 2002). Griffin and Hauser (1996) suggest that part-time transfers can be used, which provides valuable perspectives without risking to erode functional skills in long-term, an evident risk from long-term and frequent rotations.

Informal Social Systems
Informal social systems encourage open communication across departments and can hence reduce personality, cultural thought worlds, language and physical barriers (Griffin & Hauser, 1996). Informal contact can often substitutes formal processes (Workman, 1993; Griffin & Hauser, 1996). Leenders and Wierenga (2002) show a positive, but not significant, correlation between informal social system and integration. Kahn and Mentzer (1998) show that structured formal meetings between R&D and Marketing can be counter productive to some degree and that both departments prefer informality in order to collaborate. Griffin and Hauser (1996) claim that it is important that management foster and support a culture that nurtures integrated innovation, a culture with high tolerance for calculated risks, open communication, shared rewards and decentralized.

"What works is knowing the right people. . . Things often happen so quickly and outside of the formal processes that it's critical to have contacts and keep tabs on the pulse of engineering." (Workman, 1993)

Organizational Structure

Griffin and Hauser (1996) show that a firm's organizational structure has a significant impact on level of integration. By having a beneficial structure, barriers such as language and organizational responsibilities can be reduced. Gupta and Wilemon (1988) state six organizational characteristics that enhance cooperation between R&D and Marketing: harmonious operations, formalization, decentralization, innovativeness, value cooperation and joint reward systems. Many firms are functionally organized, a structure often lacking mentioned characteristics (Griffin & Hauser, 1996). Griffin and Hauser (1996) suggests three organizational structures for supporting integration: coordinating groups, matrix organizations and project teams. Utilizing cross-functional teams is the most, of the three, acclaimed mechanism for integration (Griffin & Hauser, 1996). Project teams maximize coordination across functions and set a group to focus on a specific goal, which makes it easier to overcome cultural thought world and language barriers (Griffin & Hauser, 1996). Leenders and Wierenga (2002) show that the highest degree of integration between departments comes from working in cross-functional teams. Another organizational structure is dyadic relationships, which means R&D and Marketing have joint responsibility for projects (Griffin & Hauser, 1996). Dyadic relationships encourage innovation and can also catalyze and institutionalize longer-term interactions between R&D and Marketing (Leenders & Wierenga, 2002).

O'Reilly & Tushman (2004) have studied the effects on radical innovation project success in functional organizations, cross-functional teams, unsupported teams and ambidextrous organizations. Unsupported teams refer to an autonomous emerging business project, set up outside the established organization and management hierarchy (O'Reilly & Tushman, 2004). Ambidextrous organizations are divided into structurally independent units with own processes, structures and culture, but still integrated through the same management hierarchy as the existing business (O'Reilly & Tushman, 2004). Ambidextrous organizations have been proven most successful in introducing radical innovation in large and mature companies (Gibson & Birkinshaw, 2004; O'Reilly & Tushman, 2004). Separating emerging business from existing business can help to avoid conflicts with existing business model and processes (Gibson & Birkinshaw, 2004). These four types of organizational structures are illustrated in Figure 11. Gibson and Birkinshaw (2004) claim that ambidextrous organizations put highest demand on management and leadership. The functional organization is least successful at introducing radical innovations (O'Reilly & Tushman, 2004).
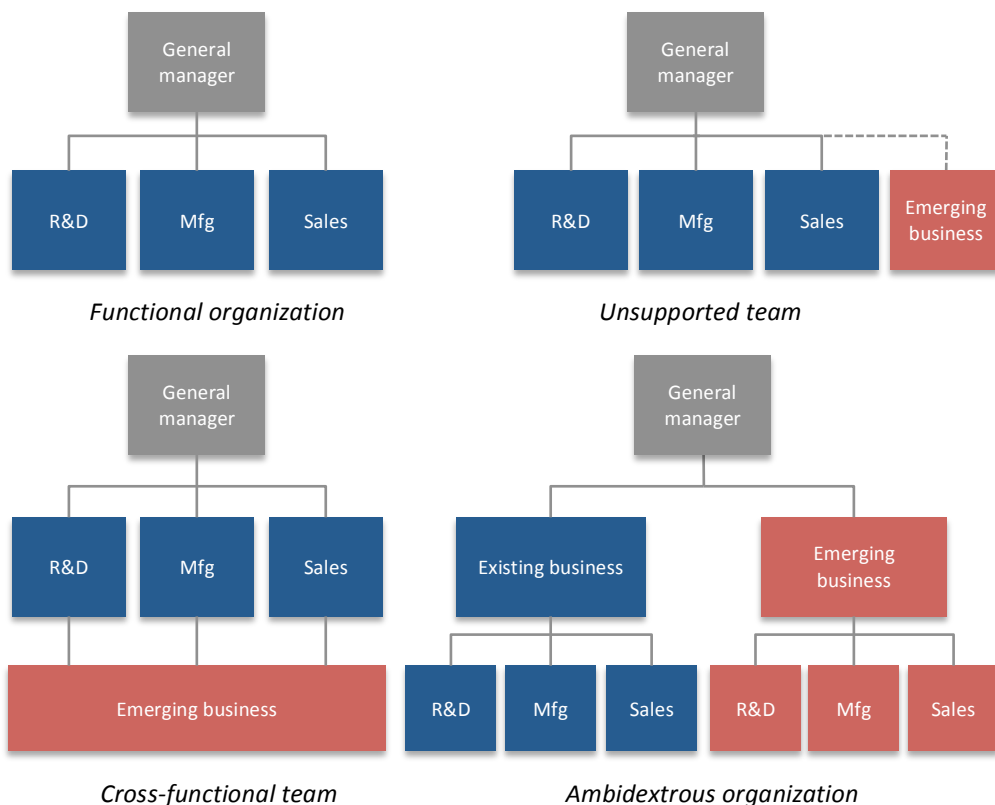
Figure 11 - Four different conceptual organizational structures to support emerging business (O'Reilly & Tushman, 2004)

Incentives and Rewards

R&D and Marketing are often evaluated individually and have different types of incentives and rewards (Donnellon, 1993; Griffin & Hauser, 1996). Marketing tends to receive bonuses based on increased market share, while R&D departments often are rewarded for patents or publications (Griffin & Hauser, 1996; Hauser & Zettelmeyer, 1997). This leads to different priorities and organizational responsibilities, which creates barrier to integration (Griffin & Hauser, 1996). Donnellon (1993) argue that individual performance measurements can discourage the efforts needed to develop successful innovation, since they do not reflect the interdependency required in an innovation process.

One way to overcome the organizational responsibility barrier is to implement reward systems that compensate R&D and Marketing collectively (Griffin & Hauser, 1996; Cotterman et al., 2009). According to scholars, collective rewards can be motivating when tasks are interdependent (Cohen and Bailey, 1997; Leenders and Wierenga, 2002). Cotterman et al. (2009) state that the most successful companies award frequently and smaller, which encourages the employees constantly.

4.4 Summary of Literature Review

The literature review can be summarized in six areas, which are presented in this section.

Factors to Consider When Opting Increasing R&D and Marketing Integration to Support Innovation

The literature review helped to find a framework developed by Gupta et al. (1986), which consists of factors driving integration needed and integration achieved in companies with R&D and marketing departments. This will be used as an analysis tool to evaluate the potential integration gap at the GMC between GH and M&PM.

Linkage between Innovation, Radical Innovation and R&D and Marketing Integration

There seems to be a research consensus regarding R&D and Marketing effects to support innovation, but when addressing radical innovation, the correlation becomes more uncertain, contextual and company specific. With regards to radical innovation projects within the FFE, the area is very little explored and shows research showing both high positive correlations and low positive correlations.

Distinction and Description of FFE Activities

The FFE framework helps to illustrate and distinguish FFE activities, which supports the analysis. It also helps to shape a classification for prior research and empirical data on how R&D and Marketing integration can stimulate and support radical innovation.

How R&D and Marketing Integration Can Support FFE Development

Prior research shows different ways on how R&D and Marketing integration can stimulate and support radical innovation, summarized in Table 6.

Table 6 - Previous research with examples for how R&D and Marketing integration in FFE can stimulate and support radical innovation

How R&D and Marketing integration can support innovation in FFE
Discussions between R&D and Marketing on early trend signals can help grasp opportunities in time (Rohrbeck, 2014)
Marketing can act as opponent to challenge R&D ideas and assumptions (Rohrbeck & Gemünden, 2011)
Marketing can provide business perspective earlier (Rubera et al., 2012)
Marketing can provide inspiration to R&D department (Rubera et al., 2012)
Marketing can help evaluate idea's commercial potential (Song & Xie, 2000)

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Exploring marketing and technology synergies together before making prototype (Veryzer, 1998)
Integration can help create mutual understanding and build relationships (Kim and Wilemon, 2002)
Integration helps co-develop marketing and technological competence (Cotterman et al., 2009)
Integration can help stimulate goal alignment between product concepts and strategy (Frishammar & Florén, 2008)

Barriers to R&D and Marketing Integration

The barriers to R&D and Marketing integration were complemented with contemporary research from Griffin and Hauser's (1996) framework and summarized in five barriers. This framework helped to distinguish and define different barriers to R&D and Marketing integration described in prior research as well as providing support for interview, survey and workshop questions.

Mechanisms for Reducing Integration Barriers

Mechanisms for integration are used as support for structuring and showing possible ways to reduce barriers for R&D and Marketing integration. These mechanisms also helped to shape interview, survey and workshop questions, and the assumed linkage between mechanisms and overcome barriers support the analysis.

5 Case Study Data

This chapter consists of GH employees' views on challenges and opportunities with integration between GH and M&PM to stimulate and support radical innovation. Data is collected through semi-structured interviews, complemented with a survey and workshop. The chapter begins with describing the current integration. Thereafter, data results are mapped into integration barriers between GH and M&PM. Finally, employees' views on different mechanisms for reducing these barriers are presented.

5.1 GH and M&PM Integration

5.1.1 Integration Today

GH and M&PM are located in two different countries in Europe. Meetings are said to occur when M&PM, or GH, visit the other site for other purposes. Such meetings are sporadic, held approximately once a month. Some of the GH employees say that meetings are an update in order to inform the other department on ongoing projects. According to one respondent, it is a one-way communication from GH to M&PM, rather than the other way around.

5.1.2 Employees' Views on Integration to Support Radical Innovation

Overall, there seems to be an interest of increased GH and M&PM integration and the survey results show that 8 out of 9 respondents believe that increased GH and M&PM integration would support radical innovation. However, the need of M&PM integration, as well as the ideas on how it will stimulate radical innovation, differs among the GH employees.

Some of the GM employees were not sure that increased integration with M&PM would support radical innovation. They believe increased integration can lead to more short-term orientation and constrain the "artistic freedom" due to M&PM's interest for profit and direct value for customers. Some GH employees claimed they already know, from experience, what the customer wants, making marketing input redundant. Some GH employees also say they hesitate to involve M&PM employees early in the process, since they tend to promise customers new products and technologies, which are far from ready. This is said to risk create unrealistic expectations that leave customers disappointed.

Most GH employees, however, agree on necessary increased integration. Many emphasize the need of iteration and feedback from M&PM during the development of an idea. One GH employee described a meeting with M&PM, when discussing a new opportunity, as very fruitful to assess magnitude of opportunity. The employee said that such meetings were too few and mainly occurred after committing resources and aligning team to the opportunity. Employees in GH often come back to the need of a potential value and business case for a radical idea. In addition, a

manager from S&P explains that the lack of an estimated value of a radical idea is the most common reason for its death. GH employees express that quantifying potential of radical ideas is tricky, and M&PM should support such assessments.

A workshop participant from FEI argued that increased integration could help indirectly, since GH employees can see new technologies in new ways with increased knowledge of market opportunities. In the survey, GH employees were first asked if increased integration between GH and M&PM would stimulate and support radical innovation. Thereafter, the respondents were asked to elaborate on how it could help, if their first answer was yes, or otherwise why it would not. The answers from the survey are presented in Table 7.

Table 7 - Answers from survey on how increased integration could stimulate and support radical innovation

Can increased integration between GH and M&PM stimulate and support radical innovation ?	
If yes, how?	**If no, why not?**
"(M&PM can) find business models to implement technical inventions from GH, were applicable"	"Already in place"
"(M&PM can) help GH to better understand which problems our customers/consumers have"	
"(M&PM can) give direction and purpose based on customers future needs"	
"Through communication (with M&PM) the ideas come up to develop customer needs"	
"(M&PM can) inspire and direct"	
"(M&PM can give) awareness of market needs and possibilities"	
"(M&PM can give GH) better contact to reality"	

5.2 Barriers to Integration between GH and M&PM

A general opinion among GH and S&P employees is that marketing support from M&PM is not working as desired. In this section, GH employees' views of barriers for GH and M&PM integration are presented. The barriers for integration are adopted from Griffin and Hauser (1996) and categorized in five areas, personality, cultural

thought world, language, organizational responsibility and physical barriers. The voting from the workshop is presented in appendix E.

