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Integrating Consumer Insight in Food Innovation: Information acquisition and dissemination in new product development

PhD dissertation

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Acknowledgements

These are the first words, I write on my dissertation (date: 20.09.2016). After a quick consideration of how it would make sense to start when gathering this three-years-of-work, I decided to start with the best part: thinking about all the important people who have somehow been part of this journey. You can compare this to starting with the desert. I know that the rest will probably be a bit more frustrating to write.

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Resumé

Et stort antal af nye fødevarer fejler på markedet. Derfor er ønsket med denne afhandling at bidrage til at bringe nyudviklede produkter tættere på forbrugernes behov og ønsker. Ud fra et markedsorienteret perspektiv på innovation er målet at forstå, hvordan forbrugerindsigt kan integreres i produktudviklingsprocessen. Fokus er virksomhedernes tilegnelse og deling af information for at opnå dette.

Introduktionen positionerer afhandlingen i forhold til det markedsorienterede perspektiv på innovation og forklarer relevansen af at integrere forbrugerindsigt i produktudvikling. Der argumenteres for, at succes i produktudvikling afhænger af virksomhedens evne på tre områder: evnen til at 1) tilegne sig, 2) dele og 3) anvende information om forbrugerne i produktudviklingen. Tilegnelse og deling af information er fokusområderne i denne afhandling. Heraf afledes det overordnede forskningsspørgsmål:

Hvordan kan virksomheder integrere forbrugerindsigt i deres udvikling af nye fødevarer ved hjælp af tilegnelse og deling af information?

For at besvare spørgsmålet, fokuserer afhandlingen på følgende underspørgsmål, der behandles i fire papirer:

1) Hvordan kan forbrugere motiveres til at interagere med fødevarevirksomheder og hinanden i online-forbrugergrupper med vidensdeling og produktinnovation som formål?
2) Hvordan kan virksomheder forbedre kommunikationen mellem funktioner i produktudviklingsprocessen?

Det første forskningsspørgsmål fokuserer på tilegnelse af information og adresseres i første og andet papir. Forskning i forbrugernes motivation for interaktion i online-grupper omkring fødevarer er begrænset. Derfor forsøger det første papir at bidrage med en forståelse af specifikke motivationsfaktorers rolle i forbrugernes villighed til at interagere i disse grupper. Herunder undersøges det, i hvilken grad motivationsfaktorerne relaterer sig til forbrugerens allerede eksisterende interesse i fødevarer og generel online-interaktion. 980 danske forbrugere deltog i et spørgeskema online, og dataet blev analyseret ved hjælp af en mediator-analyse. Resultaterne viser, at baseret på deres allerede eksisterende interesse i fødevarer og generel online-interaktion skabes motivationen til at lære af gruppen og præsentere sig selv for gruppen. Motivationen til at lære fra gruppen gør forbrugeren villig til

både at dele og især bruge information i gruppen. Motivationen til at præsentere sig for gruppen gør forbrugeren villig til at dele information i gruppen. De to motivationsfaktorer fungerer altså som mediatorer mellem forbrugerens allerede eksisterende interesse (i fødevarer og generel online-interaktion) og deres interaktionsintention i online-gruppen. Online-grupper omkring fødevarer skal derfor give mulighed for, at den enkelte forbruger kan 1) præsentere sig selv som et individ for gruppen og 2) lære af den information, der er tilgængelig i gruppen. Men virksomheder skal være opmærksomme på, at disse muligheder i høj grad kun appellerer til forbrugere med en allerede eksisterende interesse i især fødevarer og, i nogen grad, generel online-interaktion.

Det andet papir fokuserer specifikt på online grupper omkring produktudvikling som et samarbejde mellem forbrugerne og en virksomhed. Det første punkt, der undersøges er, hvordan motivationsfaktorer, baseret på behovene for relation, kompetence og autonomi, relaterer sig til forbrugernes interaktionsintention. Det andet punkt, der undersøges er, hvordan disse forhold modereres af forbrugernes hjemland, som adskiller sig på den kulturelle dimension 'individualisme-kollektivisme'. Dataet blev indsamlet via to spørgeskemaer i hhv. Danmark og Brasilien. Resultaterne viser, at forbrugernes interaktionsintention primært er motiveret af muligheden for at have et tilhørsforhold. Derudover motiveres forbrugerne i nogen grad også af muligheden for at kunne påvirke resultatet af produktudviklingen. Dog er vigtigheden af de to forskellige typer af tilhørsforhold (tilhørsforhold til virksomheden versus onlinegruppen) signifikant forskellig mellem de to lande. Denne forskel hænger sandsynligvis sammen med de respektive individualistiske og kollektivistiske værdier, der karakteriserer de to lande.

Det andet forskningsspørgsmål fokuserer på virksomhedernes deling af information mellem funktionerne i virksomheden. Det adresseres i tredje og fjerde papir. Kommunikation mellem funktionerne er nødvendig for at integrere forbrugerindsigt i produktudvikling. I det tredje papir laves en systematisk litteraturgennemgang, som identificerer specifikke faktorer, der kan styrke kommunikationen mellem virksomhedernes marketingfunktioner og teknologifunktioner. Resultaterne viser, at faktorer relateret til støtte fra ledelsen, organisationsstrukturen, holdsammensætning og systematisk forvaltning af viden fremmer kommunikation mellem funktionerne. Derudover afhænger behovet for kommunikation mellem funktionerne af det interne og eksterne usikkerhedsniveau. Baseret på de identificerede faktorer gives nogle specifikke anbefalinger til virksomheder i fødevareindustrien, som ønsker at fremme kommunikation mellem marketing og teknologi.

Det fjerde papir undersøger de forhold, som møder virksomhederne, der ønsker at implementere de foreslåede faktorer. Målet er at undersøge udfordringerne ved implementeringen, som de opfattes i virksomhederne. Fokus er på, hvordan udfordringerne opfattes forskelligt afhængigt af virksomhedens størrelse (små og mellemstore virksomheder (SME) versus store organisationer) og medarbejdernes funktionelle fokus (marketing versus teknologi). Data blev indsamlet ved hjælp af 27 interviews med teknologieksperter eller marketingeksperter fra SMEs eller store organisationer i fødevareindustrien. På tværs af virksomhedsstørrelse og funktionelt fokus er der enighed om vigtigheden af faktorerne for at fremme kommunikationen mellem funktioner. Afhængigt af virksomhedsstørrelsen og det funktionelle fokus er der dog forskel i opfattelsen af, hvordan disse faktorer skal implementeres. Implementeringen er en langsigtet proces, der ikke skaber øjeblikkelige resultater. Alligevel er det nødvendigt at tage højde for disse forskellige opfattelser af implementeringsudfordringerne, når virksomhederne forsøger at fremme kommunikationen mellem marketingfunktioner og teknologifunktioner.

Summary

As a response to the high number of product failures in the food industry, the aim of this dissertation is to study the factors that align consumer needs/wants and companies' new product development. From a market-oriented perspective on innovation, the objective is to understand how information acquisition and dissemination can support consumer insight integration into the new product development process.

First, the introduction positions the dissertation in relation to the market-oriented innovation perspective and explains the relevance of supporting consumer insight integration in new product development. The dissertation builds on the assumption that successful new product development depends on companies' abilities to acquire, disseminate, and apply information about consumers. Information acquisition and dissemination are in focus in this dissertation. The following overall research question is proposed:

How can companies integrate consumer insight in new food product development through information acquisition and dissemination?

In order to answer this question, the following sub-questions are addressed in four papers:

1) How can consumers be motivated to interact with food companies and each other in virtual food communities with the purpose of knowledge sharing and product innovation?
2) How can companies support cross-functional communication in the new product development process?

The first research question focuses on companies' information acquisition and is addressed in the first two papers. Research on consumer motivation for interacting in virtual food communities is scarce. The first paper therefore aims at understanding the mediating role of specific motivation factors in consumers' willingness to interact in virtual food communities. It investigates to what extent these motivation factors explain the relationship between pre-existing consumer interest in food and general online interaction, and interaction intention. A total of 980 Danish consumers participated in the online survey, and a mediation analysis was conducted. Results shows that based on their pre-existing interest in food and general online interaction, consumers are motivated to learn from the community and present themselves to the community. The chance to learn from the community and show oneself to the community are reasons *why* consumers intend to engage in community interaction given their pre-existing involvement with especially food and, to some extent, general online interaction.

Virtual food communities should therefore provide consumers with the opportunity to present themselves as skilled individuals to the community as well as to learn from the information available from the community. Still, companies must keep in mind that these opportunities will appeal mainly to consumers with a high food involvement.

The second paper specifically focuses on virtual communities aimed at product innovation as a collaboration between consumers and companies. The study addresses two points:1) How are motivation factors, rooted in the need for relatedness, competence, and autonomy, associated with behavioural interaction intention in a virtual community aimed at product innovation? 2) How are these relationships moderated by countries differing on the cultural dimension of individualism – collectivism? Two surveys were conducted in Denmark and Brazil, respectively. Results shows that relatedness is the dominating motivation factor for consumer participation. Additionally, consumers are, to some extent, motivated by the perceived outcome benefits. However, the importance of group relatedness versus company relatedness differs strongly between countries, which is well in line with the particular individualistic and collectivistic values characterising the individual societies.

The second research question focuses on companies' information dissemination between functions; this is addressed in the third paper and the fourth paper. Cross-functional communication is required in integrating consumer insight into new product development. In a systematic literature review, the third paper therefore extracts factors that support cross-functional communication. The findings show that factors related to management support, organisational structure, team composition, and knowledge management all support communication between the functions. Furthermore, the need for cross-functional communication depends on internal and external uncertainty issues. Based on these factors extracted from literature, a set of recommendations aimed at food industry practitioners is proposed.

The fourth paper investigates the issues faced by companies in their implementation of the suggested supporting factors extracted in the third paper. The objective of this study is to explore the perceived challenges organisations face in their implementation of these cross-functional communication supporting factors. Focus is on how the implementation challenges are perceived differently depending on organisation size (small and medium-sized enterprises (SME) vs. large organisations) and the employees' functional focus (marketing vs. technology). A total of twenty-seven semi-structured interviews were conducted with

technology or marketing experts from SMEs or large organisations operating in the food sector. Across company size and functional focus, the findings show that cross-functional communication is generally agreed to be crucial for successful new product development. However, depending on the company size and the functional focus, the perceptions of how these factors should be implemented differ. The implementation of factors supporting cross-functional communication is a long-term process without immediate benefits. Still, the different perceptions of the implementation challenges should be included when managing cross-functional communication, in order to overcome the implementation challenges of the supporting factors.

Introduction

Many product innovations fail because of poor preparation in the early stages of new product development (NPD) (Cooper, 1988). Since the 1960s, high failure rates among new products have justified research in the area of product success and failure, in order to develop the 'best practices' to comply within NPD (Griffin, 1997, Griffin and Page, 1993). Still, it is estimated that a high number of new products fail in the market, although these estimations differ depending on the information source and definition of product success.

Looking across products, Crawford (1987) estimated that the average product failure rate (see explanation in the background section) is around 35%, supported by Griffin (1997) reporting that around one third of firms' NPD projects fail. Equally, Cooper (1988) reported that only 56% of companies achieve a product success rate of 60% or higher. In recent literature, the failure rates are still cited to be high. For example, Evanschitzky et al. (2012) claim that less than 25% of the NPDs in the market succeed.

In the food industry, high failure rates dominate as well (e.g. Menrad, 2003), and most new food and beverage products are claimed to fail when commercialised (Kemp, 2013). Rudolph (1995) stated that 80-90% of all new food products are removed from the shelves within a year after being introduced to the market. This is supported by Kemp (2013) who explains this number to be between 75 and 90%. The failure rate of frozen food is cited as 70-80% (Gresham et al., 2006), and Asplund and Sandin (1999) found that 50% of newly developed beers leave the market within four years.

Furthermore, many products never get as far as to the market despite having required considerable time and financial resources. They may make it to the final development stages, but are then rejected before even being introduced to the market (Fuller, 2011). Many different products enter the market every year - some may be designed to be on the market for only a limited period. When such a product leaves the market within a year after its introduction, it is not necessarily a problem for the company. However, regarding packaged and branded food products that have required considerable resources from the company to develop, leaving the market within a year, is a waste of time and financial resources. Therefore, a high failure rate among these new products is problematic also for food companies (Fuller, 2011). The focus in this dissertation is on packaged and branded food

products designed to be on the market for more than one year – and which have required considerable development resources from the company in order to succeed.