5.2.1 Personality Barrier

During interviews, GH employees state that they strive for new technology development and patents, while M&PM employees focus more on satisfying customers and increased market share. One GH employee believed M&PM employees, unlike GH employees, are motivated from "climbing a career ladder". Another GH employee said, during the workshop, that having different drivers, such as passion for technology vs. interest in making money could create barriers for cooperation.

In general, GH employees do not prefer formal processes with gates, structures and rules. Skepticism against rigid models for market integration is also expressed. Instead they prefer freedom and autonomy to experiment, and believe in an environment where informal network and contacts are used. GH employees say that M&PM employees, on the contrary, to a greater extent, favor structure and processes. The participants during the workshop discussed recognizing personality differences between GH and M&PM but do not believe they have to create barriers. They say that a good match between personalities is important, but it does not necessarily mean they are similar personalities.

"Differences are healthy for good relations"
(GH employee, 2014)

Despite expressed differences between M&PM and GH employees, there are also implied differences among GH employees. Some of the employees do not always care about the use, or market need, for the technology. On the other hand, there are employees who have more of a business mindset and holistic perspective when developing new technologies. Interviewees say that differences within GH can be a problem, since it results in different needs and preferences regarding the integration's set up. When asking if, or how, integration with M&PM should be increased, most interviewees answer that it depends on the person.

In the survey, respondents were asked: "How much do personality differences between GH and M&PM negatively affect the cooperation and communication?" The result from the survey is shown in Figure 12.

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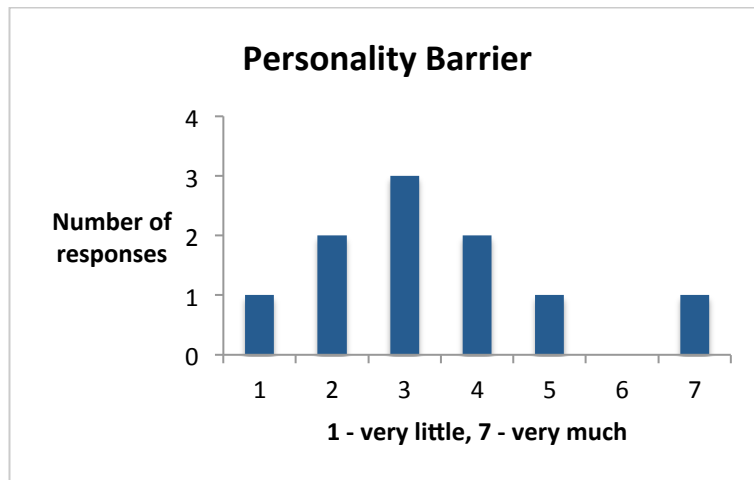
Figure 12 - Result from survey on the question: "How much do personality differences between GH and M&PM negatively affect the cooperation and communication?"

5.2.2 Cultural Thought World Barrier

GH employees say they have a technology mind-set, while they describe M&PM as naturally more market-oriented than GH. GH employees are said to have a long-term perspective and think in terms of 10-15 years ahead. There is, however, a general perception among GH employees that M&PM employees have a more short-term perspective. A manager from S&P mentions in an interview that GH and M&PM have a big cultural distance, "it's two different worlds".

In the survey, respondents were asked: "How much do different cultural thought worlds negatively affect the cooperation and communication?" The result from the survey is shown in Figure 13.
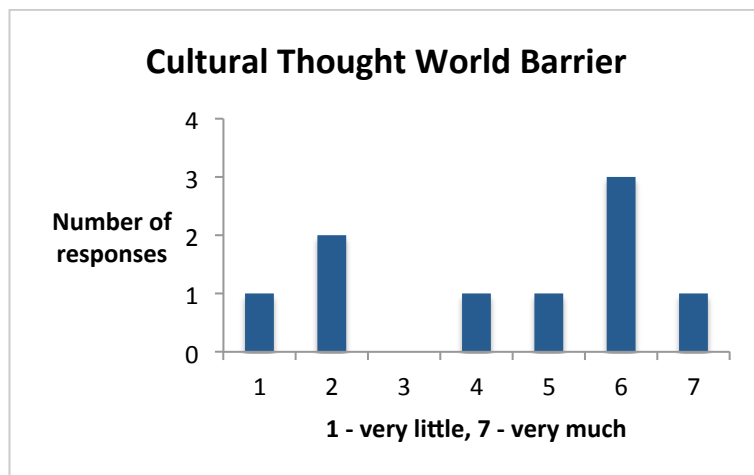
Figure 13 - Result from survey on the question: "How much do different cultural thought worlds negatively affect the cooperation and communication?"

5.2.3 Language Barrier

GH employees claim that marketing information is easier to discuss with a person with engineering background. They argue that conversations with very market-oriented persons are not as valuable, partly due to the person's inability to understand complex technology. GH employees have, because of this, preferable M&PM contacts with engineering background they communicate with. When interviewing FEI employees in the pre-study, they suggested different languages as potential barriers for communication between GH and M&PM. They said M&PM tends to speak about benefits while GH refer to features. During the workshop, no particular emphasis was put on the area of language barriers. The facilitator asked about the comfort of speaking to someone with similar background. The participants answered that it was not because of the language barrier, but rather due to engineers' long-term mind set.

In the survey, respondents were asked: "How much do different languages negatively affect the cooperation and communication?" The result from the survey is shown in Figure 14.
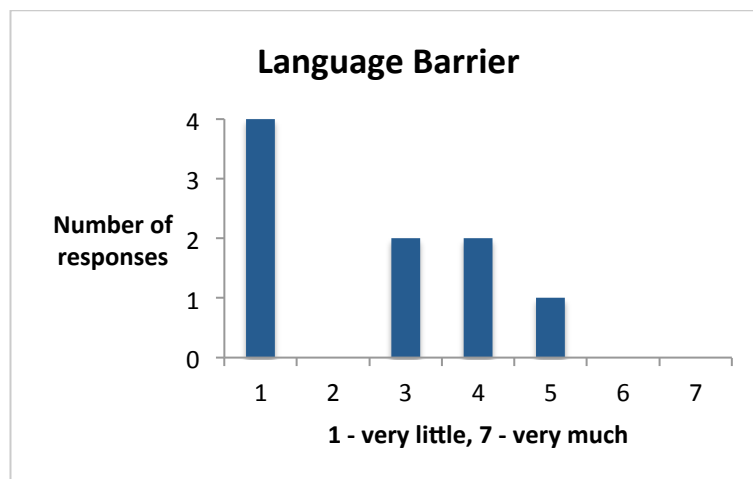
Figure 14 - Result from survey on the question: "How much do different languages negatively affect the cooperation and communication?"

5.2.4 Organizational Responsibility Barrier

There is a general consensus among GH employees regarding a clear difference in organizational responsibilities between GH and M&PM. From company internal documents, the organizational responsibility for GH and M&PM are stated. The written description for GH's is "to scout, create, test and evaluate concepts based on new technologies and ideas". M&PM is "responsible for marketing and product management with full accountability for product lifecycle to maximize market share and product profitability". During the workshop, the organizational responsibility barrier was regarded as high. One post-it, similar to many others, said "M&PM has an operative responsibility, while GH has a strategic responsibility". Participants

express that M&PM have responsibility for the "fiscal year" rather than the GMC's long-term future. Participants in full group discussions agreed on that M&PM's short-term fiscal agenda makes them focus on incremental improvements.

There are currently no formal incentives for GH and M&PM integration. Interviewees in GH express they have limited time, which they rather spend on technology development, than communicating with M&PM, since they have such a short-term responsibility. One employee explains that, as long as no one put pressure on them, they stay in their comfort zone, without exposing ideas or opportunities to the rest of the organization. GH employees say that there is a resistance of introducing an idea to M&PM too early in the innovation phase. They explain that they often wait until the idea is "full-fledged". GH employees claim that working with their technology for a longer period, rather than exposing it early, can be more comfortable.

> "putting a seed or plant outside of GH is risky, since there is a totally different climate; the idea risks to be killed".
>
> (GH employee, 2014)

Managers from S&P argue that, in terms of radical innovations in the early phase, it is very hard to measure performance. Key Performance Indicators (KPIs) are set in the beginning of 2.0 projects, tailored for the specific technology, and 6-12 months later followed up. GH employees are responsible for this analysis and follow-up. The KPIs for early studies mostly involve following up key technological assumptions that have to confirmed. KPIs do, according to some GH employees, seldom involve a market perspective.

In the survey, respondents were asked: "How much do different organizational responsibilities negatively affect the cooperation and communication?" The result from the survey is shown in Figure 15.

Organizational Responsibility Barrier

Figure 15 – Result from survey on the question: "How much do different organizational responsibilities negatively affect the cooperation and communication?"

5.2.5   Physical Barrier

M&PM and GH are located in two different countries in Europe, which GH employees say discourages contact and communication. During the workshop, participants wrote post-its saying "different countries=less contact", "long physical distance" and "not seated closely, not daily contact". When elaborating on the effects of this physical barrier, interviewees and workshop participants frequently refer to that it makes informal contact harder.

In the survey, respondents were asked: "How much do physical barriers negatively affect the cooperation and communication?" The result from the survey is shown in Figure 16.
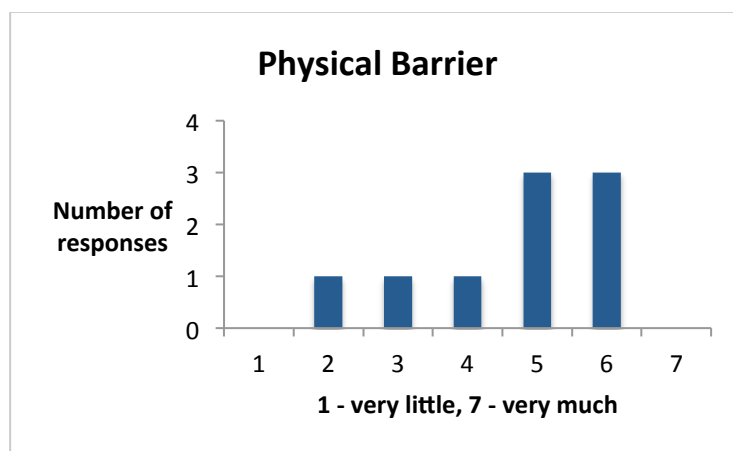
Figure 16 – Result from survey on the question: "How much do physical barriers negatively affect the cooperation and communication?"

5.3   Attitudes to Different Mechanisms for Reducing Integration Barriers

This section will present GH employees' views of mechanisms for increasing integration between GH and M&PM. Mechanisms are adopted from Griffin and Hauser (1996) and categorized in five areas, Relocation and physical facilities design, Personnel movement, Informal social systems, Organizational structure, Incentives and rewards. The voting results from the workshop are presented in appendix E.

5.3.1   Relocation and Physical Facilities Design

Many of the GH interviewees express that they want more areas for informal meetings. One interviewee says that coffee breaks are an underestimated source of contact and inspiration. In the workshop, relocation and physical facilities design seem to be an important topic for the participants. However, there were not many post-its in this area. When facilitator asked about this in the full group discussion, a respondent claimed that it was so obvious and referred to the note, "relocate for

proximity => spontaneous meetings". Another participant filled in that the reason for not writing a post-it was that "relocation and physical facilities design" area of method was already a finished solution.

5.3.2 Personnel Movement

A manager from S&P is doubtful when it comes to job rotation between GH and M&PM. The interviewee wonders what an M&PM employee could contribute with in GH, since it is such an advanced technical department and doubts that anyone in GH would like to be placed in M&PM. However, the manager adds, "if the distance is so big, this may be something we need to do". When asking GH employees about what would happen if a M&PM employee was permanently integrated in GH, the interviewees have somewhat discordant opinions. Most of them say that the person would feel like an outsider. However, some of them say it could work if it is an engineer or other person with technical understanding. GH employees say that a fruitful outcome of such a rotation depends on the person. During the workshop, one participant suggested: "Two week job rotation each year". Another participant said that increased exposure and cooperation is necessary, but doubts personnel rotation as a method.

5.3.3 Informal Social Systems

In general, among GH employees, there seems to be a high confidence in informal networks. During an interview, an employee said that most of the current marketing communication is facilitated through informal networks and that a formalization would be difficult. Another interviewee agrees, but claims that the informality also can imply risks, in example when new personnel have trouble understanding how the informal communication works. In the workshop the view on informal system as a tool to communicate with M&PM differed a lot between the two different groups. The group positive to informal social systems claimed that informal meetings are important as radical innovation is not planned, and thus it is hard to know on how and when information flow will have an effect. The other group claimed that informal systems are important but that it is already in place and therefore not necessary to focus on. When the facilitator asked if it was extensive enough, the participant answered that it perhaps is isolated to a few people. The participant continued saying it was important, but that other areas are even more important.

5.3.4 Organizational Structure

During interviews, many different types of possible new organizational structures have been discussed. Some employees argue that a merger of GH with the more market-oriented FEI department could help increase the collaboration, helping to find market opportunities and stimulate creativity. One GH employee saw a risk with such a merger, since the organization would become too big, which would inhibit an effective creative process. Another employee did not believe that a merger was necessary to have proper communication. Overall, GH employees seem very positive to changing the organizational structure.

During the workshop, there appeared to be a quite differing view between the groups regarding changing organizational structure to better integrate GH and M&PM. The group positive to changes in the organizational structure had many ideas:

- Merge GH with FEI department working with business model innovation.
- Organize new technologies and ideas as start-ups, separate from rest of the organization.
- Divide both GH and M&PM into two different units with different time orientation (medium term and long-term).

After introducing the ideas in a full group discussion, the other group found it interesting and one participant claimed: "perhaps we would have voted differently if we would have heard those ideas".

5.3.5 Incentives and Rewards

In an interview, a discussion was held with an S&P manager regarding involve M&PM through giving them responsibility for certain KPIs in GH projects. The manager expressed that it is an opportunity to look further into and that a KPI could, incentivize M&PM's involvement for understanding a customer need or providing a rough business case for projects.

During the workshop, one participant said that individual measurements should be removed, since it was inhibiting to risk-taking. Another participant said that monetary incentives and rewards, for both M&PM and GH should be removed completely for people working with radical innovation. Another idea from the participants was to reward or force having time off in the schedule, to make the work-time more flexible and informal. When the facilitator introduced the idea of involving M&PM through project KPIs to the group discussion, participants seemed positive. One said "Yes that would be good", another one said, "Sure, but for it to work, M&PM have to think long-term".

5.3.6 Survey Results

In the survey, respondents in GH were asked to mention what type of integration mechanisms they would prefer in order to improve cooperation and communication with M&PM. The respondents could mention 0-5 of the mechanisms. The result from the survey is presented in Figure 17. Relocation and physical facilities design, informal social systems and organizational structure all received the same score (4), which also was the highest score. Only one respondent would prefer to incentives and rewards, and none of the respondents mentioned personnel movement as a mechanism for improved integration.
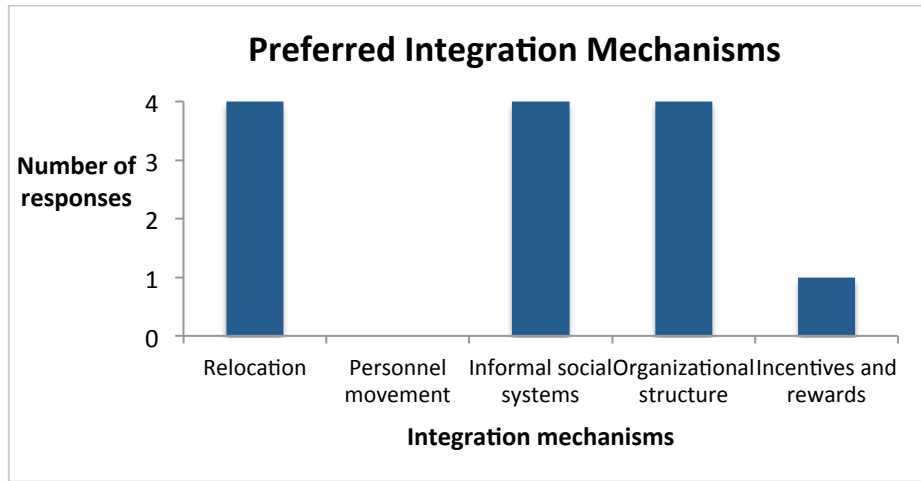
53

Figure 17 - Result from survey on the question: "What type of actions to improve cooperation and communication would you prefer?"

6 Analysis

This chapter begins with analyzing factors to consider when opting increasing R&D and Marketing integration to stimulate and support radical innovation. Thereafter, an analysis of integration barriers is presented, which combines employee views and prior research to evaluate the strength of the different barriers. Conclusively, different types of mechanisms to reduce these barriers are evaluated.

6.1 Evaluating the Integration Gap

The literature review and empirical collection from the GMC case show many factors to consider when opting increasing R&D and Marketing integration to support radical innovation. Gupta et al. (1986) and Fain et al. (2011) claim that a high need for integration and a low degree of current integration results in a high integration gap and, thereby, indicates that increased integration would enhance innovation capability. This integration gap framework is complemented with discussing degree of innovation radicalism to address the first research question; *Is there reason to believe that increased R&D and Marketing integration in the FFE would stimulate and support radical innovation?*

6.1.1 Need for Integration

The need for integration is analyzed through the innovation strategy and environmental conditions for GH. Both the innovation strategy and increased environmental uncertainty point to a high need for integration in the GMC.

Innovation Strategy
The innovation strategy affects the need for R&D and Marketing integration (Gupta et al., 1986; Fain et al., 2011). Fain et al. (2011) confirmed findings from Gupta et al. (1986), showing that pursuing an innovation strategy involving being "first in" with new products on the market, requires a higher level of R&D and Marketing integration. This description corresponds well with GH's mission, pointing towards a high need for integration in the GMC. The GH innovation strategy also seems to correspond to a technology push strategy, described by Brem and Voigt (2009) and Jaruzelski and Dehoff (2008). GH relies on exploring technologies and by this come up with commercial ideas, rather than begin with a market opportunity. Scholars state that a technology push strategy requires a higher degree of integration than market pull strategies, since the market opportunity is not involved from the beginning (Veryzer, 1998; Becker & Lillemark, 2006). The GH technology push strategy and mission to be first on the market with new products, thereby, indicates a high need for R&D and Marketing integration in the GMC.

Environmental Conditions
There is a consensus among GMC employees that there is an ongoing shift towards a more competitive market. This shift along with rapid technological change can infer

a more turbulent and uncertain environment, which is said to increase the need for integration (Gupta et al., 1986; Fain et al., 2011). Gassman and Schweitzer (2014) say that the trends of globalization, modern IT and faster product-life cycles infers a higher need of integration in the FFE. Becker and Lillemark (2006) claim that operating in industries where culture and preferences have a big influence on product success, marketing input is more essential to integrate early in the innovation process. The GMC operates in an industry where products' success is affected by both culture and preferences and selling products and services to both industrial customers and end consumers. These macro-trends and industry drivers point to a high need of integration for the GMC.

6.1.2   Degree of Integration Achieved

Scholars show that the degree of integration depends on individual and organizational factors (Gupta et al., 1986; Fain et al., 2011). Griffin and Hauser (1996) and Assink (2006) argue that large and mature organizations have a tendency to gradually make R&D and Marketing less aware of each other's contributions and becoming more isolated from each other. It is clear that such a distance between GH and M&PM exists in the GMC and there are many evident organizational and individual factors driving a low degree of integration.

Organizational and Individual Factors
GH and M&PM meet primarily to exchange information, and do not have mutual resources, incentives or rewards, which according to Kahn & Mentzer (1998) corresponds to a low degree of integration. The departments are located in different countries and meetings between GH and M&PM occur sporadic. They do not either have any mutual goals, which according to Kahn & Mentzer (1998) also indicates low degree of integration. Senior management does not show high awareness or focus for supporting increased integration in the GMC. Fain et al. (2011) state that such lack of management support tends to result in lower degree of integration. GH employees express many sociocultural differences between GH and M&PM employees regarding tolerance of ambiguity, time-orientation and types of projects preferred. Such perceived differences also lower the integration between departments (Gupta et al., 1986; Griffin & Hauser, 1996; Fain et al., 2011).

6.1.3   Integration Gap Summary

To summarize, there are many indications towards a high need for integration and low degree of integration achieved, which leads to an integration gap. In Figure 18 the different factors driving the integration gap in the GMC are illustrated.
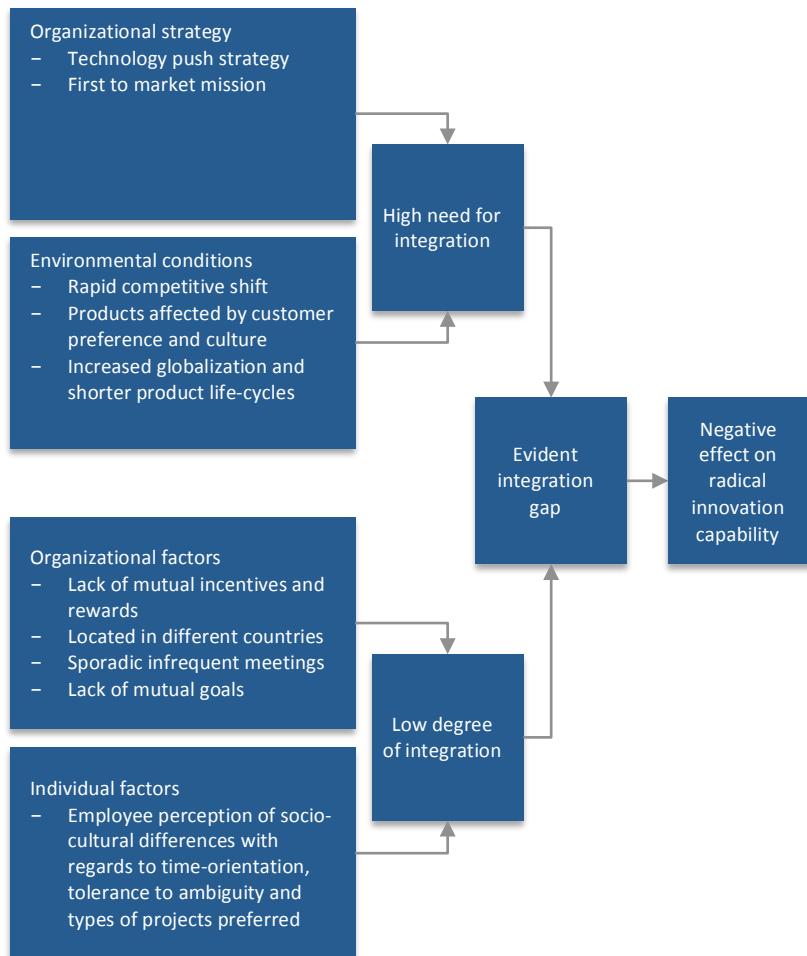
Figure 18 - Factors driving integration gap between GH and M&PM (The authors' own figure, adopted from Gupta et al. (1986) and Fain et al. (2011))

This analysis does, however, not take degree of innovation radicalism into accountability. Therefore, prior research and GMC employees' views regarding degree of radicalism are compared to complement this analysis.

6.1.4 Degree of Innovation Radicalism

When analyzing drivers of integration gap, this gap is evident in the GMC, which indicates that increased integration would be favorable. The GMC employees are positive to increased integration, but the views are somewhat inconsistent regarding what type of innovations this integration could support. The same pattern is seen in academia. Scholars' views differ on what type of innovations integration is most effective for (Griffin & Hauser, 1996; Rubera et al., 2012; Christensen, 2013). Some scholars claim that incremental innovation is highly favored from a higher integration, but that the positive correlation is weaker for radical innovation projects (Brettel et al., 2012). Song and Xie (2000) say that a high Marketing's involvement in R&D activities can imply constraints on radical innovations, due to a strong focus on

today's customers and products, inhibiting development of new markets and technologies. Some of the GH employees have claimed that M&PM's strong focus on customers and market share can discourage GH's creativity. The negative aspects of integration for radical innovations stressed in academia often refer to a too high level of integration. Christensen (2013) claims that radical innovations can be inhibited when a very high level of integration exists and thus Marketing's short-term priorities risk shifting development focus. A very low integration presented in the GMC can infer that such risks are low, since it must increase substantially before such effects will change development focus in GH.

There are several studies showing a positive relation between radical innovation success and a high degree of integration between R&D and Marketing in the FFE (Cotterman et al., 2009; Brettel et al., 2011; Rubera et al., 2012). Scholars have different definitions of innovation radicalism, which could be an explanation to the differing results. Dialogues regarding integration with GH employees often end up in discussions on innovation radicalism. GH employees, similar to scholars, have different definitions of radical innovation, which seems to affect results in both research and GH employee opinions. Garcia and Calantone (2002) describe radical innovation as innovations that "embody a new technology that results in a new market infrastructure" (p. 120). When interviewing employees, they say that such innovations only have occurred 4-5 times in the long history of the GMC. GMC's definition of 2.0 innovations is, however, according to GMC employees, not equivalent to such a meaning of radical innovation. The broader definition of radical innovation utilized in this study, expanded to include "really new" innovations (Garcia & Calantone, 2002), does however seem to correlate quite well to the 2.0 definition.