The '*key to maintaining a competitive position in the marketplace is the ability to repeatedly commercialize successful new products'* (Griffin and Page, 1996, p. 479). From this point of view, companies need to develop new products (i.e. product innovations) continuously in order to grow, succeed, and stay competitive (Brown and Eisenhardt, 1995, Cooper, 1983, Calantone et al., 1996, Poolton and Barclay, 1998). Innovations can be new to the industry, the company, or the consumers (Garcia and Calantone, 2002). This dissertation takes a market-oriented approach to product innovation. From a market-oriented point of view, innovation is consumer driven and defined as *'the detection and fulfilment of unfilled needs and wants of potential customers, using the skills, resources, and competences of the company* (Traill and Grunert, 1997, p. 1). Innovation is not about developing a product per se, but about fulfilling consumer needs and wants through product development (Kemp, 2013). In this dissertation, a new product includes only physical products – innovations related to services and processes are therefore not addressed.

Also in the food industry, product innovation is crucial for the business performance (Traill and Grunert, 1997). The food industry is a low- and medium technology industry consisting of many small and medium sized enterprises (SME) (Baregheh et al., 2012, Dadura and Lee, 2011, King et al., 2002, Traill and Grunert, 1997). In fact, SMEs account for 99.1% of all food and drink companies (FoodDrinkEurope, 2016), but when it comes to turn-over, value added, and employment, large companies and SMEs are more equally represented (FoodDrinkEurope, 2015). Food innovations are primarily incremental compared to radical (Baregheh et al., 2012, Noordman and Meijer, 2013), and the market is characterised by a high number of product turn-overs (Traill and Meulenberg, 2002). NPD is essential for a company's success, survival, and renewal, especially in a fast-paced and competitive market (Brown and Eisenhardt, 1995) such as the food industry (Barrena and Sánchez, 2012, Grunert et al., 1996, Stewart-Knox and Mitchell, 2003).

Different factors such as product advantage, product innovativeness, marketing synergy, technological synergy and market orientation determines NPD success (Henard and Szymanski, 2001). The most dominant factor is product advantage. NPD success requires that the consumer perceives the product as superior (Cooper and Kleinschmidt, 2007, Henard and Szymanski, 2001, Cooper, 1999, Ogawa and Piller, 2006, Simonson, 1993). Although other

factors such as retailer demands can play a role in a product's market introduction and endurance (Fuller, 2011), product superiority will be one of the main requirements for a product to make it to the market and stay in the market for more than a limited time-period. The majority of products fail because there is no market for it – not because of technological shortcomings. In line with this, research has found that timely and reliable knowledge about consumer needs and wants is the most important factor for decreasing product failure rates (Ogawa and Piller, 2006). This dissertation therefore builds on the assumption that new product success requires that the product meets the needs of its target consumers to a larger extent than other products (Cooper, 1983).

The market-orientation perspective states market information processing to be a necessity for NPD success. In addition to consumer information, market information includes information on all market actors such as retailers, wholesalers, regulators, and competitors that may somehow influence consumers' preferences and needs (Kohli and Jaworski, 1990). Retailers are often the intermediaries between companies and consumers of food products, and can act as providers of consumer information to companies and take care of consumer needs and wants. On the other hand, retailers can also constitute barriers to product innovations (Esbjerg et al., 2016). An important factor for retailers to accept companies' products on their shelves is the products' ability to clearly communicate the benefits to consumers at minimum risk to the retailer (Esbjerg et al., 2016). In other words, retailers are very focused on carrying product assortments that meet consumer needs and wants. This further supports the importance for companies to develop products targeting the needs and wants of potential consumers, despite selling their products to end consumers through intermediaries such as retailers.

Given the relevance of consumer information in successful food product innovation, this dissertation will address market information in terms of consumer needs and wants. To achieve NPD success, consumer information must be 1) acquired, 2) disseminated, and 3) applied (Ottum and Moore, 1997) (Figure 1).

First, this perspective highlights the importance of acquiring information on consumer needs and wants in the NPD process (Ottum and Moore, 1997, Cooper, 1988, Cooper, 1999). Cooper (1988) explains that product failures often are a result of lacking market information preliminary to the product launch. As information generation from consumers is typically considered a necessity for successful NPD (Antikainen et al., 2010, Heiskanen et al., 2007),

different methods have been identified and used in order to obtain information on consumer needs and wants (Nahius et al., 2012, van Kleef et al., 2005, Ogawa and Piller, 2006). Overall, understanding the needs and wants of the market is essential for companies in order to develop successful products, and it is therefore important to acquire consumer insight.

Second, in order to integrate consumer insight in NPD, acquiring information through external communication between consumers and companies is not enough. This knowledge must also be disseminated through cross-functional communication (Gresham et al., 2006, Kohli and Jaworski, 1990, Ottum and Moore, 1997). Cross-functional information sharing is often a problem in companies because the consumer information stays in the marketing functions and is therefore never integrated in the product development (Griffin and Hauser, 1996).

Third, the application of consumer information is necessary in order to develop the specific product targeting consumer needs and wants. This dissertation will not focus on the application of information in the final product development, but only on consumer information acquisition and dissemination as the two important communication flows to secure consumer insight in the NPD process: 1) information flowing from consumers to companies and 2) dissemination of the information between relevant functions in the company (Figure 1).

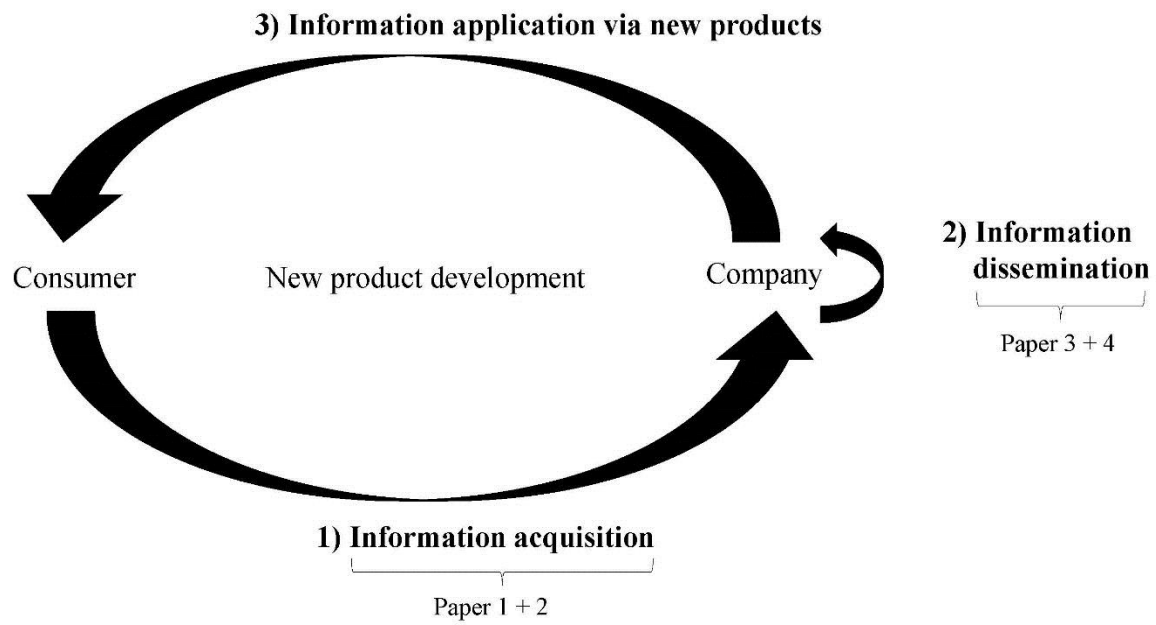

Figure 1: Overview of the papers

Research questions and contributions

The aim of this dissertation is to bring the NPD closer to consumer needs and wants in order to limit the number of product failures in the food market. The objective is to understand how information acquisition and dissemination can support consumer insight integration into the NPD process. To understand this, the overall research question will be answered:

How can companies integrate consumer insight in new food product development through information acquisition and dissemination?

In order to answer this question, the following sub-questions are addressed:

RQ1: How can consumers be motivated to interact with food companies and each other in virtual food communities with the purpose of knowledge sharing and product innovation?

RQ2: How can companies support cross-functional communication in the new product development process?

These questions are addressed in four papers: the first two focus on RQ1 whereas the last two focus on RQ2.

Although the research questions of the different papers all relate to the integration of consumer insight into NPD, they contribute to different streams of literature. The first paper and the second paper contribute to the marketing and consumer behaviour literature by improving the understanding of consumers' motivations for virtual food community interaction and how companies can use this to acquire information on consumer needs and wants. Whereas the first paper focuses on the motivations for virtual food community interaction, the second paper introduces a cultural perspective to the importance of motivation factors. Both papers centre on the motivations for community interaction, but emphasis is on different aspects. The third and the fourth paper contribute to the innovation literature by focusing on the factors that companies can implement in order to optimise dissemination of information. Focus is on communication of consumer needs and wants between marketing and technology functions. These two papers are connected, as the third paper builds the basis for the fourth paper. The third paper identifies factors from existing

literature that support cross-functional communication. The fourth paper focuses on the implementation problems of these factors.

The outline of the dissertation is as follows: first, in order to provide a foundation for the four papers, the background for the dissertation is presented. Here, the concepts of product success, market orientation, and the two communication flows (information acquisition and information dissemination) are explained. This is followed by a description of the different study designs including elaborations on how the papers are related. Each paper is then presented shortly through four summaries, and afterwards each of the four papers appears in full length. In the end, the main conclusions, contributions, and implications of the dissertation are derived.

Background

An overview of the key concepts and their relations is found in Figure 2. The following will present NPD success, as it is treated in this dissertation. Based on this, the relevance of market orientation for supporting NPD success is explained. Two aspects of market orientation are in focus, namely information acquisition and information dissemination. Starting with information acquisition, this dissertation focuses on virtual communities as a way to acquire consumer information by integrating consumers in the innovation process. In order to do that, companies must understand how consumers can be motivated to share their information in such virtual communities. Continuing with the second aspect of market orientation, information dissemination, this dissertation focuses on cross-functional communication between marketing and technology functions in the NPD process. The key concepts are discussed in the following.

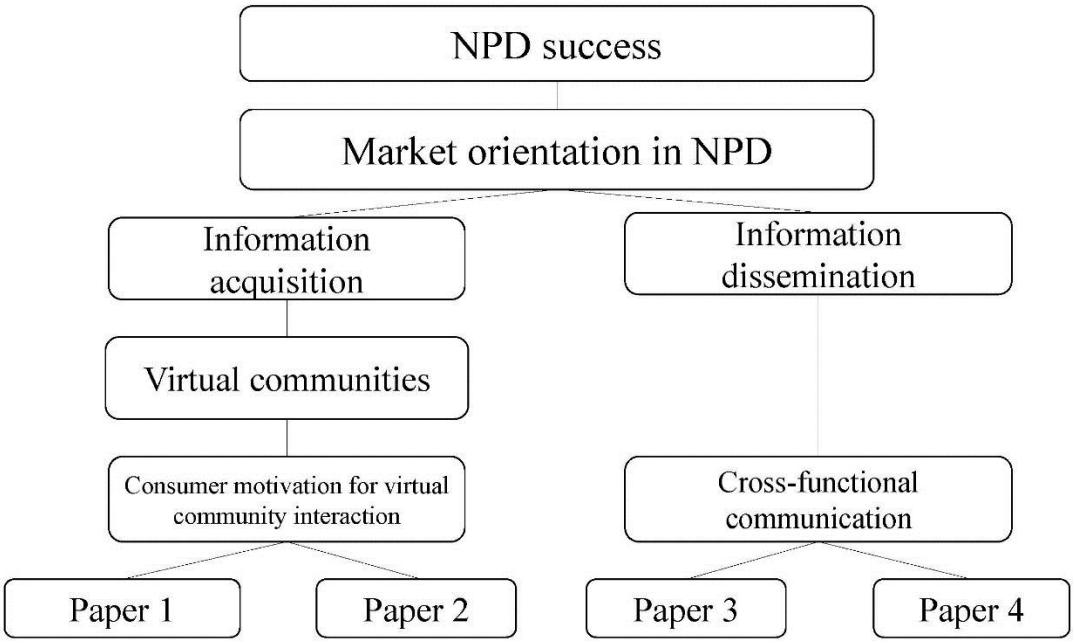

Figure 2: Overview of key concepts and their relations.