To summarize, employee views and consolidated research indicates that R&D and Marketing integration does not stimulate and support the type of innovations embodying new technologies and new markets. However, the 2.0 definition of innovation including Garcia and Calantone's (2002) definition of "really new" innovations can be stimulated and supported by radical innovation. This relation is illustrated in Figure 19.
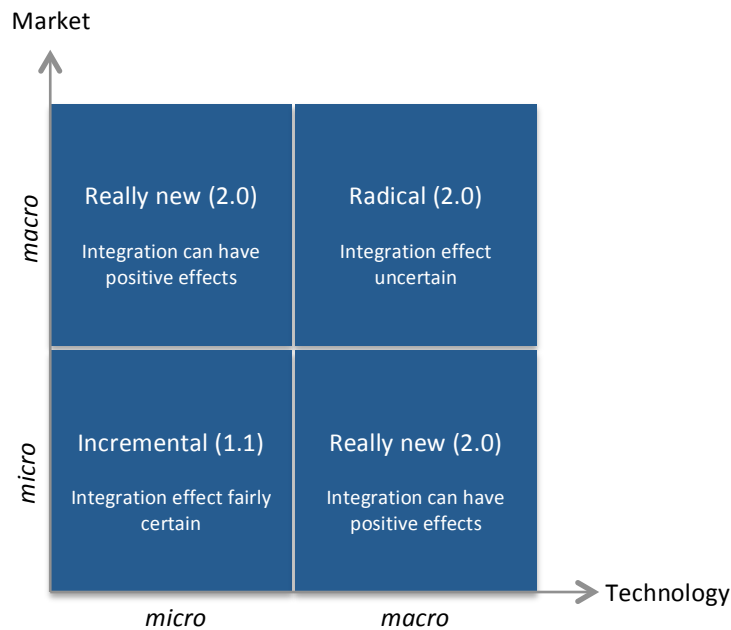
Figure 19 - R&D and Marketing integration's effects on different type of innovations (The authors' own figure, adopted from Garcia and Calantone (2002))

6.1.5 Summary of Integration Gap and Degree of Radicalism Effects

After consolidating employees' views and prior research, increased GH and M&PM integration in the FFE seems favorable to support 2.0 innovations in the GMC. Firstly, there are many indications to a high integration gap between GH and M&PM at the GMC. Even though scholars are somewhat inconsistent for radical innovation embodying a new technology and new markets, studies show positive relation between integration and innovation success quite consistently for the wider definition of 2.0 innovations. Many of the claimed negative effects of integration by scholars refer to a very high level of integration, risking a too short-term marketing oriented development. Since the degree of integration is very low in the GMC, this risk is considered low, as increased integration at this stage will probably not shift the time-orientation in the GH technology push strategy. To summarize, the integration gap thereby considered as evident for 2.0 innovations in the GMC, which implies that increased GH and M&PM integration in the FFE would stimulate and support radical innovation.

6.2 R&D and Marketing Integration Effects in FFE

Employees had many opinions on how integration between GH and M&PM in FFE could effect radical innovation. To analyze this data these views have, along with research, been consolidated and categorized in different activities of the FFE, see Figure 20. The environmental conditions are not accounted for, due to the

assumption that R&D and Marketing integration does not affect external environmental conditions, as defined by Koen et al. (2001).
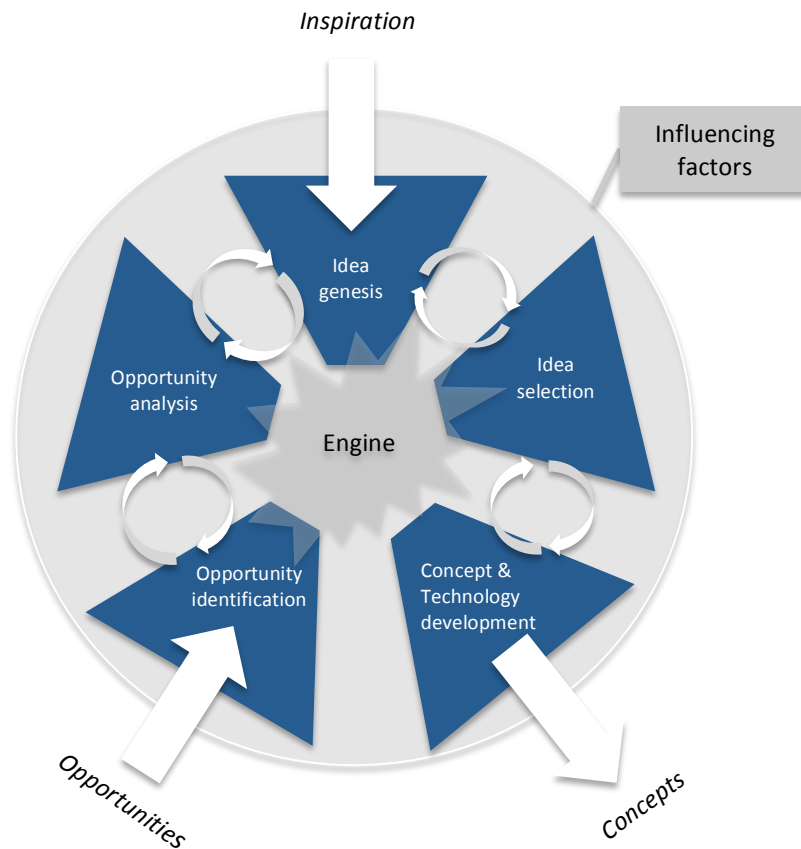
Figure 20 - Activities in FFE (Koen et al., 2001)

6.2.1 Opportunity Identification

The activity of identifying opportunities in FFE is said to be highly dependent on the individuals conducting the activity and can mean identifying both technology and market opportunities (Koen et al., 2001). GH pursues a technology push strategy, which means that opportunities are mainly identified through exploring new technologies. This can provide a challenge to utilizing marketing input at this stage since they are not used to start development sprung from market opportunities. GH employees say that iterative support from M&PM can assist with new perspectives on technology, which can be developed into new opportunities. Researchers claim that a marketing department can provide guidance when identifying technology opportunities, but also to address new market opportunities with new technologies (Brettel et al., 2011; Rubera et al., 2012). Rohrbeck (2014) claims that discussions between R&D and Marketing can help to spot opportunities, through interpreting early trend signals together. Employees overall, seem positive to acquiring help from M&PM to interpret future needs for customers or give awareness on new market needs and possibilities. M&PM can also presumably have an indirect effect, since

increased knowledge transfer of market trends and signals can help employees in GH to interpret new technologies in different ways. This is especially relevant in terms of 2.0 innovations, which can be innovations with existing technology for new markets.

6.2.2   Opportunity Analysis

Analyzing and assessing opportunities in the FFE are activities entailed with a great deal of uncertainty (Reid and De Brentani, 2004; Poskela, 2007). The employees agree, and say that it is especially hard when it comes to 2.0 innovations. Currently, goals are set up, with support from S&P, for GH projects in the beginning of projects. The goals are often set in order to confirm or discard certain hypotheses regarding the technology. Forming and following up these goals can be seen as a type of opportunity analysis. This analysis does not include M&PM. Thus, there is potential of including M&PM in opportunity analysis. The main risk to including M&PM in these types of activities is the fear from GH employees that M&PM will reveal new technologies and ideas to early to customers, creating unrealistic expectations. There is also a perception among GH employees that M&PM's short-term responsibilities and priorities risk kill the idea if assessed too early. These risks have to be mitigated or reduced, for gaining GH employees' approval to include M&PM in opportunity analysis activities.

Many employees express a will to have more frequent meetings between GH and M&PM for helping to better assess opportunities and also to challenge GH's assumptions. Rohrbeck and Gemünden (2011) claim that the marketing department could act as an opponent to challenge R&D ideas and assumptions in the FFE. Rubera et al. (2012) argue that when assessing potential of new technologies and markets, marketing department should not put up specific targets, since they tend to be shortsighted, but rather give input on R&D's assumptions. This would be favorable to consider when forming increased integration for opportunity analysis activities.

6.2.3   Idea Genesis

Discussing inspiration and idea genesis with GH employees was hard due to the complexity and difficulty of defining how, and when, inspiration and ideation occurs. Koen et al. (2001) say, which an employee also expresses, that idea genesis does not come from an "aha"-experience. Instead, it is a continuous process, which makes it hard to evaluate how integration will affect idea genesis. However, in similar way as identifying opportunities, some employees say that M&PM can help to inspire and direct, and also give ideas for development. M&PM can also help GH employees to better understand which problems customers and consumers have, which can act as inspiration. Leifer et al. (2001) say that R&D scientists do have a tendency of being inspired by problems. This indicates that M&PM can have a positive affect on the idea genesis activity in GH.

6.2.4 Idea Selection

GH does not seem to have a formal selection process when choosing ideas, and employees instead refer to the gut feeling when asking about the selection process. According to Koen et al. (2001), this corresponds to one of the most informal approaches of potential selection processes. Even though some employees say that a business perspective is considered when selecting ideas, they have some trouble describing how the business assessments are made. Poskela (2007) claims that competitive analysis and rough profit estimations are essential when comparing new types of technologies. None of the GH employees have, in example, mentioned that the competitive situation is considered when evaluating ideas. Few speak of profit estimations, but rather repeatedly refer to evaluation of how well the technology will fit into the entire value chain. This indicates a possible task for M&PM, which ought to have relevant competence for assessing competitive and profit implications of ideas.

For including M&PM in idea selection, the process would probably have to be somewhat more formalized. According to Gassmann and Schweitzer (2014), a balance between formalization and informality is key to successful idea selection in the FFE for product with high degree of radicalism. Since idea selection is presently totally informal, this indicates that the potential subtly increased degree of formality of including M&PM may positively affect the degree of radicalism.

6.2.5 Concept and Technology Development

GH employees claim that integration can help to develop radical innovation concepts through continuous feedback that gives new perspectives. Koen et al. (2001) propose to iteratively test projects and prototypes during the development to reduce the technology uncertainty. Veryzer (1998) sees a risk in not involving Marketing until late in concept development activity. Technology and marketing synergies are much harder to achieve if the R&D department already have finished prototypes when meeting (Veryzer, 1998). Some GH employees say that M&PM can help create business models for new technologies developed by GH, as a part of developing concepts.

The major reason for a well-developed concept to fail is, according to many GH employees, that the business case is to weak to survive when leaving GH. Employees frequently say that increased input from M&PM regarding this would be helpful. Song and Xie (2000) claim that marketing departments can help R&D departments to make business evaluations and assessments. Becker and Lillemark (2006) also argue that Marketing can, when evaluating ideas, lift other aspects often overlooked by R&D departments, such as regarding sales capability or channels for commercializing the idea. Increased integration seems therefore to have positive effects on the concept development, and due to potentially improved market estimations and competitor assessments it may also help the idea to survive longer in the GMC.

6.2.6 Engine

The engine empowers the activities in the FFE through management support and cultural factors (Griffin & Hauser, 1996; Leenders & Wierenga, 2002). There is research showing that integration can have positive effects on such factors. Kim and Wilemon (2002) claim that integration can create mutual understanding and build relationships, which can be interpreted as a cultural factor as a part of the NCD engine. Frishammar and Florén (2008) argue that increased integration can stimulate goal alignment between product concepts and strategy. GH employees do not directly refer to integration effects on engine factors when asked in the survey. A reason for this could be that more practical effects are "top of mind", such as business assessments of concepts. However, in interviews, some GH employees say that increased integration can help create better relations between M&PM and GH, which could have positive effects on the engine factor. Leadership within the organization is also an important part of the engine empowering FFE activities (Koen et al. 2001). Increased management priority to support integration could infer introducing mechanisms for increasing integration. Such mechanisms can have effects on engine, through, in example changes in organizational structure or incentives and rewards.

6.2.7 Summary of Integration Effects in FFE

Table 8 summarizes the potential positive integration effects and belonging concerns for different FFE activities. In line with reasoning from this analysis, the potential positive integration effects are separated into prior research and GH employees' views. Taken this analysis into consideration, the integration effects with highest potential in the GMC are considered to be: helping to grasp early market and technology opportunities, making better business assessments for new opportunities and concepts as well as aligning goals and vision between departments.

Table 8 - GH and M&PM integration effects in FFE (FFE framework adopted from Koen et al. (2001))

FFE activity	Potential positive integration effects		Concerns
	Prior research	**GH employees**	
Opportunity identification	- Provide guidance regarding newly discovered technologies for market opportunities (Rubera et al. (2012) - Discussions can help to grasp market and technology opportunities in time (Rohrbeck, 2014)	- "M&PM can assist with new perspectives on technological opportunities" - "Give direction and purpose based on customers' future needs"	- GH not used to utilizing marketing input this early - M&PM capability on providing input this early uncertain, possibly necessary to co-develop such capability
Opportunity analysis	- M&PM can act as opponent to challenge assumptions (Rohrbeck and Gemünden, 2011) - M&PM can help support market research methodology (Rubera et al. (2012) - Marketing should provide input, not specific targets (Rubera et al., 2012)	- "More frequent meetings to assess opportunities"	- Some GH employees indicate skepticism to integration in analysis due to short-term perspective or promising customers products before ready
Idea genesis	- Marketing can provide problems or goals, which Leifer et al. (2001) say can inspire R&D scientists.	- "Help us better understand which problems customers and consumers have"	- Discussing inspiration and ideation was difficult due to the complexity of defining when and how they occur
Idea selection	- Rough profit estimations and competitive analysis is important when evaluating ideas (Poskela, 2007) - A balance of formality and informality is key to select project ideas (Gassmann & Schweitzer, 2014)		- GH employees do not refer to profit estimations or competitive analysis when selecting ideas - GH idea selection totally informal, which could favor a subtle increase of formality
Concept and technology development	- Help R&D department to make business evaluations and assessments (Song & Xie, 2000) - Lift other aspects overlooked by R&D departments, regarding, in example sales capability or channels	- "Help develop radical concepts through continuous feedback" - "Create business cases" - "Create business models from technical inventions"	- Lack of trustworthy business cases are perceived as the biggest reason for concept failure and highly demanded by GH employees
Engine	- Create mutual understanding and build relationships (Kim and Wilemon, 2002) - Stimulating goal alignment between concepts and strategy (Frishammar and Florén, 2008)	- "Create better relationships between GH and M&PM employees"	- Increased integration would affect leadership circumstances, but highly depend on potential integration mechanisms

6.3   Barriers to R&D and Marketing Integration

During the empirical collection, many different types of barriers, defined by Griffin & Hauser (1996), for integration between GH and M&PM have been identified. In this section, the impact of each barrier will be analyzed by matching prior research with views from employees.

6.3.1   Personality Barrier

GH employees tend to describe the M&PM employees with typical marketing employee characteristics. M&PM are said to be different from GH employees through being more positive to formalized structures and driven by financial incentives and "climbing the career ladder". This, in some ways, corresponds to Griffin and Hauser's (1996) stereotype of a Marketing employee. Since not all employees in GH have worked closely together with M&PM, this can indicate the view of M&PM may partly be derived from a general opinion in GH. This may have created stereotypes, which both Griffin and Hauser (1996) and Keaveney (2008) argue can create barriers, regardless if the personality differences actually exist.

In the survey, the personality barrier scored a low effect on integration, which the result from the voting also confirmed. Even though personality differences are recognized, there seems to be a consensus that the differences do not affect the integration in a very negative way. One of the participants expressed "different personalities is healthy for a relationship" and GH employees in workshop agreed. When consolidating employee views from different data collection methods the personality differences seem evident, but without perceived negative effects, and thereby the barrier is considered as low.

6.3.2   Cultural Thought World Barrier

Differences in cultural thought worlds between GH and M&PM can be identified as a barrier for integration. Practically all employees in GH have an engineering background, while many in M&PM have a business background, which can be a driver of such differences. In accordance with prior research (Gupta et al., 1986; Griffin & Hauser, 1996), differences in time horizon between GH and M&PM was, in interviews, the most recurring topic regarding cultural thought world barriers. A typical statement claimed by GH employees was that M&PM has a short-time perspective and is therefore not able to provide any valuable input for long-term projects. Employees also express that they prefer to communicate with those M&PM employees that have an engineering background, due to a similar perspective on time horizon. This points to an evident cultural thought world barrier between the departments. According to scholars, departments that are isolated over time, as in the GMC, tend to increase cultural thought world barriers (Dougherty, 1992). This may be the explanation why an S&P manager expressed that GH and M&PM are like "two different worlds".

In the workshop, the employees had a somewhat inconsistent view regarding the cultural thought world barrier's effects on integration. The survey also showed quite differing views; half of the respondents gave the barrier high score, 6 and 7, while the other half gave 1 and 2. A consolidation of the data shows that employees' views on the cultural thought world barrier were the most discordant of all barriers. This can partly depend on that the barrier is complex and thus can be interpreted in many different ways. When taken the entire empirical data into consideration, the barriers affect is deemed to have an intermediate effect on the integration.

6.3.3 Language Barrier

Not many GH employees refer to a difficulty of communicating with M&PM. Some, however, said that marketing employees can have trouble understanding technical aspects. A GH employee said that M&PM tend to refer to products benefits, while GH speak about features, meaning the same thing but resulting in misunderstandings. This can be referred to what Griffin and Hauser (1996) call the language barrier. During the workshop, none of the employees highlighted language as a high barrier and it was not given any points in the dot voting session. In addition, the survey showed that almost 50 % of the respondents scored 1 at the language barrier. This indicates a low impact of language barrier on the integration between the departments.

6.3.4 Organizational Responsibility Barrier

The most frequently described obstacle to integration between GH and M&PM is the different organizational responsibilities. Such differences are common between R&D and Marketing in large organizations (Griffin and Hauser, 1996; Leenders and Wierenga, 2002). Employees express that M&PM's fiscal year responsibility makes them focus more on incremental improvements rather than radical. According to a company internal document (2014), M&PM is organizationally "responsible for marketing and product management with full accountability for product lifecycle to maximize market share and product profitability". The word profitability could infer a financial year responsibility. S&P managers claim that M&PM bonuses are linked to financial year performance. GH's responsibility of "scouting and testing" new ideas, are quite far from such responsibilities, confirming interviewees perceived difference in organizational responsibilities. These differences seem to have created evident integration barriers between GH and M&PM.

Griffin and Hauser (1996) argue that the organizational responsibility barrier is mostly controlled and designed by management, why management support for integration between the departments becomes vital. None of the employees have mentioned management's role in terms of facilitating integration, which indicates a lack of management support for integration, a common issue within the organizational responsibility barrier (Griffin & Hauser, 1996).

The different responsibilities are, according to GH employees, a reason for GH's unwillingness to present ideas early in the development phase. GH employees express that they often hesitate to introduce a radical idea until it is full-fledged, to avoid the risk that the ideas being killed. This indicates a lack of trust between the departments. Furthermore, GH and M&PM are not evaluated collectively or have project KPIs that involve both departments. Lack of integrated measurement of success tends to increase the organizational responsibility barrier (Griffin and Hauser, 1996; Leenders and Wierenga, 2002).

Employees frequently refer to the organizational responsibility barrier in interviews and it is scored consistently high in both survey and workshop. In the survey, 7 out of 9 score between 5-7 on the organizational responsibility barrier, making it the highest scoring barrier. The barrier was also given high attention during the workshop and scored highest in the dot voting. The interviews, workshop and survey results point to that the organizational responsibility barrier is highly evident in the GMC.

6.3.5   Physical Barrier

GH and M&PM are located in two different European countries, which automatically creates a physical distance, a critical barrier for integration (Pinto et al., 1993; Griffin & Hauser, 1996; Van den Bulte & Moenaert, 1998). The most recurring challenge that arises from the physical distance is the lack of informal contact. Employees at the GMC, overall, have a strong belief in informal networks as well as spontaneous contact. Only a few employees in GH currently have sporadic meeting with M&PM approximately once a month during M&PM's rather hectic visits. This implies that the informal contact between employees in GH and M&PM is practically non-existent. Peters (1990) argues that employees are most likely to interact when they have structures that encourage them to. Griffin and Hauser (1996) argue that physical distance often can reinforce other integration barriers, which indicates that the barrier needs to be taken into consideration. Physical barrier was a hot topic during the workshop and also showed the second highest score in both survey and workshop results. When consolidating all empirical data, the physical barrier is considered to have a high impact on the integration.

6.3.6   Summary of Barrier Analysis

Different organizational responsibilities and physical barriers are the barriers with highest presence and impact on integration in the GMC. The organizational responsibility barrier scored highest in both survey and workshop, but also got a lot of attention during interviews and the workshop. GH employees perceive the difference in short-term and long-term responsibilities as the biggest reason for their low integration. Physical distance is another strong barrier with high impact on the integration between GH and M&PM. Through this, lack of informal contact has high negative impact. The interpretation of empirical data from interviews, workshop and survey indicates a medium impact of the cultural thought world barrier. However,

employees do not seem to agree on its level of existence and effect. Consolidating interview responses shows that personality and language barriers have lowest impact. Low scores in workshop and survey results also support this. Figure 21 illustrates to what extent the different barriers negatively affect the GH and M&PM integration. A high pillar corresponds to a high negative effect on integration.

Figure 21 - Barriers to GH and M&PM integration at the GMC. (The authors' own figure, adopted from Griffin & Hauser (1996))

6.4 Mechanisms for Reducing Integration Barriers

Griffin and Hauser (1996) suggest five different mechanisms for reducing integration barriers. This section presents employees' attitudes towards these mechanisms, matched with prior research, in order to evaluate favorable mechanisms in the GMC.

6.4.1 Relocation and Physical Facilities Design

The relocation and physical facilities design mechanism reduces the physical barrier between R&D and Marketing (Griffin & Hauser, 1996; Leenders & Wierenga, 2002). The physical barrier in the GMC was in the barrier analysis pointed out as one of the two strongest barriers, indicating the mechanism as a viable alternative. Leenders and Wierenga (2002) show a strong positive correlation between physical proximity and integration.

In general, GH employees do not prefer formal integration processes, and do instead favor informal contact and have a high belief in informal networks. The possible informal contact a new physical design would imply supports that the mechanism could be effective. Furthermore, radical innovation projects are said to be stochastic and unpredictable (Reid & De Brentani, 2012). Therefore, it could be favorable to utilize a mechanism that does not require planning or formal support for meetings. When discussing physical relocation during the workshop, employees were positive. Physical proximity was considered effective for supporting informal meetings to stimulate 2.0 ideas. Relocation and physical facilities design also received among the highest score in the survey, which further supports the mechanism. When summarizing empirical and theoretical input, the relocation and physical facilities design mechanism seems to be a viable alternative for the GMC to stimulate integration between GH and M&PM.

6.4.2 Personnel Movement

None of the employees were overly positive to job rotation as integration mechanism. Some argue that an M&PM employee in GH would become an outsider and vice versa. In a study by Leenders and Wierenga (2002), this mechanism also showed lowest positive correlation to integration of the five mechanisms. Moenaert et al. (1994) found that short-time job rotation can have positive information flow effects, but also observed skepticism from managers to the mechanism. In the survey, none of the respondents mentioned personnel movement as a preferable mechanism. In addition, personnel movement can primarily overcome barriers related to differences in cultural thought worlds, personality and language (Griffin & Hauser, 1996; Leenders and Wierenga, 2002), barriers that were found to be low in the barrier analysis. This indicates that personnel movement is not an effective alternative for the GMC.

6.4.3 Informal Social System

Employees in GH have a high belief in informal networks. As scholars suggest (Workman, 1993; Griffin & Hauser, 1996), informal contact seems to substitute formal processes in many cases at the GMC. Therefore, employees also had a positive attitude when discussing the informal social systems mechanism, and claimed that informal meetings are especially important for radical innovation. In addition, the survey also showed a strong preference for informal social system as a potential integration mechanism. On the other hand, some of the GH employees stated that an informal system already is implemented between GH and M&PM, and that other areas are more important. The employees say, however, that the networks may not encompass all potential employees and could thus be developed.

Leenders and Wierenga (2002) show that there is a positive, but not especially high, correlation between informal social systems and integration. According to Griffin and Hauser (1996), informal social system can overcome personality, cultural thought worlds, language and physical barriers. Out of these barriers, both physical distance and cultural thought world barriers are present at the GMC and have an evident impact on the integration. To sum up, positive attitude among employees, high confidence in informal systems, and support from theory, indicates that the GMC could benefit from an informal social system mechanism.

6.4.4 Organizational Structure

Changing organizational structure to support innovation can mean many different things, such as shaping cross-functional teams, matrix organizations or coordinating groups (Griffin & Hauser, 1996). O'Reilly and Tushman (2004) also argue that unsupported teams and ambidextrous organizational structures are possible alternatives. When discussing organizational structure with GH employees, it has been impossible to discuss all possible organizational structures. The interviews have rather given a better understanding of the issues of the current organizational structure, and how much of a barrier this is perceived to be, compared to other

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barriers. Employees regard current organizational responsibilities as a high barrier, indicating that changes in organizational structure can help reduce integration barriers effectively. According to O'Reilly and Tushman's (2004) definition of different organizational structures, the functional organization is the least favorable structure to introduce radical innovations. This structure represents GH's current organizational positioning, illustrated in Figure 22.
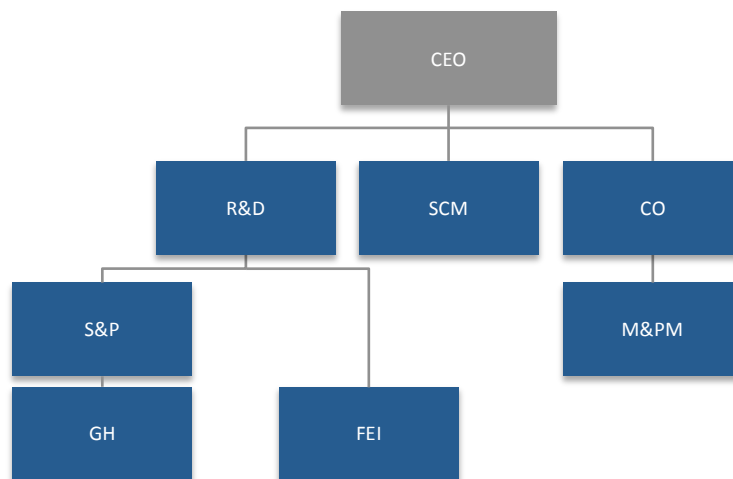
Figure 22 – The GMC's functional organization (The authors' own figure)

GH employees seem very positive to changes in organizational structure and in the survey, organizational structure was among the mechanisms that received the highest score. During the workshop, GH employees had ideas of organizing emerging business units, such as organizing 2.0 projects through autonomous cross-functional teams. Another idea was to divide both M&PM and GH in different structures with regards to different time horizons, which could correspond to an ambidextrous organizational structure, described by O'Reilly and Tushman (2004). Another idea, more specific to the GMC, was to merge the FEI and GH department. A merger between FEI and GH would not imply a different organizational structure, since FEI employees also are part of the development organization and represent the same organizational function. Thereby, such a merger would not infer a more cross-functional cooperation. One GH employee claims that a merger was not necessary to achieve the wanted cooperation with FEI.