NPD success

As touched upon in the introduction, NPD success is a necessity for companies to survive (Griffin and Page, 1996, Brown and Eisenhardt, 1995, Cooper, 1983, Calantone et al., 1996, Poolton and Barclay, 1998). Yet, when is NPD considered a success? Talking about NPD success may be very complex, as it requires a clear understanding of the terms ‘NPD’ and ‘success’.

The NPD process has been conceptualised in different ways. Following Urban and Hauser (1993), the NPD process consists of four stages: 1) the *opportunity identification phase* including identification of target consumers and idea generation; 2) the *design phase* including decisions on physical product characteristics, packaging characteristics, and logistics; 3) the *testing phase* in which the product is tested on consumers to check if it is ready for the market, needs to be adapted, or is rejected; and 4) the *introduction phase* where the product is launched and marketed to potential consumers via the marketing mix. The product moves through different stages from initial idea to market launch (Cooper, 2008). In principle, this model implies a linear process where the individual stages are treated independently of each other and separated by a gate. A decision about continued investment in the product is taken after each stage. However, this is a very simplified model of the NPD process. In reality, these stages often do not occur sequentially, but in parallel, and each stage is characterised by looping, iteration, and back-and-forth-play (Cooper, 2008).

Each stage of the NPD process can be based on *'the use of external ideas as well as internal ideas, and internal and external paths to market'* (Chesbrough, 2003, p. xxiv). This implies that the NPD process is not necessarily an internal process, but can include external actors as well. One possibility is the use of consumers as external collaborators, who may be integrated at any point in the process as well – either for generating ideas or as a paving path to the market.

Continuing with the next term, 'success' is a multi-faceted construct that can be perceived in different ways. NPD success can be perceived as *consumer benefits* by creating consumer satisfaction or acceptance; *financial benefits* by meeting the profit goals; or *technical benefits* by providing a competitive advantage (Griffin and Page, 1993). Success on one of these parameters may come at the expense of another. In other words, the definition of NPD success depends on the individual company's innovation strategy (Griffin and Page, 1996), but market endurance is often used as one way of operationalising NPD success (e.g. Rudolph, 1995, Kemp, 2013, Gresham et al., 2006).

The most important determinant for achieving NPD success is to have a product that consumers perceive as superior and unique (Cooper and Kleinschmidt, 2007, Cooper, 1987, Zirger and Maidique, 1990, Cooper, 1979). In their meta-analysis, Henard and Szymanski (2001) find that product advantage, market potential, and meeting consumer needs are among the most significant factors for NPD success. Product advantage implies superiority

compared to competing products in the market, whereas market potential reflects the expected growth in demand among consumers. Finally, meeting the consumer needs requires that the product satisfies the needs and wants of consumers (Henard and Szymanski, 2001). These factors all correspond to the need to have a superior product as perceived by consumers in order to reach NPD success. As explained by Cooper (1999), companies must deliver *'a differentiated product with unique customer benefits and superior value for its user'* (p. 117) to achieve NPD success, and that requires a company to be strongly committed to integrating the voice of the consumers. Unfortunately, this focus is lacking in many companies.

To achieve NPD success, the company should therefore acquire a good understanding of the consumers, which requires market-oriented activities (Narver and Slater, 1990, Poolton and Barclay, 1998). Based on their meta-analysis of determinants for NPD success, Montoya-Weiss and Calantone (1994) explain that successful companies develop superior products targeting consumer wants. Companies must be market oriented in their NPD process which implies the need to acquire, disseminate, and apply consumer information in order to succeed in NPD (Ottum and Moore, 1997). This dissertation relies on the concept of market orientation, which is introduced in the following.

Market orientation in the NPD process

Market orientation means *'the organization-wide generation of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and organization-wide responsiveness to it'* (Kohli and Jaworski, 1990, p. 6) and implies that a company acquire, disseminate, and apply customer information (Ottum and Moore, 1997). Despite the market including competitors, regulators, etc., customers should be in focus in all company actions (Kohli and Jaworski, 1990) – also in the NPD process (Ottum and Moore, 1997). Customers can include end consumers as well as distributors (e.g. retailers and wholesalers), but in this dissertation focus is on end consumers.

There is no doubt that market orientation has a positive effect on NPD success (Baker and Sinkula, 2005, Kirca et al., 2005). However, the relevance of market orientation for company performance has been debated in existing literature, depending on the definition of company performance. Market orientation has indeed been found to have a strong positive effect on NPD success as one aspect of company performance, but its effect on a company's profitability and market share may be weaker (Baker and Sinkula, 2005). As NPD-success

not necessarily implies increased market share and profitability, market-oriented activities should always be considered in relation to the company's resources and capabilities (Baker and Sinkula, 2005). Furthermore, there may be other influencers on the effect of market-orientation on company performance such as company type, market turbulence, as well as the undertaken measures of performance (subjective versus objective) (Kirca et al., 2005, Droge et al., 2008).

Still, considering market orientation and its effect on NPD success as one aspect of company performance, extensive evidence has found it to have a significant positive relationship in the literature (Baker and Sinkula, 2005). In their literature review, 94% of the identified articles focusing on the relation between market orientation and NPD success found a positive significant relationship. This is supported by the meta-analysis conducted by Kirca et al. (2005), who find that market orientation is positively associated with new product performance. Also Im and Workman Jr. (2004) state that market orientation has a positive influence on new product success through the mediating effect of creativity in generating and marketing new ideas as well as in related marketing programs.

Overall, market orientation is assumed to be a relevant concept to integrate in the discussion of successful food product development. The following presents the two focus areas of market orientation in this dissertation: information acquisition and information dissemination.

Consumer information acquisition

As stated before, the market-oriented approach to innovation implies that products are developed based on detection and fulfilment of consumer needs and wants (Traill and Grunert, 1997). Having an advantageous product as perceived by consumers on parameters such as benefits, quality, costs, and innovative features, requires careful orientation towards the needs and wants of attractive consumers (Brown and Eisenhardt, 1995, Narver and Slater, 1990, Zirger and Maidique, 1990). This implies skilled collection and assessment of market information on consumer needs, wants, price sensitivity, purchase intentions, etc. (Calantone et al., 1996).

Companies succeeding in innovation has a better understanding of consumer needs (Radosevic and Yoruk, 2012). Companies can integrate consumer insight in NPD in various ways and to different extents (van Kleef et al., 2005, Wind and Mahajan, 1997). However, acquiring reliable consumer information can be a challenge for companies, as consumers may not always be able or willing to express their true needs (Simonson, 1993, van Kleef et al.,

2005). One can distinguish between self-articulated and indirectly derived consumer needs. Whereas indirectly derived needs and wants can be assessed by for example observations, self-articulated needs and wants are derived directly from consumers, assuming that consumers are able to express them (van Kleef et al., 2005). Simonson (1993) explains how consumers often do not have well-defined needs and wants, and that they therefore are imprecise and unstable in their articulated preferences. This unstable characteristic of consumer needs may result in the articulated preferences to correlate only weakly with future product preference and purchase. Many consumer needs are categorised as latent needs meaning that consumer are not aware of them and therefore they are not able to express them (van Kleef et al., 2005). Furthermore, if consumers are aware of their needs and wants, they should be willing to share them with others (e.g. the researcher, the company, fellow consumers, etc.), and this is not always the case, as some needs may be perceived as uncomfortable to articulate (Donoghue, 2000, van Kleef et al., 2005). Acquiring consumer information can therefore be a challenge.

Today, openness is considered crucial for companies to succeed in innovation as companies cannot innovate in isolation (Dahlander and Gann, 2010, Chesbrough, 2003). Companies can develop or improve their own products by adopting ideas from external sources (Chesbrough, 2006). Also in the food industry, openness is important (Acosta et al., 2013), as food companies rely highly on external information sources for NPD (Sarkar and Costa, 2008, Avermaete et al., 2004). Innovative companies are often more likely to include external sources such as consumers or suppliers in the NPD process (Poolton and Barclay, 1998). Consumers are increasingly considered as a valuable source of information (Von Hippel et al., 2012, Nishikawa et al., 2013, Poetz and Schreier, 2012). Successful innovation depends on the company's ability to target market needs, which makes consumer information crucial to obtain and include in the NPD (van Kleef et al., 2005). This is especially true for the food industry as sensory aspects such as aroma, sound, taste, flavour, texture, and appearance determine product liking (Tuorila, 2007) and thereby the repeated purchase by consumers.

Some companies choose to integrate consumers in their innovation process through collaborative innovation (Greer and Lei, 2012, Prahalad and Ramaswamy, 2000) where consumers can provide input throughout the NPD process (Kemp, 2013, Gemser and Perks, 2015). Integration of consumers in the NPD process enables companies to develop products meeting consumer needs and wants (Cooper, 1999), but it assumes that consumers are able to express their needs and wants. Integration of consumers through collaborative innovation

will therefore primarily work 1) when consumers are *able* to express their needs, and 2) when consumers are *willing* to express their needs.

Based on the assumptions that consumer are able and willing to express their needs and wants, communities of consumers are increasingly recognised as a potential innovation source by integrating consumer insight in the NPD process (Fuchs and Schreier, 2011, Schreier et al., 2012, Poetz and Schreier, 2012). Because consumers increasingly communicate via the online setting (Kemp, 2013), communities develop here as well. Virtual communities are defined as *'mediated social spaces in the digital environment that allow groups [to] be sustained through ongoing communication processes'* (Bagozzi and Dholokia, 2002, p. 1). This dissertation focuses on one type of communities, namely consumption-based virtual communities (from now on virtual communities). These are described as *'affiliative groups whose online interactions are based upon shared enthusiasm for, and knowledge of, a specific consumption activity or related group of activities'* (Kozinets, 1999, p. 254). Increasing access to Internet allows consumers to form virtual communities based on interests and affiliations. Many of these, are centred on consumption (Kozinets, 1999). Despite the fact that members of virtual communities rarely meet physically, often are anonymous, and interactions in these communities appear superficial and functional, virtual communities are considered useful media for social exchange (e.g. Garton et al., 1999, Brown et al., 2007). The virtual communities offer an opportunity for companies to integrate consumers in the NPD process and thereby improve the company's innovativeness through continuous interaction (Roberts and Candi, 2014). Consumers can be both creative and novel in their suggested solutions (Prahalad and Ramaswamy, 2000, Franke et al., 2006), and can thereby help to improve the product concepts during the NPD process (Hoyer et al., 2010). Especially in the earlier stages of the NPD process, it can be highly relevant to integrate consumers, in order to identify consumer needs and wants (Kemp, 2013). The virtual communities allow for interaction between consumers themselves and between consumers and companies.

However, in order to manage consumer integration optimally, companies should understand how to motivate consumers to take part in the NPD process through virtual communities (Roberts and Candi, 2014). Motivation in this dissertation is defined as *'the degree to which a person is moved or aroused to expend effort to achieve some purpose'* (Rainey, 2001, p. 20), and is the focus of the first two papers.

Consumers' motivations for participating in virtual communities have been studied as the reasons why consumers contribute and use information to/from these communities, and various concepts have been introduced as potential reasons for this participation. These include cooperation and support (Antikainen et al., 2010, Franke and Shah, 2003, Jeppesen, 2005), learning (Antikainen et al., 2010, Leimeister et al., 2009, von Hippel, 2007, Wiertz and Ruyter, 2007), entertainment (Antikainen et al., 2010, Füller et al., 2006), intrinsic enjoyment and curiosity (Frey et al., 2011, Füller, 2006, Füller et al., 2007, Füller et al., 2009, Lakhani and Panetta, 2007), altruism (Lee and Chang, 2011, von Hippel, 2007, Wasko and Faraj, 2005), social capital and outcome expectations (Chiu et al., 2006), reciprocity (Franke and Shah, 2003, Wasko and Faraj, 2000), obligation (Lakhani and Panetta, 2007), recognition from peers and companies (Füller et al., 2007, Jeppesen and Frederiksen, 2006, Jeppesen and Molin, 2003, von Hippel, 2007), reputation (Lakhani and Panetta, 2007, Wasko and Faraj, 2005) and status (Lampel and Bhalla, 2007), self-worth (Hennig-Thurau et al., 2004) and self-identity (Lakhani and Panetta, 2007, Ma and Argawal, 2007), empowerment (Füller et al., 2009), economic benefits (Hennig-Thurau et al., 2004), and trust (Ridings et al., 2002).

The objective of the first study is to understand the role of specific motivation factors in consumers' willingness to interact in virtual food communities. More specifically, the aim is to understand *1) the associations between the pre-existing consumer interests in food and general online interaction, and consumers' willingness to interact in virtual food communities, and 2) the mediating role of consumers' motivation to self-present to and learn from the community in explaining these associations.* This paper works with two levels of motivation. Motivation is not normally conceptualised as an endogenous variable, as it is often treated as a variable that is not explained by other factors. However, motivation in this study refers to motivations for two very specific behaviours, namely the motivation to self-present to and learn from the food community. The paper therefore suggests that these may be determined by two other variables: general online interaction propensity and food involvement. These are called 'individual consumer interests' in the model, and basically refer to the consumer's general level of involvement with two important characteristics of virtual communities: *online communication* around a common *domain of interest*. Involvement is also considered a motivational factor for consumer behaviour (Dholokia, 2000, Laurent and Kapferer, 1985), which means that the model actually includes two levels of motivation: 'individual consumer interests', which is motivational at a more general and enduring level, and 'motivation factors', which is motivational at a more specific level (i.e.

for two specific behaviours). Following this, the general motivation (food involvement and general online interaction propensity) determines motivation for a more specific behaviour (motivation to learn from and self-present to the community) – which then determines how a person engage in community interaction activities.

The second paper also focuses on motivation for consumer interaction in virtual communities specifically with the aim of developing a product in collaboration with a company. The paper takes a cross-cultural perspective. The following questions are addressed: *1) how do motivation factors, rooted in the need for relatedness, competence, and autonomy, influence behavioural interaction intention in a virtual community aiming at product innovation, and 2) how are these relationships moderated by countries differing on the cultural dimension of individualism-collectivism?* Based on the need for relatedness, competence, and autonomy, this paper focuses on four specific motivation factors: company relatedness, group relatedness, perceived skills, and perceived outcome benefits as reasons to interact in a virtual food community for product development. As stated above, extensive literature has focused on the various motivation factors for consumers to participate in virtual communities with different purposes (e.g. Jeppesen and Frederiksen, 2006, Hennig-Thurau et al., 2004, von Hippel, 2007, Leimeister et al., 2009), but this study is among the first to consider the cultural aspect of motivation by incorporating country as a moderating factor.

Information dissemination between functions

In order to develop products perceived as superior by consumers, acquiring knowledge on consumer needs and wants is a necessity, but not enough: this knowledge must also be disseminated between functions in order to be used in NPD (Ottum and Moore, 1997). This calls attention to the importance of cross-functional communication between the marketing area and technology area. Successful NPD requires contribution from both technical experts and marketing experts (Cooper and Kleinschmidt, 2007, Calantone and Benedetto, 1988, van Trijp and Steenkamp, 2001, Gupta et al., 1986), and its dissemination depends on coordination among these functions (Earle, 1997).

Communication between functions has been suggested as one of the critical factors for successful NPD (Henard and Szymanski, 2001, Cooper and Kleinschmidt, 2007) by reducing the risk for NPD failure (Autahene-Gima and Evangelista, 2000, Souder and Chakrabarti, 1978). Following Kahn (1996), interaction (i.e. structural nature of cross-functional activities) between functions are needed for NPD success, but it is the cross-functional collaboration

(i.e. unstructured and affective nature of cross-functional activities) that determines the success. In order to integrate consumer insight in NPD, this collaboration is especially important in the stages before product launch where the product is designed (Song et al., 1998, Gomes et al., 2003, Love and Roper, 2009). Also Narver and Slater (1990) suggest inter-functional coordination to be one of the three aspects of market-orientation and thus necessary in order to reach success in the market. This implies that different functions are working cooperatively in the same direction to create superior value for consumers (Narver and Slater, 1990). According to Zirger and Maidique (1990), a strong link between technology and especially marketing is needed, in order to understand and translate consumer needs and wants into product solutions. Kohli and Jaworski (1990) support this by suggesting inter-functional dynamics to be one of the antecedents for market orientation. Still, cross-functional communication is a struggle for many companies (Moenaert et al., 1994, Gupta et al., 1985). Conflicts between functions and lack of cross-functional connectedness will hinder successful communication (Kohli and Jaworski, 1990).

The third paper focuses on identifying the factors supporting cross-functional communication between marketing and technology in the NPD process by addressing the main question: *what are the barriers and facilitators of internal communication between technology and market/consumer experts?* In this paper, cross-functional communication is referred to as 'internal communication'.

In extension of this, the fourth paper focuses on the implementation issues of these factors from a practical perspective by addressing the following question: *how are implementation challenges perceived differently by professionals in large organisations vs. SMEs as well as in technology vs. marketing functions?*

Table 1: Overview of the papers

Title of paper	Objective	Literature	Method	Main findings	Status/ target journal
Paper 1 ***Consumers' Motivation to Interact in Virtual Food Communities – The importance of self-presentation and learning.***	Understand 1) the associations between the pre-existing consumer interests in food and general online interaction, and consumers' willingness to interact in virtual food communities, and 2) the mediating role of consumers' motivation to self-present to and learn from the community in explaining these associations.	Self-presentation theory, online reference groups, motivation for online interaction	*Data collection:* Online survey among Danish consumers (n=980). *Data analysis:* SEM based mediation analysis.	The possibility for learning from the community and presenting oneself to the community are the reasons *why* consumers intend to engage in community interaction given their pre-existing involvement with food and general online interaction.	Published in *Food Quality and Preference 62 (2017) 8-16*
Paper 2 ***Consumer Motivation to Interact in Virtual Communities for Product Innovation: A cross-cultural perspective.***	Develop and test a conceptual model of 1) how motivation factors, rooted in the need for relatedness, competence, and autonomy, influence behavioural interaction intention in a VC aiming at product innovation, and 2) how these relationships are moderated by countries differing on the cultural dimension of individualism-collectivism.	Motivation theory, individualism-collectivism	*Data collection:* Online survey among Danish consumers (n=1045). Face-to-face survey among Brazilian consumers (n=617). *Data analysis:* SEM based moderation analysis.	Relatedness is the strongest driver of consumers' intended interaction activity, but the importance of group relatedness versus company relatedness differs between countries. The possibility for beneficial outcomes, for the consumers themselves and for the market, drives consumers in both cultures.	Under review in *Inter-national Marketing Review*
Paper 3 ***Improving internal communication between marketing and technology functions for successful new food product development.***	Identify the facilitators and barriers of communication between marketing and technology experts, transform this into practical guidelines of use to the food industry, and detect potential gaps in existing research.	Organisational structure, team composition, management support, knowledge management	Systematic literature review	Two types of factors are relevant when considering the marketing-technology communication: 1) the factors supporting cross-functional communication and 2) the situational factors determining the extent to which cross-functional communication is needed.	Published in *Trends in Food Science & Techno-logy 37 (2014) 106-114*
Paper 4 ***Challenges in Cross-Functional Communication Implementation: Differences related to organisation size and functional focus***	Explore the perceived challenges that are facing organisations in their implementation of these cross-functional communication supporting factors. Focus is on how the implementation challenges are perceived differently depending on organisation size and functional focus of the professionals involved.	Market orientation, innovation in SMEs vs. large organisations, thought-worlds	*Data collection:* Semi-structured interviews conducted with technology experts or marketing experts from SMEs or large organisations operating in the food sector.	The perceived challenges evolves around three major points: 1) the need for a long-term focus, 2) a balance between resources, goals, and practices, and 3) full support from the management.	Revised and re-submitted to *R&D Manage-ment*

Research overview

An overview of the papers appears in Table 1.

Design of the studies

The papers in this dissertation are of both qualitative and quantitative nature with data collected in Demark, other European countries, and Brazil. Data for the first paper and the second paper were collected independently of any project. Data for the third paper and the fourth paper were collected as part of the Connect4Action project (Connect4Action, 2011). The choice of method for each paper depended on their relevance in answering the specific research questions, and therefore the dissertation includes survey data, interview data, and literature data. Four different datasets have been used for shedding light on the possibility for integrating consumer insight into NPD. In the following, the method approach for each paper is explained, although a deeper explanation of the design is found in each of the individual papers.

For the first paper, data were collected through an online survey managed by a Danish market research agency to ensure the representativeness of the Danish population on gender, age, and regional location. The sample consisted of 980 usable responses. Securing a representative sample is important when trying to estimate the behaviour among general consumers in order to avoid bias. The survey was primarily developed based on validated scales, but was supplied with additional items based on a review of posted messages in an existing virtual food community. In this way, the measures could be adapted to the specific food setting without compromising the content validity. A mediation analysis based on Baron and Kenny (1986) was conducted using Structural Equation Modelling (SEM).

The second paper is also based on survey data. Data were gathered in both Denmark and Brazil with usable sample sizes of n = 1045 and n = 617, respectively. These two countries were selected based on their different levels of one cultural dimension (individualism – collectivism) in focus. Again, the survey was developed primarily based on validated scales from existing literature. In Denmark, the data were collected online through a market research agency. In Brazil, the data were collected through a university based market research agency as well, but via face-to-face surveys. As the purpose of this study was to test a model predicting consumer behaviour, the general consumer must be the basis for the data collection. Therefore, the most optimal sampling approaches in this regard were selected for

each country. The data were analysed using SEM and the moderation effect of the country variable was tested.

The third paper is based on a systematic literature review in order to identify factors of importance for cross-functional communication. This paper served as a background for the fourth paper. The systematic review approach was therefore considered appropriate as a way to develop a framework based on existing research in the area. The articles included were all peer-reviewed and published no later than 1990. They were extracted based on pre-defined keywords in the databases: ProQuest, Science Direct, Scopus, and Ebsco. 1,604 articles were scanned based on their title and/or abstract, and the final articles (N = 28) were read in full length. Central literature (N = 9) was found in the references of these articles and included additionally. In total, 37 articles were included in the final literature review. The systematic procedure ensured that the data collection could be followed step-by-step and eventually replicated. However, this approach has its limitations, as important keywords may have been left out from the search process. Thereby, relevant papers on the issue of cross-functional communication could have been excluded.

The fourth paper takes an exploratory approach to the implementation issues of the factors identified. More specifically, the factors identified in the third paper were used as stimulus in the semi-structured interviews for the fourth paper (see Appendix 1 in paper 4). A total of twenty-seven interviewees, representing either a marketing or technology function in a large organisation or an SME, were interviewed. SMEs also included start-ups and consultancies, whereas large organisations mainly consisted of manufacturing companies, but also university functions collaborating with the industry were included. Participants were identified through a European project community (Connect4Action, 2011). The data were collected in different European countries and coded in three rounds using a thematic approach (see coding manual in Appendix 2 in paper 4). All comments were coded into specific topics, and were then divided into groups based on participants' background. This allowed an extraction of similarities and differences in the implementation issues related to organisation size and functional focus of the professionals involved.

The papers

Paper 1: Consumers' Motivation to Interact in Virtual Food Communities – The importance of self-presentation and learning

The first paper focuses on the role of motivation to self-present and learn for consumers to interact in virtual food communities. Together with the increasing use of the Internet, the tendency of consumers using online platforms for communication around various issues has increased as well (Bagozzi and Dholokia, 2002, Burnett, 2000). The consumers' motivations for interacting in online communities have been studied extensively in domains such as electronic music instruments (Jeppesen and Frederiksen, 2006), online news (Wasko and Faraj, 2000), IT and open-source software (Leimeister et al., 2009, von Hippel, 2007, Lerner and Tirole, 2002), technical support (Wiertz and Ruyter, 2007), and computer games (Jeppesen and Molin, 2003).