Change in organizational structure is a mechanism said to overcome barriers of organizational responsibility, language and cultural thought worlds (Griffin & Hauser, 1996; Leenders et al. 2002). The organizational responsibility barrier was regarded as the highest barrier present, which indicates that potential changes can have valuable effects at the GMC. O'Reilly and Tushman (2004) found that the current functional organization was the least effective structure for introducing radical innovations, also indicating that changes in the GMC can have positive effect.

6.4.5 Incentives and Rewards

The data from interviews, survey and workshop regarding the incentives and rewards mechanism is quite inconclusive. Some employees had a very high skepticism against incentives and rewards in general, for example, only one person thought of incentives and rewards as a preferable integration mechanism in the survey. During the workshop, one GH employee said that incentives and rewards should be totally removed. However, when asking about creating mutual KPIs between M&PM and GH, the employee was very positive.

According to Leenders and Wierenga (2002), incentives and rewards are effective mechanisms to integrate R&D and Marketing. Literature does not suggest incentives and rewards based on individual performance measurements, which rather can inhibit integration (Donnellon, 1993). Instead, Griffin and Hauser (1996) suggest utilizing a collective reward system. Such a system increases the interdependency between departments, and can ultimately reduce organizational responsibility barriers. GH employees and S&P managers seem initially positive to such kinds of mutual incentives. Incentives and rewards help to overcome organizational responsibility barrier (Leenders & Wierenga, 2002). The organizational barrier was the strongest barrier at the GMC, which indicates that the GMC should consider further investigating the incentives and rewards mechanism.

6.4.6 Summary of Mechanism Analysis

When consolidating the mechanism analysis, all mechanisms, except personnel movement seem relevant to further investigate for the GMC. The relevant mechanism and linkages to barrier are illustrated in Figure 23.
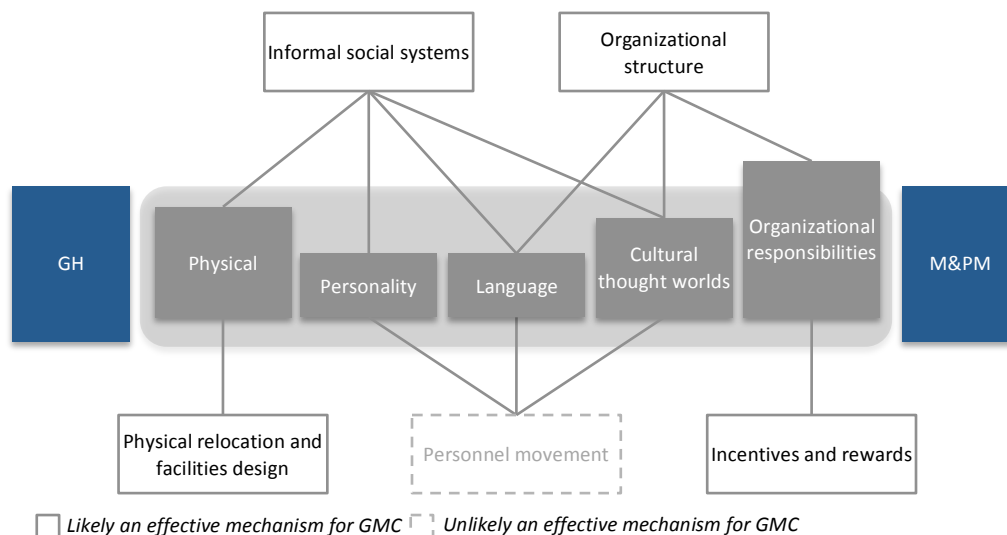

Figure 23 - Relevant mechanisms and linkage to barriers in the GMC (The authors' own figure, adopted from Griffin & Hauser (1996))

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7 Discussion

This chapter elaborates on what supports and contradicts the results as well as how they can be used. The possible implications of the chosen method on the results are also included. First, the findings pointing to that increased integration can support radical innovation are discussed. Thereafter, the chapter continues with results for how such integration can support radical innovation, the barriers to integration and the mechanisms for reducing barriers.

Increased Integration Seems Favorable to Support Radical Innovation

The analysis points to a high need of integration for the GMC and a very low existing degree of integration. This indicates an integration gap between GH and M&PM, which implies that increased integration will support innovation. These results where reached without finding much contradicting research or employee views. The ambiguity of the results arises since the question includes radical innovation. Claiming that increased integration is favorable for radical innovation partly depends on previous studies (Cotterman et al., 2009; Brettel et al., 2011; Rubera et al., 2012), in which the interpretation of the degree of innovation radicalism was difficult. Relying on such secondary sources for these results decreases validity. However, since the integration gap is clearly evident in the GMC, and the radical innovation definition quite wide, the results are still deemed trustworthy. As a necessary delimitation, the capability of M&PM to support long-term development was not included in the scope of the thesis. To trust increased integration to support radical innovation, one must believe there is relevant capability present in M&PM, or has the potential to be developed in parallel with increased integration.

How R&D and Marketing Integration Affects FFE Activities

This analysis shows how increased integration between GH and M&PM would affect FFE activities. Employees' views along with previous research on potential effects of increased integration is summarized and categorized in different FFE activities. The authors have not found any similar categorization in previous research, and the categorization is thereby only theoretically based on the separate fields of R&D and Marketing integration, and FFE activities. The authors believe that this categorization can help companies, and the GMC in particular, to increase their awareness of how, and when, R&D and Marketing integration can be included in FFE activities to stimulate and support radical innovation.

Barriers to Integration

The case study results present many different barriers for integration between GH and M&PM in the GMC. This confirms previous literature regarding integration issues in organizations, and also supports the fact that large and mature companies often have isolated functions (Griffin & Hauser, 1996; Assink, 2006). The analysis showed that the physical and organizational responsibility barriers were most highly evident for the integration at the GMC. The evaluation of these barriers showed a quite high consistency among different GH employees and in all three data

collection methods, which makes these results valid. One mentioned limitation to the study is that integration barriers are studied from GH employees' perspective, and thus does not comprise M&PM's view. This limitation has an impact, and the study would probably have shown somewhat different result if M&PM's view was included.

A clarification and evaluation of the barriers impact from a GH perspective can be used for the GMC to understand the issues connected to the integration today, and to indicate how to prioritize resources for reducing the most significant barriers. It can also help to know what to focus on in communication to GH employees when implementing change. These results can also support other companies considering increasing R&D and Marketing integration, since GH employees' opinions likely can represent R&D employees' views in a large and mature organization with highly isolated departments.

Mechanisms to Reduce Barriers and Stimulate Integration
Four different types of mechanisms are considered relevant to further investigate for the GMC: relocation and physical facilities design, organizational structure and informal social systems, incentives and rewards. Personnel movement is deemed as a likely poor integration mechanism in the GMC. The empirical data shows that neither employees nor management are positive to job rotation. Scholars do not either seem to be convinced that personnel movement is a favorable mechanism. According to a study of Leenders and Wierenga (2002), the mechanism showed weakest correlation to integration. Finally, this mechanism would primarily reduce personality, language and cultural thought world barrier (Griffin & Hauser, 1996), which are the least evident barriers in the GMC. The personnel movement mechanism does therefore not seem to be favorable for the GMC to increase integration. This research question has limited empirical data and the data is also more discordant than the other data, which reduces the credibility, hence the generalizability.

8 Recommendations to the Case Company

This chapter summarizes five recommendations to the case company, derived from the study's results. The authors recommend to make supporting GH and M&PM integration a management priority and to increase awareness of how this integration can stimulate radical innovation. The authors also propose forming an M&PM function with emerging business responsibility and placing an M&PM function physically close to the GH department. Conclusively, a recommendation of forming integration KPIs is presented.

Make Supporting GH and M&PM Integration a Management Priority

The analysis indicates that increased integration between GH and M&PM would stimulate and support radical innovation. Management support can lower the factors driving current low degree of integration through proposed recommendations. Linkage between recommendations and positive effect on radical innovation capability is illustrated in Figure 24.
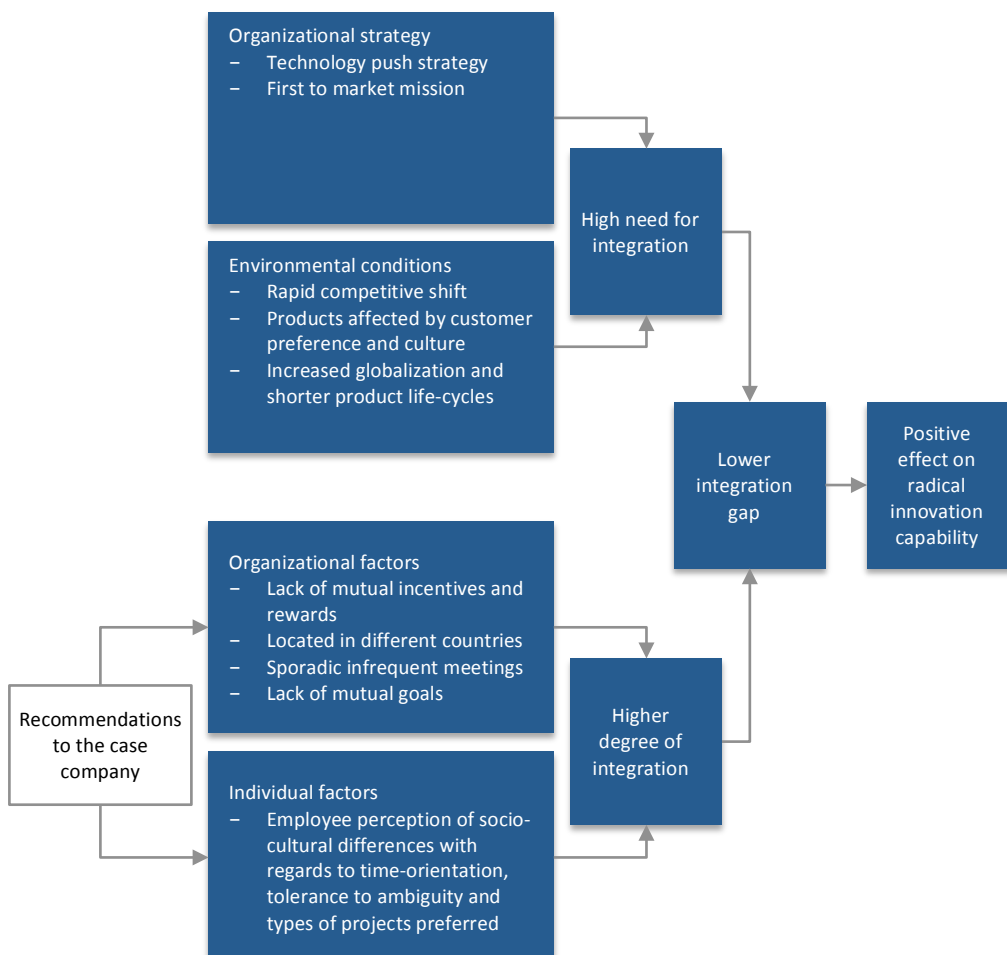

Figure 24 – The recommendations to case company's linkage to positive effect on radical innovation capability (The authors' own figure, adopted from Gupta et al. (1986))

Increase Awareness of How M&PM and GH Integration Can Support Radical Innovation

To leverage possible actions towards increased GH and M&PM integration, it is important to create awareness of the opportunities regarding integration to support 2.0 development. This report consolidates research and employees' views on these opportunities and concerns, which can provide a foundation for what to communicate to GH and M&PM employees. Such communication would benefit from a clear distinction between different types of innovation, and its relation to integration. For gaining a belief in integration among employees, the type of innovations the integration supports should therefore be clearly stated in the communication. As previously mentioned, such innovations also incorporate the "really new" innovations adopted from Garcia and Calantone (2002).

Consider Forming an M&PM Function with Emerging Business Responsibility to Reduce Differences in Organizational Responsibility between GH and M&PM

The analysis showed that the organizational responsibility barrier was the most evident barrier to integration in the GMC. A potential organizational structure mechanism is to form an M&PM function with solely emerging business responsibility. This would make the responsibilities become more similar between GH and M&PM and thereby reducing the most evident barrier. Leenders & Wierenga (2002) claim that employees, working with 2.0 development, should not have short-term incentives and responsibilities, which GH employees agree with. The start of this function could preferably spring as a reform from the current collaboration. The amount of resources and amount of employees within function will have to be further evaluated, along with a review of M&PM employees' opinions on such change.