Also within the area of food, consumers use the online setting to express themselves to a large extent in different virtual communities (e.g. Carr et al., 2015). Virtual communities are based on online communication about a common domain interest (Koh et al., 2007). This paper focuses on a consumption-based virtual food community where consumers can share information on food preparation and cooking with each other. However, the literature addressing consumers' motivation for interaction in the online food setting remains scarce. Given the difference between the food industry and the more high-technology industries, it is not clear from existing research, to what extent factors motivate consumers to engage in interaction in an online food setting and how these specific motivation factors associate with more basic pre-existing consumer interests. This study draws on literature on involvement (Celsi and Olson, 1988, Petty et al., 1991) as well as (online) self-presentation (Kim et al., 2012, Ma and Argawal, 2007) and identification (De Valck et al., 2009, Kozinets, 1999) to establish a link between pre-existing consumer interests and motivations. Additionally, it relies on literature on self-presentation and learning as motivations for engaging in community interaction (Wasko and Faraj, 2000, Leimeister et al., 2009, Wiertz and Ruyter, 2007). Based on the expected relationships between 1) pre-existing interests and motivation, and 2) motivation and intended interaction, it is argued that motivation to self-present to and learn from the community are the mechanisms through which pre-existing consumer interests determine virtual community interaction. The motivation factors are treated as mediators on the relationship between pre-existing consumer interests and interaction intention.

The objective of this study is to understand the role of specific motivation factors in consumers' willingness to interact in virtual food communities. The aim is to understand: 1) the associations between the pre-existing consumer interests in food and general online interaction, and consumers' willingness to interact in virtual food communities, and 2) the mediating role of consumers' motivation to self-present to and learn from the community in explaining these associations. The study proposes and tests a mediating model where consumers' level of food involvement and general online interaction propensity are indirectly related to community interaction intention (information provision and consumption) through the mediating effects of two motivation factors (motivation to learn from the community and motivation to self-present to the community). This implies 1) a relationship between pre-existing consumer interests and interaction intention that may be mediated, 2) a direct relationship between pre-existing consumer interests and motivations, and 3) a direct relationship between motivations and intended interaction. The model suggests motivation to self-present to and learn from the community to be the mechanisms through which pre-existing interests relate to intended interaction. In the end, a final model including both mediators is examined in order to understand the strength of the individual as well as indirect relationships.

An online questionnaire (n = 980) was conducted among Danish consumers. As expected by default, a direct positive relationship was found between the pre-existing consumer interests and intended interaction in the community. This indicates that a pre-existing involvement with food and general online interaction largely determines the intended information provision and consumption. However, by introducing the motivation to learn from the community and self-present to the community as mediators, these direct effects decreased significantly. In other words, the chance to learn and present oneself from/to the community are reasons *why* consumers intend to engage in community interaction given their pre-existing involvement with especially food and, to some extent, general online interaction. These findings highlight the importance for virtual food communities' ability to provide consumers with the opportunity to present themselves as skilled individuals to the community, as well as to learn from the information available from the community. Still, companies must keep in mind that these opportunities will mainly appeal to consumers with a certain food involvement.

Paper 2: Consumer Interaction in Virtual Communities for Product Innovation: A cross-cultural perspective

In order to develop products for targeting consumer needs and wants, companies increasingly choose to integrate consumers in collaborative innovation (Greer and Lei, 2012). Virtual communities (VCs) provide a possibility for integrating consumers in product innovation because they can establish a knowledge sharing platform for ongoing interaction between consumers and companies (Sawhney et al., 2005). Consumers' motivations for participating in such communities have been the focus of much research (e.g. von Hippel, 2007, Lakhani and Panetta, 2007). This study extends existing research on VCs for product innovation by introducing country, differing on individualism-collectivism, as a cultural factor. This factor may affect the way in which individuals interact in VCs. The aim of the study is 1) to develop and test a conceptual model of how motivation factors, rooted in the need for relatedness, competence, and autonomy, influence behavioural interaction intention in a VC aiming at product innovation, and 2) to understand how these relationships are moderated by countries differing on the cultural dimension of individualism–collectivism. Two surveys were conducted in Denmark and Brazil, respectively, on the concept of a company-hosted virtual community aimed at designing a weight managing food product.

Results demonstrated relatedness to be, by far, the strongest driver of consumers' intended interaction activity within both countries. However, the importance of group relatedness versus company relatedness differed strongly between countries, which is well in line with the respective individualistic and collectivistic values characterising the societies. A second important factor in both countries was the perceived outcome benefits. Consumers need to be ensured that their participation is beneficial. This can be done by showing them how their information is used and how they have contributed to the market. They need to be convinced about their influence on the final product outcome. Finally, perceived skills within the product innovation domain appeared to have no influence on intended interaction, but there may be domain specific skills that are essential for the capability of contributing to the product innovation tasks.

Paper 3: Improving internal communication between marketing and technology functions for successful new food product development.

The third paper focuses on improving the communication between marketing and technology functions during the NPD process in the food industry. In order to increase NPD success for novel food products, it is important to understand how information can be optimally communicated within companies, as both knowledge from marketing experts and technology

experts is required as input. The paper 1) identifies the facilitators of communication between marketing and technology experts, 2) transforms this into practical guidelines of use to the food industry, and 3) detects potential gaps in existing research. A systematic literature review was conducted on papers addressing communication between marketing and technology functions during the NPD process in the food and similar industries. It became clear that research in high-tech industries dominates this area, whereas research in the food industry is scarce. Therefore, papers addressing similar industries were included as well.

Results showed that two types of factors are relevant when considering the marketing-technology communication: 1) the factors supporting cross-functional communication, and 2) the situational factors determining the extent to which cross-functional communication is needed. Starting with the supporting factors, these are management support, organisational structure, team composition, and knowledge management. Support from management is a crucial factor in establishing cross-functional communication because it creates a trustful and collaborative organisational climate. Furthermore, an organisational structure balanced according to formalisation and de-centralisation will facilitate cross-functional communication. The same is true for cross-functional team compositions consisting of members from different functions. Finally, systems for managing knowledge can help facilitate communication between marketing and technology experts, if designed to benefit both functions in their NPD work. These systems need to be thoroughly adapted to the specific company. Turning to the situational factors, the need for cross-functional communication depends on the level of internal/external uncertainty and the specific stage in the NPD process. Under levels of high competition, market turbulence, and technological developments, cross-functional communication becomes more important for companies to stay competitive and adapt to changing circumstances. In addition, the internal uncertainty determines the need for cross-functional communication, as radical innovations require a higher level of cross-functional communication compared to incremental innovations. Finally, cross-functional communication is more relevant in the early NPD stages focusing on opportunity identification and design, compared to the later NPD stages, where the product is marketed. Based on these factors extracted from literature, a set of recommendations for practitioners in the food industry is proposed.

Paper 4: Challenges in Cross-Functional Communication Implementation: Differences related to organisation size and functional focus

Successful innovation depends, to a large extent, on the combination of marketing insight and technology insight (Zirger and Maidique, 1990). This highlights the need for cross-functional communication between these functions. Existing research has focused on identifying factors supporting the cross-functional communication between these two areas (e.g. Jacobsen et al., 2014). A balanced level between formalisation and decentralisation; cross-functional teams consisting of a mix of marketing and technology personnel; management support of a trustful and collaborative climate; knowledge management systems to exploit explicit and implicit knowledge within the organisation; and a common language and shared vision between marketing experts and technology experts are all factors derived from literature for supporting cross-functional communication. Still, the implementation of these factors appears to be a struggle for companies, due to their generalising nature making them less suitable for individual companies.

The objective of this study is to explore the perceived challenges that are facing organisations in their implementation of the cross-functional communication supporting factors. Focus is on how the implementation challenges are perceived differently depending on the organisation size (SMEs vs. large organisations) and the functional focus (marketing vs. technology) of the professionals.

Twenty-seven semi-structured interviews were conducted with technology experts or marketing experts from SMEs or large organisations operating in the food sector. The perceptions of the implementation challenges were explored along the two dimensions: size of the organisation and functional focus of the professional. Considering organisation size, the main differences concerned the external vs. internal aspect of cross-functional communication. SMEs face problems related to lack of internal skills and access to external knowledge. On the other hand, large organisations typically experience problems related to the lack of respect that characterises the organisational climate. Regarding the functional focus, the main difference related to perspectives on the innovation process as being driven by technology or market needs. Marketing experts approach the innovation from a market perspective based on consumer needs whereas technology experts approach innovation from a product perspective based on the technology or product development.

Reflecting on the overall results across the two dimensions, the perceived challenges evolve around three major points: 1) the need for a long-term focus, 2) a balance between resources,

goals, and practices, and 3) full support from the management. Managers are encouraged to take a long-term perspective on the innovation process in addition to the short-term perspective. Additionally, they need to signal this priority in the balance of resources, goals, and practices in order to successfully implement the factors supporting cross-functional communication. However, when determining the long-term focus and the optimal balance, the management should carefully consider the individual organisation in terms of size and functional focus of the employees.

Summing up, this dissertation takes departure in market-oriented product development by focusing on consumer information acquisition and dissemination during the innovation process. It improves our understanding of the consumer motivations for participating in virtual communities, which can help companies in their acquisition of consumer information for product development. Furthermore, it addresses the barriers to successful cross-functional communication and thereby improves the understanding of the barriers to successful information dissemination between functions in the innovation process.

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Paper 1: Consumers' Motivation to Interact in Virtual Food Communities – The importance of self-presentation and learning

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Abstract

Consumption-based virtual communities are nowadays a common place on the Internet where individuals share and acquire knowledge on food and specific food-related issues such as preparation and cooking. The objective of this research is to propose and test a model that illustrates the role of motivation to self-present to and learn from the community regarding consumers' willingness to interact in virtual food communities. The study investigates 1) the associations between the pre-existing consumer interests in food and general online interaction, and consumers' willingness to interact in virtual food communities, and 2) the mediating role of consumers' motivation to self-present to and learn from the community in explaining these associations. An online questionnaire (n = 980) was conducted among Danish consumers. Results showed that motivation to learn and motivation to self-present are strong mediators of the relationships especially between food involvement and behavioural interaction intention. The chance to learn from and present oneself to the community are reasons *why* consumers engage in interaction in virtual food communities, given their pre-existing interest in food and, to some extent, their general online interaction propensity. Virtual food communities should therefore provide consumers with the opportunity to present themselves as skilled individuals to the community and the opportunity to learn from the information available from that community. Still, community managers must keep in mind that these opportunities will only appeal to food involved consumers with a certain online interaction propensity.

Introduction

Along with the expansion of the Internet, the tendency of individuals to use the digital world for communication has also increased (Burnett, 2000, Bagozzi and Dholokia, 2002, Cummins et al., 2014). Individuals gather in digital networks for support, organisation, and communication (Rheingold, 1993, Bagozzi and Dholokia, 2002) around common interests. They concentrate on sharing, elaborating, and discussing knowledge within a domain of interest or personal need in the online environment (Zwass, 2010, Hagel, 1999, Johnson and Lowe, 2015). Communication is made possible through virtually based platforms such as blogs, knowledge bases, wikis, and Internet forums. This study concentrates on Internet forums in form of consumption-based virtual communities, which can be described as *'affiliative groups whose online interactions are based upon shared enthusiasm for, and knowledge of, a specific consumption activity or related group of activities'* (Kozinets, 1999, p. 254). This study focuses specifically on consumption-based virtual communities in relation to food preparation and cooking (from now on virtual food communities). Thus, focus is not on consumption of a particular brand or product, but on consumers' preparation and cooking of their own food.

Virtual food communities provide companies with an opportunity to understand how people consume products as well as fundamental changes in their consumption (Kozinets, 1999). Virtual communities have often been suggested as highly relevant for companies in order to understand consumers' needs and wants, and they are a potential source of ideas and knowledge to be used for collaborative innovation between consumers and companies (Dahlander et al., 2008, Fuchs and Schreier, 2011, Schreier et al., 2012, Poetz and Schreier, 2012, Sawhney et al., 2005). Consumers are often creative and novel in their suggested problem solutions (Prahalad and Ramaswamy, 2000, Franke et al., 2006), and their ideas and knowledge can therefore be highly relevant to integrate especially in the early stages of product development for identifying consumer needs and wants (Kemp, 2013).

In the area of food, consumers show a high interest in interacting on various food related issues in the online setting (e.g. Carr et al., 2015, Hilverda et al., 2017, Närvänen et al., 2013, Vidal et al., 2015, Vidal et al., 2016). The online platforms offer a possibility for consumers to share and gain knowledge on specific food issues. However, the literature addressing consumers' motivation for online interaction in the online food setting remains scarce. Given that food is an essential part of most people's lives, it is important to understand which

factors motivate consumers to engage in interaction in an online food setting and how these specific motivation factors associate with more basic pre-existing consumer interests.

The objective of this study is to understand 1) the associations between the pre-existing consumer interests in food and general online interaction, and consumers' willingness to interact in virtual food communities, and 2) the mediating role of consumers' motivation to self-present to and learn from the community in explaining these associations (see Figure 1).

From a food sector perspective, this research is interesting as the increasing general use of online media provides a possibility for companies to use these tools for understanding consumer needs and wants in their product development (Carr et al., 2015). Food companies face a constant requirement to develop product innovations tailored to consumer needs (Barrena and Sánchez, 2012, Grunert et al., 1996, Stewart-Knox and Mitchell, 2003), but many food products fail when introduced to the market (Rudolph, 1995, Gresham et al., 2006). This highlights the relevance of consumer-oriented innovation within this industry (Grunert et al., 2008, Moskowitz et al., 2006).

Pre-existing consumer interests: food involvement and general online interaction propensity

The fact that virtual communities are based on *online communication* about a *common interest* (Koh et al., 2007) implies that a certain involvement with the community domain and general online interaction practices is relevant for participation. Interest in a specific domain may instigate a strong desire for participating in online knowledge sharing with likeminded others (Wasko and Faraj, 2000). Food involvement, as *'the level of importance of food in a person's life'* (Bell and Marshall, 2003, p. 236), is thus expected to increase a person's interest in virtual food community interaction.

In addition to involvement with the food domain, consumers' general attitudes towards online interaction are likely to play a separate role in virtual community communication, as individuals may possess basic differences in their preference to engage in social interactions (Liu, 2007). Basic personality traits related to for example extroversion/introversion may influence how people engage in online interaction (e.g. Amichai-Hamburger et al., 2002, Liu, 2003, Wiertz and Ruyter, 2007). Hammond (2000) describes two types of participants: those that participate actively by both using and providing information, and those that are passive members using the information only. Online interaction propensity reflects a person's inclination to participate in interaction with people on the Internet that they have never met

(Wiertz and Ruyter, 2007, p. 357). It is not a question of Internet adoption as such, but rather the use of the Internet for interactive purposes (Liu, 2007). According to Kozinets (1999), the more time consumers spend online in general, the more likely they are to settle in a virtual community. Consumers differ in their general disposition to online interaction, and this general online interaction propensity is rooted in their personality, which means that not all consumers will engage in online interaction under identical conditions (Wiertz and Ruyter, 2007). Thus, based on personality, some may not engage in virtual communities on food issues despite a high level of food involvement.

In the following, we suggest a mediating model where consumers' levels of food involvement and general online interaction propensity influence interaction intention (information provision and usage) in a virtual food community, indirectly, through the mediating effects of two motivation factors: motivation to learn from and to self-present to the community (see Figure 1).

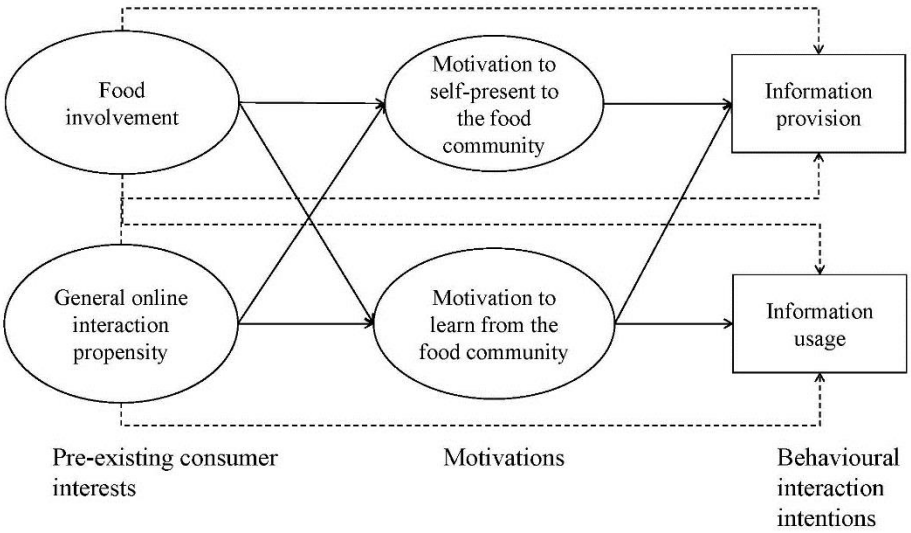

Figure 1: Conceptual model of the mediating role of motivation.

Hypotheses development

The mediating role of motivation to learn from the community

Consumers search for and process information based on its personal relevance (Celsi & Olson, 1988; Petty, Unnava, & Strathman, 1991) and are therefore driven by their motivation to learn more about topics of personal interest. Thus, their motivation to learn is expected to be higher in areas of personal interest. Virtual communities are potential information sources (e.g. Burnett, 2000; Wiertz & Ruyter, 2007) where consumers can turn to peer consumers to acquire skills, knowledge, and attitudes supporting them in their role as consumers (Wang,

Yu, & Wei, 2012). De Valck, Bruggen, and Wierenga (2009) explain how consumers often use the virtual community of interest as a reference group before making a consumption related decision. A consumption-based virtual community can potentially have strong influence on decisions because consumers' voluntarily engage in this group (De Valck et al., 2009). The pre-existing interests in terms of food involvement and general online interaction propensity are therefore expected to be positively associated with motivation to learn from the community.

Furthermore, learning is often suggested as a motivation for interacting in virtual communities (e.g. M. Antikainen, Mäkipää, & Ahonen, 2010; Leimeister, Huber, Bretschneider, & Krcmar, 2009; von Hippel, 2007), and many consumers turn to the online environment when searching for information (Bickart & Schindler, 2001; Burnett, 2000; De Valck et al., 2009). Consumers' likelihood of turning to the online social environment in search for information relates to the type of information needed and the type of media used (Kuttschreuter et al., 2014). Basically, consumers visit these communities, if they expect to find valuable information for their needs (Koh et al., 2007; Wiertz & Ruyter, 2007). This indicates a positive relationship between motivation to learn from the community and information usage.

Expected informational value is also found to be one of the main drivers of contributing information to virtual communities (Wiertz & Ruyter, 2007). Wasko and Faraj (2005) suggest that community participants will be more inclined to provide information, if they expect it to result in the creation of new informational value that they themselves may receive in exchange. Thus, a positive relationship between motivation to learn from the community and information provision is expected as well.

Taking together the expected relationships between the pre-existing consumer interests (food involvement and general online interaction propensity), motivation to learn from the community, and behavioural interaction intention (information provision and usage), the following hypotheses are derived:

H1: Motivation to learn from the community mediates the relationship between:

(1) Food involvement and intended information provision

(2) General online interaction propensity and intended information provision

(3) Food involvement and intended information usage

(4) General online interaction propensity and intended information usage

The mediating role of motivation to self-present to the community

According to the self-presentation theory (Goffman, 1959), people want to present their identities to others (Ma & Argawal, 2007). For example, consumers may purchase particular brands to comply with the presentation of a certain identity (Escalas & Bettman, 2005). Also, food consumption can play a role in shaping people's identities (e.g. Turner, Ferguson, Craig, Jeffries, & Beaton, 2013). The desire for self-presentation through expression plays a role in the online setting as well (Labrecque, Markos, & Milne, 2011; Lampel & Bhalla, 2007), and various activities related to food are to a great extend expressed by consumers online (Carr et al., 2015; Vidal et al., 2015; Vidal et al., 2016). Consumers are more likely to actively participate in a consumption based virtual community, if they identify with the group (De Valck et al., 2009). With a focus on the drivers of motivation to self-present, Kim, Chan, and Kankanhalli (2012) define the desire for online self-presentation as *'the extent to which an individual wants to present his or her preferred image in a [virtual community] of interest'* (p.1235). People act in order to comply with their identity (Oyserman, 2015; Shavitt, Torelli, & Wong, 2009), and an interest in being part of a particular group motivates a person to present him-/herself towards that group (Kim et al., 2012). The more important a particular consumption domain is to the consumer, the more eager he/she is to be part of a community centred on this type of consumption (Kozinets, 1999). Identification with a virtual food community reflects a consumer's food involvement as well as his/her interest in interacting in that group of likeminded others. Therefore, both food involvement and general online interaction propensity are expected to positively associate with a motivation to self-present to the community.

Additionally, self-presentation as a motivation to interact in virtual communities has been addressed in terms of approval from others (e.g. Jeppesen & Frederiksen, 2006; Jeppesen & Molin, 2003; Leimeister et al., 2009), improved reputation/status (Lampel & Bhalla, 2007; Wasko & Faraj, 2005), and improved self-worth (Hennig-Thurau, Gwinner, Walsh, & Gremler, 2004). Participants may achieve satisfaction from knowing that when others are consuming and approving the information they have provided (Hennig-Thurau et al., 2004), their skills and expertise is presented to others (Leimeister et al., 2009). Economic theory suggests that the motivation for information provision (i.e. signalling incentive) becomes

stronger when people have the possibility to make their performance visible to relevant others such as peer consumers in the community (Lerner & Tirole, 2002). Consumers motivated to self-present in virtual food communities are more likely to provide information, if they can reach relevant others with this information. This is supported by Hennig-Thurau et al. (2004) who found that the possibility for gaining approval from others is one of the main drivers for contributing to the community. Also Ma and Argawal (2007), Lampel and Bhalla (2007) and Teichmann, Stokburger-Sauer, Plank, and Strobl (2015) found that the possibility for self-presentation enhances knowledge contribution. Therefore, a positive relationship is expected between motivation to self-present to the community and information provision.

Based on the expected relationships between pre-existing consumer interests (food involvement and general online interaction propensity), motivation to self-present to the community, and behavioural interaction intention, the following hypotheses are derived:

H2: Motivation to self-present to the community mediates the relationship between

(1) Food involvement and intended information provision

(2) General online interaction propensity and intended information provision

The suggested relationships appear in Figure 1.

Method

Sample and questionnaire procedure

The sample of respondents who filled in the online questionnaire consisted of 980 respondents representative of the Danish population on gender, age, and region. Respondents were recruited through a Danish market research agency (Userneeds) via email. All respondents were part of the pre-established consumer panel and rewarded with points for their participation. The average age was 44 years with 50.2% males and 49.8% females (see demographics in Table 1).

Table 1: Demographics of respondents.

Gender		**Highest level of education**	
Male	50.2%	None	1%
Female	49.8%	Primary school	24.8%
		High school	12.2%
Age		Short academy education	4%
18-24	14.4%	Diploma education	30.4%
25-34	15.5%	University bachelor	5.1%
35-44	16.8%	University master	8.1%
45-54	24.3%	Other	0.8%
55-64	18.7%		
65(+)	10.3%	**Occupation**	
		Full time job (>29 hours/week)	48.3%
Household size		Part time job (8-29 hours/week)	5.6%
1	24.5%	Part time job (<8 hours/week)	1.2%
2	41.1%	Retired	18.4%
3	13.9%	At school	5.6%
4	14.4%	In full-time higher education	7.1%
5	4%	Unemployed (seeking job)	7%
6(+)	2.1%	Unemployed (not seeking job)	1.1%
		Other	5.1%

Respondents were introduced to the concept of a virtual food community for consumers. The community was described as *a virtual group existing online consisting of users as members. The idea is that members can meet online to discuss different topics by posting messages in the forum. In this survey, we are specifically focusing on online food communities – thus, the topics discussed in the online forum relates to food. Imagine an online food community, where members can interact, share, and compare one's own food ideas and perceptions of other people's food ideas (e.g. recipes). Members can present their food ideas, suggestions, or simple thoughts, as well as give comments to others' ideas, discuss, and develop them together. In order to take part in the online discussion, a membership is required (free of charge).*

Following this, respondents were asked to evaluate the importance of factors that would influence their willingness to participate in such a community. Furthermore, they were requested to state their intention to engage in interaction as providers or users of information. Then they were asked questions on different consumer characteristics including food involvement and general online interaction propensity. Finally, demographic questions were asked.