Starting a function with emerging business responsibility can align organizational responsibility but also support developing necessary M&PM capability to support 2.0 projects. Tasks for such a function can include much of the consolidated research (Griffin & Hauser, 1996; Cotterman, 2009; Rubera et al., 2012; Rohrbeck, 2014) and employees' ideas for collaboration in the FFE to stimulate and support radical innovation, summarized in Table 9.

Table 9 - Potential tasks for M&PM function with emerging business responsibility

Potential tasks for M&PM function with emerging business responsibility
- Conducting long-term market sensing and foresight research
- Translating customer, consumer and competitor trends for 2.0 development support
- Supplying long-term visions to GH and forming a 2.0 roadmap
- Supporting with knowledge on market research methodology for early concepts
- Acting as opponent and inspiration to 2.0 opportunities, ideas and concepts.
- Providing input on commercialization aspects of 2.0 concepts
- Supporting business assessments for 2.0 opportunities, ideas and concepts.
- Assisting in 2.0 handovers from GH to development and M&PM product portfolio

Changing the current organizational structure towards a long-term, emerging business cooperation between such an M&PM function and GH is further supported by research by O'Reilly & Tushman (2004). Their research shows that the least effective organizational structure to introduce radical innovation is a functional organization, which GH operates within today. O'Reilly & Tushman (2004) claim that companies effective at introducing radical innovations work more integrated between functions, with a clearer defined mutual long-term emerging business responsibility. There are many inhibitors to radical innovation capability at the GMC, shown in the pre-study. Such inhibitors can, according to Gibson & Birkinshaw (2004), be avoided by dividing emerging and existing business. GH can be seen as an R&D department focused on emerging business, but perhaps the GMC is lacking a Marketing equivalent. The next step would be to also evaluate the forming of a corresponding SCM department, to have representation from all departments involved in the innovation process. Figure 25 illustrates the structural change implied by forming the new function.

Current organizational structure

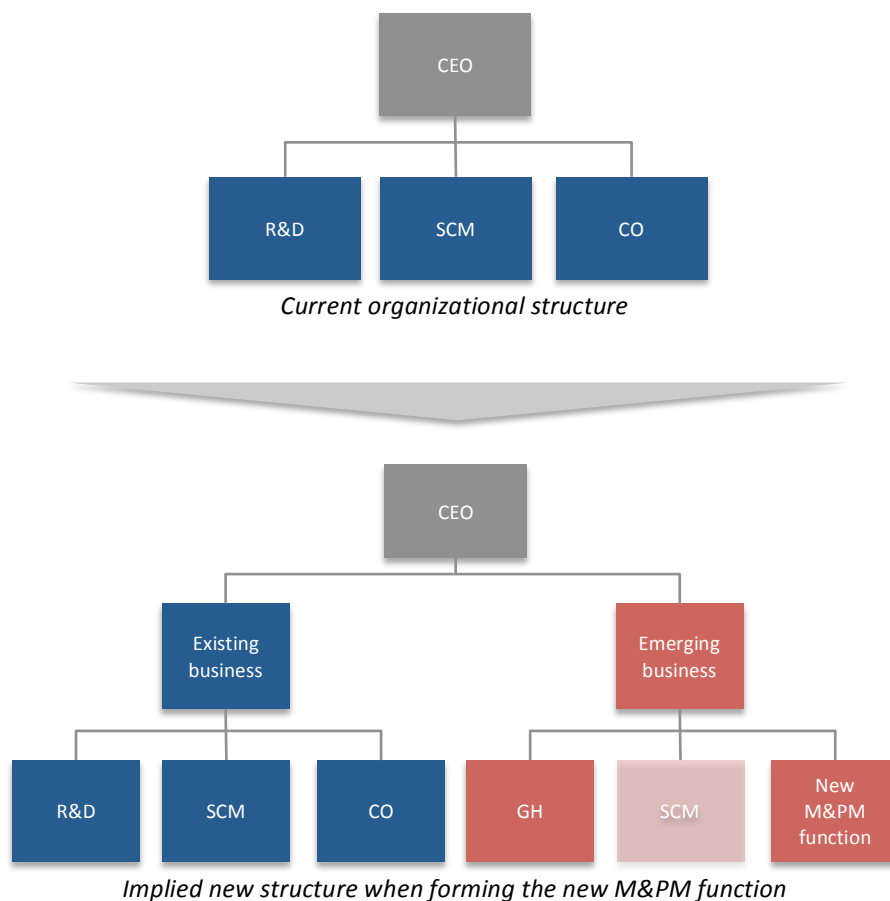*Implied new structure when forming the new M&PM function*

Figure 25. The implied change of forming an M&PM function with solely long-term responsibility (The authors' own figure, adopted from O'Reilly & Tushman (2004)).

Place an M&PM Function in the Same Building as GH to Create Circumstances for Desired Informal and Individualized Contact

GH employees highly prefer informal meetings, which is made difficult when departments are placed in different countries. Placing an M&PM function in the same building as GH, is a relocation mechanism that would facilitate desired informality (Leenders and Wierenga, 2002). The current way of communicating is problematic, since meetings are infrequent and when M&PM employees visit, their schedule is full, and more of a one-way update from GH to M&PM. This can inhibit circumstances to explore technology and marketing synergies. The other issue of current integration is that only a few GH employees are involved in the contact. There are many different types of individuals in GH, which implies different preferred ways of communicating as well as different motivational triggers. All GH employees do not necessarily have to have contact with M&PM, some employees probably do not want to. However, creating circumstances for informal contact can help satisfy individual preferences. Reid and de Brentani (2012) have shown that radical innovation projects tend to spring from individuals, which supports having individualized contact. The complexity and uncertainty of 2.0 innovations make them difficult to plan for (Leifer et al., 2001). One employee said that good and original ideas come from connecting different things you hear, but not knowing beforehand to connect. This also supports creating physical circumstances for such communication, without having a specific goal or formality connected to the communication. Since M&PM cooperates with other parts of the organization placed near GH, this relocation could also stimulate integration with other departments.

Form integration KPIs

Incentives could be put in place for supporting integration. This can, in example, be made through linking M&PM employees' bonus system through KPIs for GH 2.0 study involvement. In early technical 2.0-studies, goals are set in the beginning of the project to confirm or discard certain hypotheses regarding the technology. Such goals could also be phrased to confirm or discard hypotheses regarding what potential commercial benefit the technology has or other marketing relevant research. The exact phrasing of such KPIs requires further investigation. Integration incentives could help support integration as well as stimulating a development of necessary M&PM capability to support 2.0 development.

9 Conclusions and Further Research

This chapter presents the conclusions of this study by responding to the posed research questions: if there is reason to believe that increased integration would stimulate and support radical innovation, integration effects on FFE activities, most evident integration barriers and how these barriers can be reduced. The claimed generalizations for these conclusions are also discussed along with potential further research.

Is There Reason to Believe That Increased Integration between Greenhouse and Marketing & Product Management in the Fuzzy Front End Would Stimulate and Support Radical Innovation?

Results indicate a high need for integration between GH and M&PM. GH's technology push innovation strategy does not initiate projects from market opportunities and thereby depends on integration with M&PM. GH's first to market mission also puts a high demand on understanding of the market, especially since GH aims to introduce types of products affected by culture and preference. A rapid competitive shift for the GMC and increased globalization, modern IT and faster product-life cycles indicate more uncertain environmental conditions, which also drives higher need for integration. The current integration is deemed very low, with sporadic infrequent meetings, lack of mutual incentives and goals and departments located in different countries. This indicates an integration gap. Consolidated research on a wide definition for radical innovation, including Garcia's (2002) really new innovations, as well as GMC employees' opinions, indicate that the integration gap also is evident for radical innovation. Thereby, there is reason to believe that increased integration between GH and M&PM would stimulate and support radical innovation.

The marketing department's capability of supporting radical innovation is highly relevant for a successful radical innovation output of integration in the FFE. This study presumed that such capability existed within the M&PM department. M&PM have very little involvement in supporting radical development and such tasks have, in very little extent, been required, requested or incentivized by management historically. Research on if such capability can exist under such circumstances, and how it can be developed, is needed to be able to determine if integration is a suitable approach to stimulate and support radical innovation.

The data from the GMC shows that utilizing the Integration gap framework (Gupta et al., 1986) without taking degree of radicalism into accountability is difficult. GMC employees constantly refer to the importance of incorporating degree of radicalism when discussing integration. Even though there is not a consensus, among employees and in academia, on how integration and different types of innovation success is related, this study shows that the relation is relevant to consider. Thereby, more substantial empirical support is needed to evaluate effects from factors driving

an integration gap and the relation to innovation success, when taking degree of radicalism into account. Such research interlinking the integration gap factors to degree of radicalism could support reforming the framework to include not only innovation success, but also radical innovation success.

How Would This Integration Affect Fuzzy Front End Activities?

The case study accounts for how increased integration would affect FFE development, through categorizing effects in different FFE activities and elements. This is based on potential positive effects as well as risks and considerations derived from previous research and GMC employees' views. The categorization can help companies, and the GMC in particular, to better understand when and how integration supports radical development in the FFE. In the GMC, indications of positive integrations effects were strongest regarding: helping to early grasp market and technology opportunities, making better business assessments for new opportunities and concepts as well as aligning goals and vision between departments. The authors claim that GH employee perspectives on integration in FFE can help to indicate R&D employee views in large and mature companies with highly isolated departments. This study has mainly focused on M&PM as a support to GH's technology push strategy, but further research could focus more on the innovation capability of Marketing, such as business model innovation capability.

What are the Barriers for Integration between Greenhouse and Marketing & Product Management?

The result from the case study clearly shows that high barriers for integration between GH and M&PM exist in the GMC. These findings confirm previous research, which states that large and mature companies often have R&D and Marketing integration issues. Barriers clearly spotted in the GMC's case were personality differences, language barriers, differences in cultural thought worlds and organizational responsibilities as well as physical barriers. When evaluating most evident barriers, organizational responsibility barrier was deemed highest along with the physical barrier, which was considered having a slightly lower negative impact. The GH employees' views on barriers for integration could very well indicate typical R&D department employees' views for large and mature companies, with highly isolated departments. To fully understand the integration barriers, however, further research on Marketing employees' views on integration barriers in similar context are required.

The personality barrier, a part of Griffin and Hauser's (1996) integration barrier framework, was deemed very low at the GMC. Many employees described personality differences as natural and necessary for a fruitful integration. This does not only indicate that it is a low barrier at the GMC, but perhaps also questions the barrier's relevance in general. The GMC represents a case with highly isolated departments and perceived personality differences are highly present, but they are still not deemed as an evident barrier. This raises the question if there are any cases where personality differences do have a high negative effect on integration. Further

research could help to confirm or discard this notion. Such empirical evidence would imply to remove or reform the personality barrier part of the framework.

How Can These Barriers Be Reduced?

The study showed that mechanisms of relocation and physical facilities design, informal social systems, organizational structure and incentives and rewards are likely to be effective for reducing integration barriers at the GMC. This is based on employees' attitudes and previous research on mechanisms' effect for reducing evident GMC barriers. The personnel movement mechanism was not deemed to be a likely effective mechanism. Practically all employees had skepticism towards this mechanism, and previous research claims that personnel rotation can be problematic and shows low correlation to integration barrier reduction. The empirical data regarding this research question was limited, somewhat inconclusive and the nature of the mechanisms was not clearly defined when discussed. Therefore, it is hard to draw externally valid conclusions from these findings. The mechanism conclusions could, as a general contribution, rather be used as a summary of possible actions for reducing barriers.

Even though the results from the study indicate favorable approaches in the GMC, further research on effectiveness of different mechanisms is needed. This research ought to evaluate integration mechanisms, preferably with case companies in a similar situation as the GMC, which have implemented mechanisms. This research would benefit from measuring effects on radical innovation success. Findings from such studies could help academia to better understand preferable integration mechanisms, given evident integration barriers, when aiming to increase radical innovation capability.

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Company Internal Sources

Company internal documents (2014)

Company intranet (2014)

Company website (2014)

Oral Sources

Expert Interviews

Bill, S. [Interview], 2014-03-04; 2014-03-26; 2014-04-08

Kronqvist, B. [Interview], 2014-03-10

Pre-study Interviews (14 interviews with 14 GMC employees)

S&P manager, [Interview], 2014-02-19

GH employee, [Interview], 2014-02-19

FEI employee, [Interview], 2014-02-19

GH employee, [Interview], 2014-02-20

FEI employee, [Interview], 2014-02-24

GH manager,   [Interview], 2014-02-24

GH employee, [Interview], 2014-02-26

FEI employee, [Interview], 2014-02-26

GH employee, [Interview], 2014-02-27

GH employee, [Interview], 2014-02-27

GH employee, [Interview], 2014-03-03

GH employee, [Interview], 2014-03-05

GH employee, [Interview], 2014-03-05

GH manager,   [Interview], 2014-03-06

Case-study Interviews (12 interviews with 9 GMC employees)

GH manager,   [Interview], 2014-03-12; 2014-03-27

GH manager,   [Interview], 2014-03-12; 2014-03-27

S&P manager, [Interview], 2014-03-13

GH employee, [Interview], 2014-03-20

GH employee, [Interview], 2014-03-24

GH employee, [Interview], 2014-03-24

GH employee, [Interview], 2014-03-25

GH employee, [Interview], 2014-03-25

S&P manager, [Interview], 2014-03-31

Observations

Workshop, 2014-04-09

Appendices

Appendix A - Interview Guide Pre-study

Appendix B - Interview Guide Case study

Appendix C - Assink's Conceptual Framework

Appendix D - Workshop

Appendix E - Workshop Results

Appendix F - Survey Form

I

Appendix A - Interview Guide Pre-study

Role and tasks
- What is your role and responsibilities?