Measures

An overview of all measurement scales appears in Table 2. The questionnaire was developed based on scales existing in current literature. Extra items were added based on a content

analysis of 3679 web-postings in an already existing Danish online community for sharing recipes on food and drinks. Most variables (motivation to learn from the community, motivation to self-present to the community, food involvement, and general online interaction propensity) were measured by multiple items. Items related to motivation factors and pre-existing consumer interests were adapted to the food domain, apart from general online interaction propensity, which should capture the interest in online interaction in general. Items representing information provision and information usage were measured with a single item each. All items were measured using a 7-point Likert scale running from 'Strongly disagree' to 'Strongly agree'. The questionnaire was translated into Danish and then back-translated to English to ensure the intended understanding of the Danish questionnaire among respondents.

Four items measuring 'motivation to self-present in the community' were adapted from the scale for extraversion/positive self-enhancement by Hennig-Thurau et al. (2004). The items measuring 'motivation to learn from the community' were based on the content analysis of web-postings, as many of them concerned suggestions for improvements on the food ideas. These were in relation to the final food product and the process of preparing the food. Six items measuring 'food involvement', related to the subscale on preparation and eating, were taken from the food involvement scale developed by Bell and Marshall (2003). An extra item was added concerning the interest in watching food programs on TV. 'General online interaction propensity' was measured by four items used by Wiertz and Ruyter (2007). The two items representing intended information provision and information usage ('Share ideas/recipes' and 'Try out ideas/recipes') were developed for this study for capturing both dimensions needed for continuous interaction. The negatively phrased items were reversed for further analysis.

Data analysis procedure

The descriptive statistics were conducted in SPSS whereas the confirmatory factor analysis (CFA) and structural equation model (SEM) were conducted in the statistical program AMOS version 22. The CFA was conducted to test the reliability and validity of the measurement scales (see Table 2). Afterwards, the SEM model was conducted to test the mediating effects of the motivation factors and propose the final model (see Table 4 and Figure 2).

The mediating effects of the motivation to self-present to and motivation to learn from the community were tested based on Baron and Kenny (1986) (Table 4). Briefly, this procedure

consists of several requirements. First, the causal variable must correlate with the outcome to show that there is an effect that can be mediated. Second, the causal variable should correlate with the mediator, essentially meaning that the mediator plays the role of the outcome variable. Finally, the mediator should affect the outcome variable while controlling for the effect of the causal variable. If the effect of the cause on the outcome, controlling for the mediator, is zero (or decreases), the mediator completely (or partially) mediates the cause-outcome relationship.

The following presents the preliminary data analysis followed by the testing of the two mediators. Afterwards, the final model is presented including estimates of the individual paths as well as an evaluation of the model.

Results

Descriptive results showed a moderate interest in information provision, but a slightly higher interest in information usage among respondents ($M_{provision} = 3.88$ and $M_{usage} = 4.66$). Normality tests revealed no extreme deviation from the normal distribution for any of the variables involved.

Confirmatory factor analysis

The model fit was acceptable (GFI = 0.979, IFI = 0.992, RMSEA = 0.036). Composite reliability (CR) and average variance extracted (AVE) estimates were computed for each construct to check the scale reliability (Hair Jr., Black, Babin, & Anderson, 2010). All CR and AVE (except food involvement with CR = 0.733 and AVE = 0.480) were above the cut-off levels of 0.8 and 0.5, respectively. All factor loadings were above 0.6 with significant p-values < 0.01, indicating a satisfying convergent validity of the corresponding items. The discriminant validity was assessed by examining the correlation matrix and by using the Fornell and Larcker (1981) criterion. Here, the square root of AVE of any two constructs should be larger than the correlation coefficient between the constructs (Table 3). The results show that all pairs of the reflective constructs fulfilled this requirement, which supports the evidence of discriminant validity.

Table 2: Construct and measurement model.

Constructs & items	Mean	Std.dev.	t-value	Λ	C.R.[a]	AVE[b]
PRE-EXISTING CONSUMER INTERESTS						
Food involvement					0.733	0.480
I don't think much about food every day**						
Cooking is not much fun**						
Talking about what I ate or what I am going to eat is something I like to do	3.98	1.84	16.273	0.771***		
Compared with other daily decisions my food choices are not very important**						
I enjoy cooking	4.72	1.90	15.547	0.679***		
When I eat out, I don't think much about how the food tastes**						
I like to watch food programs on TV (fx Brødrene Price, Det Søde Liv, Den Store Bagedyst)*	4.20	2.12		0.621***		
General online interaction propensity					0.943	0.848
In general I like to get involved in online discussions	2.88	1.78		0.914***		
I am someone who enjoy interacting with likeminded others online	3.33	1.91	43.214	0.879***		
I am someone who like actively participating in online discussions	2.91	1.79	53.792	0.967***		
In general, I thoroughly enjoy exchanging ideas with other people online**						
MOTIVATION FACTORS						
I would join an online food community because…						
Motivation to self-present					0.888	0.726
…I can express my joy about a good food	4.04	1.89	31.084	0.864***		
…I feel good when I can tell others about my food successes	3.39	1.81		0.814***		
…I can tell others about a great experience	3.99	1.86	31.668	0.877***		
…I can show others that I am clever in cooking/preparing food**						
…I can show others that I have experience with cooking/preparing food* **						
…I can show others that I am passionate about my cooking/food preparation* **						
Motivation to learn					0.924	0.802
…I can improve the result of my cooking/food preparation*	4.56	1.79		0.938***		
…I can improve the taste experience of my food products*	4.51	1.79	50.295	0.925***		
…I can find more efficient ways to cook/prepare food*	4.50	1.74	37.214	0.818***		
INTERACTION INTENTION						
In an online community, I would like to…						
Information provision						
…share my ideas with others	3.83	1.93		1(fixed)		
Information usage						
… try out new ideas/recipes	4.66	1.90		1(fixed)		

*added from analysis of webpostings ** Items left out due to low factor loadings or cross-loadings ***p-value < 0.01 [a]CR = Composite reliability = $\frac{(\sum_{i=1}^{n} L_i)^2}{(\sum_{i=1}^{n} L_i)^2 + (\sum_{i=1}^{n} e_i)}$ [b]$AVE = Average\ variance\ extracted = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$

Table 3: Correlations matrix for constructs and outcome measures.

Correlation matrix	Food involvement	General online interaction propensity	Motivation to learn	Motivation to self-present	Information provision	Information usage
Food involvement	0.693[a]					
General online interaction propensity	0.343	0.921[a]				
Motivation to learn	0.548	0.373	0.896[a]			
Motivation to self-present	0.592	0.407	0.734	0.852[a]		
Information provision	0.493	0.370	0.573	0.663	-	
Information usage	0.499	0.341	0.675	0.539	0.699	-

[a] $\sqrt{\text{AVE}}$

SEM model and hypothesis testing

1) In *Model A* (Table 4), food involvement and general online interaction propensity had a significant positive main effect on information provision and usage. Thereby, the first requirement for a mediating model is satisfied (i.e. a correlation between the causal variables and outcome variables). *Model B* in Table 4 showed a significant direct effect of food involvement and general online interaction propensity on motivation to learn from the community. Likewise, *Model C* showed a significant direct effect of food involvement and general online interaction propensity on motivation to self-present to the community. Thus, the second requirement for the motivation factors to function as mediators is satisfied (i.e. a correlation between the causal variables and the mediating variables)

2) In *Model B1* (Table 4), the relationships between motivation to learn and both information provision and usage are significant. The main effect of food involvement on information provision and usage decreases (compare main effects of food involvement on information provision and usage in *Model A* and *Model B1*). This satisfies the third requirement for mediation (i.e. effect of the causal variable on the outcome variable decreases/becomes insignificant when controlling for the mediator). This is in support of H1.1 and H1.3. Thus, motivation to learn from the community partially mediates the relationships between food involvement and information provision, and between food involvement and information usage. Furthermore, the main effects of general online interaction propensity on information provision and usage decrease (compare main effects of general online interaction propensity on information provision and usage in *Model A* and *Model B1*). Likewise, this satisfies the third requirement for mediation. These results support H1.2 and H1.4 implying that

motivation to learn from the community partially mediates 1) the relationship between general online interaction propensity and information provision, and 2) the relationship between general online interaction propensity and information usage.

3) In *Model C1* (Table 4), the relationship between motivation to self-present to the community and information provision is significant, and the main effect of food involvement on information provision becomes insignificant (compare main effect of food involvement and information provision in *Model A* and *Model C1*). This satisfies the third requirement for mediation (i.e. effect of the causal variable on the outcome variable decreases/becomes insignificant when controlling for the mediator). Similarly, the main effect of general online interaction propensity on information provision decreases (Compare main effect of general online interaction propensity and information provision in Model A and B1). Likewise, this satisfies the third requirement for mediation. Thereby, H2.1 and H2.2 are supported. In other words, motivation to self-present to the community 1) fully mediates the relationship between food involvement and information provision, and 2) partially mediates the relationship between general online interaction propensity and information provision.

4) *Model D* (Table 4), shows the final model when including both motivation to self-present to the community and motivation to learn from the community as mediators. The model verifies that the mediating effects hold when both motivation factors are included and provides an overview of the strengths of the individual relationships in the model. The mediating effects for all paths (Table 4) are calculated based on the individual paths and show that the indirect effects of the motivation factors are stronger for the relationships between food involvement and interaction intention compared to the relationship between general online interaction propensity and interaction intention. Furthermore, the indirect effects indicate that motivation to self-present mediates the relationship between food involvement and information provision to larger extent than motivation to learn.

Table 4: Analysis of the mediation model.

Paths	Individual interests → Interaction	MtL[f] as a mediator		MtS[e] as a mediator		Joint effect of MtS[e] and MtL[f] as mediators
	Model A	**Model B**	**Model B_1**	**Model C**	**Model C_1**	**Model D**
Main effects						
FI[a] → PROV[b]	0.420***	-	0.233***	-	n.s.(0.785)[1]	n.s.(0.063)[1]
FI[a] → USAG[c]	0.440***	-	0.177***	-	-	0.223***
GOIP[d] → PROV[b]	0.225***	-	0.141***	-	0.053(0.043)[1]	0.092***
GOIP[d] → USAG[c]	0.189***	-	0.071***	-	-	0.073***
FI[a] → MtS[e]		-	-	0.516***	0.516***	0.717***
GOIP[d] → MtS[e]		-	-	0.232***	0.227***	0.138***
FI[a] → MtL[f]		0.483***	0.473***	-	-	0.681***
GOIP[d] → MtL[f]		0.218***	0.212***	-	-	0.120***
Final model						
MtS[e] → PROV[b]		-		0.440***	0.416***	0.421***
MtL[f] → PROV[b]		0.586***	0.397***	-	-	0.156***
MtL[f] → USAG[c]		0.687***	0.557***	-	-	0.491***
Indirect paths*						**Indirect effect**
FI[a] → MtL[f] → PROV[b]						0.11
FI[a] → MtL[f] → USAG[c]						0.33
GOIP[d] → MtL[f] → PROV[b]						0.02
GOIP[d] → MtL[f] → USAG[c]						0.06
FI[a] → MtS[e] → PROV[b]						0.30
GOIP[d] → MtS[e] → PROV[b]						0.06
Model fit						**R^2**
MtS[e]						0.608
MtL[f]						0.540
PROV[b]						0.470
USAG[c]						0.494

[1]p-value ***p-value < 0.01 [a]Food involvement [b]Information provision [c]Information usage [d]General online interaction propensity [e]Motivation to self-present [f]Motivation to learn *product of β-values for individual paths