Process
- Can you describe a typical process from ideas to the start of the development phase you are a part of?

Potential follow-up question: Ask more if interviewee speaks of 2.0 or radical innovations.

- Do you take part of idea detection?

Potential follow-up questions: How does that work? Positive and negative aspects regarding 2.0 innovations

- Are you working with idea development?

Potential follow-up questions: How does that work? Positive and negative aspects regarding 2.0 innovations

- Are you working with idea evaluation?

Potential follow-up questions: How does that work? Positive and negative aspects regarding 2.0 innovations

- Are you working with idea prioritization?

Potential follow-up questions: How does that work? Positive and negative aspects regarding 2.0 innovations

Cooperation
- In which part of the process do you have contact with other parts of the organization?

Potential follow-up questions: Which departments are most frequent in contact? How does the cooperation support the innovation process?

2.0 focus
- What is 2.0?

Potential follow up: Do you have any examples of 2.0 innovations?

- Are there any differences between the process for 1.1 and 2.0?

- How do you think the focus has been on 2.0 the last years and now?

- What do you think is needed to get more and better 2.0?

- What do you need to be able to contribute to more and better 2.0?

Hinders
- What are the inhibitors for 2.0 innovations at the GMC?

Potential follow-up questions: How is that expressed?

Evaluation/prioritization
- Are ideas evaluated with regards to current production processes or if they are possible at all?

- Are incremental and radical ideas evaluated in the same way?

- How are the projects prioritized when there are many projects to choose between?

Other questions
- How is your performance measured and evaluated?

- What motivates you?

- Is there consensus within the organization about how the GMC should innovate?
    - *Potential follow-up questions: Is it important? How can it be reached?*

Appendix B - Interview Guide Case Study

- Can you briefly describe your role and responsibilities?

- Do you believe that integration with M&PM is important for your (GH) role and tasks?

- Is M&PM integrated in the radical innovation process today? In that case, how?

- Can, and should, M&PM support radical innovation in GH?

- What type of activities in GH could M&PM support?
    o In what activities of the New Concept Development can M&PM support?

- What are the challenges regarding the collaboration between GH and M&PM?
    o *Potential follow up: personality, language, cultural thought worlds, physical and organizational responsibility*

- Do you have any ideas of how the collaboration can be improved?
    o *Potential follow up: organizational structure, incentives and rewards, physical relocation, informal social systems and personnel movement*

Appendix C - Assink's Conceptual Framework

Cluster 1 - The Adoption Barrier
Table C1 - Theoretical description and synthesized responses of adoption barrier cluster

Barrier	Theoretical description	Synthesized responses
Path dependency and dominant design	Companies often loose their innovative edge as they limit themselves to incremental innovation, the so-called dominant design, too long (Paap & Katz, 2004)	The technology roadmaps that are used are described by some respondents as "continuous technology development tools" rather than stimulating new paths.
Existing successful products or business model	These successful products or models can limit the willingness of risk, therefore the probability of falling into the "curse of success" is increased (Paap & Katz, 2004)	Successful product concepts imply a lack of pressure to change focus from incremental to radical innovation since "there are so many incremental profitable alternatives". Making processes efficient and incremental innovations has historically driven the profitability of the company. A respondent says, "why would anyone want to change?".
Organizational dualism	Organizations with patterns of success often encounter a conflict between keeping business as usual and incorporate radical innovations that can enable competitive advantage in the future (Paap and Katz, 2004) Large companies often lack a two-fold structure that is capable to combine incremental innovation with radical innovation (Cosier and Hughes, 2001; Sharma, 1999).	Employees express that their role has become too singularized around their controlled task, "we have become as a grocery store personnel, "biping" products in the register, so specialized and process-driven that we do not have time or resources to reflect on the possibility of doing things differently". The efficient thinking of development has spilled over to the early stages of the innovation and research and that the organization has trouble mastering both.
Excessive bureaucracy	Rules and procedures can inhibit creativity, which means that the flexibility to react and willingness to risk decrease. Generic conservatism and learning deficiency are two main reasons why large organizations find it problematic to encompass radical innovation (Stringer, 2000).	Bureaucracy is described as a "curse" and disruptive innovation barrier. There doesn't seem to be any clear identifiable perpetrator driving this, but rather being a function of the company's sheer size. The legal procedures of discussing ideas and the supply chain specification procedures are two of the recurring issues brought up in interviews. "A lot of people with good spirit and ideas get stuck in bureaucracy and falter".

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| Stifling of the status quo | "That's the way we've always done things around here" is a clear signal of status quo, which affect companies that prefer stable, familiar and efficient processes at the expense of new potential market opportunities (Stringer, 2000; Sharma, 1999). | Respondents frequently refer to the organizational and cultural resolve to maintaining status quo. "Exploitative organization as ours has an "immune system" against change". One respondent described it as resistance from support functions, with high demand with their involvement when making specifications. |

Cluster 2 - The Mindset Barrier

Table C2 - Theoretical description and synthesized responses of mindset barrier cluster

Barrier	Theoretical description	Synthesized responses
Inability to unlearn	The ability to unlearn is a critical competence and is described as the process by which people and firms eliminate old logic and substitute it with something fundamentally new (Sinkula, 2002; Baker and Sinkula, 2002). If patterns of conventional thinking and old beliefs are destroyed this counteracts obsolete mental models.	One of the respondents described that there exists a "mindset wall" - saying "this is the way we have always done around here"
Lack of distinctive competencies	Historically useful core competencies can become core rigidities for radical innovation instead (Johannessen, Olsen & Lumpkin, 2001). Most large organization lack the ability to introduce necessary capabilities for radical innovation and use of old ones also inhibits the effort of change capabilities (Baker and Sinkula, 2002).	
Obsolete mental models and theory-in-use	Mental models and beliefs, both on individual- and organization level, which no longer fit the changing environment or competitive situation rots the development of theory-is-use, the tacit knowledge system (Assink, 2006).	Related to disruptive initiatives, a respondent describes a common mental model of "yes, sounds good, but we'll do it next year, now go back to business as usual". Some other also claimed that the awareness of the tough strategic situation created a "mental paralysis" among employees.

Cluster 3 - The Risk Barrier

Table C3 - Theoretical description and synthesized responses of risk barrier cluster

Barrier	Theoretical description	Synthesized responses
Learning trap	Large and mature companies often end up doing the same thing, even when it is not effective any more. It is a conflict between continuing the efficient successful routines and processes and the need to challenge these capabilities for radical innovation (Assink, 2006).	
Lack of realistic revenue and ROI expectation	Unrealistic predictions on monetary return is often a barrier to radical innovation. High expectations hinder managers from choosing to target emerging markets, where radical innovations often hit their initial success (Harper & Becker, 2004)	
High risks and uncertainty	The barrier embodies both technical and market risks. Foresee and influencing the market needs and potential are insecure but crucial in order to be pro-actively and avoid the "chasm-pitfall" and reduce uncertainty (Sandberg, 2002).	
Risk averse climate	The failure rate on radical innovations is high, and so are the costs for new development projects, why management often is doubtful to venture on wild ideas (Hamel, 2002). For a successful implementation of an idea, the company's climate need to be receptive to uncertainty and unusual ideas (Rice et al. , 2000).	
Unwilling to cannibalize	Dominate market leaders often await to introduce radical innovations because they are unwilling to cannibalize on their own investments. Established companies often have focus on a short to medium term growth and therefore trying to protect their current products (Deloitte Research, 2004).	A respondent described a barrier as management not willing to commit resources, and said "there is a difference between saying and doing".

Cluster 4 - The Infrastructural Barrier

Table C4 - Theoretical description and synthesized responses of infrastructural barrier cluster

Barrier	Theoretical description	Synthesized responses
Lack of mandatory infrastructure	Many organization have an underdeveloped and insufficient infrastructure for radical innovations since it is far different from what the incremental innovations need (Assink, 2006)	
Lack of adequate follow-through	A great challenge in the radical innovation process is the step from innovation to sustainable growth, something that requires close co-operation and support from management (Brown and Duguid, 2001). Radical innovations demand a successful business model that is enabled by technological innovation. According to Sandberg (2002) a close and pro-active co-operation between marketing department and developments are very important for radical innovations. The market side needs to be educated about radical new products in order to create timely awareness of new concept or visions (Assink, 2006).	R&D and Marketing departments are described as not sharing the same building and that other units also have become more isolated from each other. Some respondent's refer to "the grandfather principle", where development engineers are no longer associating with their manager's manager, which is described as an issue, since they feel less responsibility.

Appendix D – Workshop

Workshop (9/4 - 2014 15:30-17:00)

Participants
5 GH employees
2 FEI employees
1 S&P employee

Facilitator
1 author

Purpose and workshop questions
Discuss the challenges and possibilities GH and M&PM integration to stimulate and support radical innovation.

1. Would increased integration stimulate and support radical innovation?
 If yes, how?
2. What are the main barriers for integration?
3. How can these barriers be reduced?

Schedule
15:30-15:40 Introduction, terminology and research questions
15:40-16:00 *Would increased integration stimulate and support radical innovation? If yes, how?*
        15:40-15:45 Individual spawning and post-it writing
        15:45-15:55 Discussion, groups of 4
        15:55-16:00 Full group discussion
16:00-16:25 *What are the barriers for such integration?*
        16:00-16:05 Individual spawning and post-it writing
        16:05-16:20 Putting post-its in barrier area with examples (area headlines on wall) and discussions in groups of three.
        16:15-16:20 Individual voting for most crucial barrier
        16:20-16:25 Full group discussion
16:25-16:50 *How can these barriers be reduced?*
        16:25-16:30 Individual spawning and post-it writing
        16:30-16:40 Putting post-its in mechanism area (mechanism areas on wall) and discussions in groups of three
        16:40-16:45 Individual voting for most efficient mechanism
        16:45-16:50 Full group discussion
16:50-17:00 Concluding remarks and questions.

Appendix E - Workshop Results

The workshop results refer to two different groups, group 1 and group 2. Each group consisted of 4 participants and each participant was allowed to allocate 5 points for voting on the most affecting barrier. This allocation could result in 5 points for one barrier and 0 for the rest of the barriers, equally distributed or somewhere in between those two alternatives. Therefore, the maximum points for all barriers are total 40 points. If distributed equally, the result would have been a total of 8 points for each barrier. The results of the voting are summarized in table E1 and table E2.

Table E1 - Workshop voting results for most affecting barrier, inhibiting GH and M&PM integration. Barriers adopted from Griffin and Hauser (1996).

Barrier	Group 1	Group 2	Total
Personality	3	4	7
Cultural thought world	4	0	4
Language	0	0	0
Organizational responsibilities	7	9	16
Physical	6	7	13

Table E2 - Workshop voting results for most effective mechanism to increase integration between Greenhouse and M&PM to stimulate and support radical innovation. Mechanisms adopted from Griffin and Hauser (1996).

Mechanism	Group 1	Group 2	Total
Relocation and physical facilities design	4	6	10
Personnel movement	3	0	3
Informal social systems	7	0	7
Organizational structure	0	9	9
Incentives and rewards	6	5	11

Appendix F - Survey form

Would an increased cooperation and communication between Greenhouse and Market & Product Management stimulate and support radical innovation?

○ Yes

○ No

If yes, how can it help?

[   ]

If no, why not?

[   ]

How much does personality differences between GH and M&PM employees negatively affect the cooperation and communication?

      1 2 3 4 5 6 7

Very little ○ ○ ○ ○ ○ ○ ○ Very much

How much do different cultural thought-worlds negatively affect the cooperation and communication?

      1 2 3 4 5 6 7

Very little ○ ○ ○ ○ ○ ○ ○ Very much

How much do different languages negatively affect the cooperation and communication?

      1 2 3 4 5 6 7

Very little ○ ○ ○ ○ ○ ○ ○ Very much

How much do different organizational responsibilities negatively affect the cooperation and communication?

      1 2 3 4 5 6 7

Very little ○ ○ ○ ○ ○ ○ ○ Very much

How much do physical barriers negatively affect the cooperation and communication?

      1 2 3 4 5 6 7

Very little ○ ○ ○ ○ ○ ○ ○ Very much

What type of actions to improve cooperation and communication would you prefer?

☐ Relocation and physical facilities design

☐ Personnel movement

☐ Informal social systems

☐ Organizational structure

☐ Incentives and rewards

Is there anything you would like to add regarding GH and M&PM cooperation and communication to support radical innovation?

[   ]