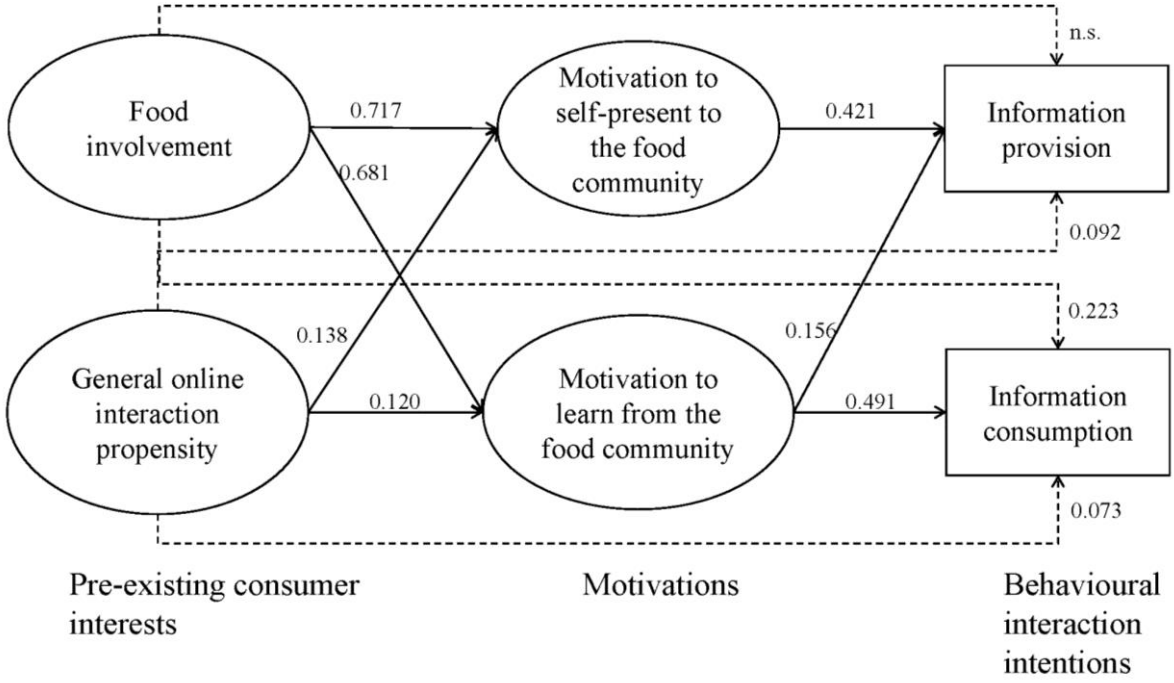

Figure 2: Final model of the significant paths.

Structural model fit

The results of the structural model are described in Table 4 (Model D) and Figure 2. The model fit was evaluated based on the number of significant paths and multiple squared correlations of the endogenous variables (R^2) as well as other standard measures (CFI = 0.970, IFI = 0.970, RMSEA = 0.068, and SRMR = 0.0532). The model predicts 47% and 49.4% of the variance in the two interaction measures (i.e. information provision and usage), respectively. The R^2 values for endogenous variables comply with the minimum criterion of 10% (Falk & Miller, 1992).

Discussion

Results confirmed that in order to engage in continuous interaction in the virtual food community, consumers must have a basic level of propensity to communicate online and especially food involvement. Model A showed a direct positive relationship between these pre-existing interests and intended interaction. This direct association was expected by default due to the characteristics of a virtual food community (i.e. *online communication* about a *common interest*). However, by including the motivation factors as mediators, it is indicated *why* these interested consumers are willing to provide and consume information in the community. Model B, C, and D (Table 4) showed a decrease in the direct relationships between especially food involvement (but also general online interaction propensity) and

intended interaction, when introducing the mediators. More specifically, based on their level of food involvement and general online interaction propensity, consumers are motivated to self-present to and learn about food related topics from the community. These motivations drive their intention to provide and consume information in the community. Therefore, in order to keep consumers in continuous interaction, virtual food communities should provide consumers with 1) the opportunity to self-present to the other community members, and 2) the opportunity to learn from the information available in the community.

Food involvement appears to be the strongest determinant for consumers to engage in interaction through the specific motivation factors. This implies that a potential virtual food community would consist of highly food involved consumers. From a food industry perspective, virtual communities offer a possibility to engage online savvy consumers possessing a certain involvement with food in interaction and dialogue. They can provide consumer insight for new food product development, but consumers with a lower degree of food involvement, and with limited propensity to interact online, will not be represented in this shared information, despite their role as food consumers on the market. Thus, the consumer insight information is obtained only for a certain group of consumers.

The importance of self-presentation and learning for interaction in virtual food communities

In addition to the pre-requisites of online interaction propensity and especially food involvement, the mediation model indicated that virtual communities for food preparation and cooking must be challenging enough to provide both the opportunity to learn from the information in the community, as well as the opportunity to present oneself to the community.

A strong incentive for consumers to visit the communities seems to be the possibility for gaining valuable information on food corresponding to their needs. Consumers with a higher level of propensity to communicate online and especially a strong food involvement may be more motivated to learn from a community focused on food. They will be motivated to learn from the personally relevant food material and therefore be strongly incentivised to consume the information from the community. Virtual food communities as potential communication channels to consumers are already used by many food companies for commercial reasons (Antikainen & Niemelä, 2014; Rutsaert, Pienaik, Regan, McConnon, & Verbeke, 2013). This study highlights the importance of the information being perceived as personally relevant by the consumer.

Motivation to learn was, although to lesser extent, positively related to information provision. Again, this supports that consumers expect some kind of valuable feedback from the community on their provided ideas (Wasko & Faraj, 2005). By providing information, consumers can state a specific food related problem to which they seek advice from other consumers on how to solve. Consumers may provide information in order to gain valuable information in return that is targeting their specific needs and thereby improving their own food experience. This is in line with Füller, Jawecki, and Mühlbacker (2007) who found that consumers share information in order to improve their own innovative ideas. It further indicates that this type of community is potentially perceived as a valuable information source for searching food inspiration and problem solutions from other consumers as fellow consumers can be relevant information providers based on their experience. The information in the community should be relevant in helping consumers improve their own food experiences in terms of both preparation and taste and not just focus on commercialisation of potential products.

The possibility for self-presentation on food related aspects is a very important factor for consumers to engage in information provision, which is in line with Lampel and Bhalla (2007) and Labrecque et al. (2011). Consumers were interested in presenting themselves to others in a way that is based on their knowledge and experience in the food preparation and cooking area, which is also indicated by the high level of food related postings online (Carr et al., 2015; Vidal et al., 2015; Vidal et al., 2016). Following existing innovation literature (e.g. Jeppesen & Frederiksen, 2006; Jeppesen & Molin, 2003; Leimeister et al., 2009), one could expect that consumers are motivated to present themselves in order to achieve recognition and approval from other food consumers. Self-presentation can be a way to increase one's self-enhancement through positive recognition from peers (Hennig-Thurau et al., 2004), as the consumer may be perceived as an expert based on his/her food-related knowledge. Self-presentation can only happen by information provision – not by information usage. However, one could argue that information usage would result in deeper food related knowledge, which could, in return, improve the level of expertise in the information provided and thereby increase approval from peers.

Implications

From a practical perspective, this research is relevant for generating interaction in virtual food communities. Generally, such communities are becoming an important part of business models (Hagel, 1999). In different industries, companies are to an increasing extent making

use of virtual communities as sources of innovation (Fuchs & Schreier, 2011; Schreier et al., 2012), but in the food industry focus has mainly been on the commercial use and less on the product development opportunities (Carr et al., 2015). As freely produced material is available from many virtual communities, food producers could use the information to gain consumer insight or alternatively create their own platforms for interacting with consumers.

As online interaction propensity and especially food involvement are important pre-requisites for willingness to interact, managers must be aware that only those consumers who possess a high interest in food are likely to engage. They should therefore consider the extent to which these consumers represent the target market. Thereafter, consumers should be given the opportunity to self-present to and learn from the community, in order to engage them in interaction.

Starting with motivation to self-present to the community, a concrete suggestion for managing virtual food communities could include visibility of performance measurements. This could be done in the form of grading systems that are easily accessed by peers from whom the information provider aim to attain recognition and approval. In relation to the grading system and social status, a ranking system could be implemented to identify top-members and possibly allow for creating different tiers of participants. Another relevant aspect of the opportunity to self-present to the community would be the necessity of linking individual participants with their provided information, for example through profiling options (Leimeister et al., 2009). Considering the strong influence of food involvement, the opportunity to present oneself to the group should focus on expertise in food, as consumers are likely to strive for recognition based on their food specific knowledge.

Turning to the motivation to learn from the community, the community must be emphasised as a valuable source of information in the food area. This can be by highlighting its profile within the food setting in order to attract the consumers who possess the required knowledge for increasing the information quality. Consumers are attracted by information that corresponds to their needs. Continuous interaction requires constant feedback on provided information, which may require an active moderator who provides relevant stimuli to the community and supports the discussions around interesting topics.

Limitations and future research

This study focused specifically on the role of two motivation factors: self-presentation and learning to/from the community. Although, these were chosen based on their overall capture

of motivations for engaging in virtual community interaction, it may be worth distinguishing between more detailed motivation factors in future research. Self-presentation may be divided into approval from others, reputation, improved self-worth, etc. Learning may be divided into improved knowledge per se or more practically oriented improved skills for handling a certain food problem. In order to understand how to engage less food involved consumers from the target market in interaction, it could be further explored if other motivation factors would be less dependent on especially food involvement.

Similarly, this study focused on two main dimensions of interaction (information provision and usage), but other and more specified interaction activities could be included as dependent variables. Examples could be activities such as grading or improvement of other consumer ideas.

The role of the community host may also be worth examining. It could be interesting to investigate the differences in the drivers of company-driven vs. consumer-driven communities. This difference has been investigated to some extent (e.g. Teichmann et al., 2015), but distinguishing further between different levels of company engagement and management of such communities could be relevant. This could provide a better understanding of the optimal way for managing the visibility and active role of the company in the community. Depending on the aim of the community (e.g. generating ideas for new product developments or acquiring a deeper understanding of product use, the moderating role of the company can differ widely. Co-creation literature suggests that consumption-based virtual communities can be a facilitator for consumers to create value in relation to consumption of the product. One example is the 'my Nutella The Community' (Cova & Pace, 2006) which acts primarily as a platform for consumers of Nutella to share their product experiences with other consumers. In such a platform, focus is less on interaction among peers and more on the possibility for expression for the individual consumer (Cova & Pace, 2006). The company's role as a less controlling and interfering community-host would also be an interesting direction in which to take future research.

This study focused on a special type of community, namely a consumption-based virtual community for food preparation and cooking. It may therefore be difficult to generalise to all other types of virtual communities (e.g. communities on food in general, restaurants or other consumption-related aspects of food). One may argue that food preparation and cooking is an area where skills are perceived as highly important, which may result in motivation to self-

present to be especially important for some consumers. Future research could therefore investigate the role of various motivation factors for virtual food communities focusing on different consumption-related domains.

Finally, presenting respondents with an artificial virtual community in the food domain was preferred in this study. This approach allowed the study to investigate the relationship between pre-existing consumer interests and the respective motivation factors among general consumers. However, setting up a real virtual food community, where actual instead of intended behaviour can be examined, could be optimal due to the well-known gap between intended and actual behaviour (Ajzen, 2011). Thereby, data on the independent variables and dependent variables would not come from the same self-reporting source. In relation to this approach, it would be possible to focus more on the concrete tools companies can use to support consumers' self-presentation and learning. However, it could also create a bias towards consumers with a high level of food involvement and general online interaction propensity, and the variation in these variables would then be limited.

Conclusion

Motivation to self-present to and motivation to learn from the virtual food community mediated the relationships between pre-existing consumer interests and intended interaction behaviour among consumers. Especially for the relationship between food involvement and interaction, the mediating effects were strong. These relationships imply that the motivation to present oneself as an individual to the community, as well as learning from the information in the community, are reasons why consumers with pre-existing interests in online interaction and especially in food intend to interact in the community. To drive interaction, virtual food communities should therefore provide consumers with the opportunity to self-present to and learn from the community. Still, companies must keep in mind that these opportunities will only appeal to food involved consumer with a certain level of online interaction propensity.

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Paper 2: Consumer Interaction in Virtual Communities for Product Innovation: A cross-cultural perspective

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Abstract

This study investigated 1) how motivation factors rooted in the need for relatedness, competence, and autonomy, influence behavioural interaction intention in a virtual community aimed at product innovation, and 2) how these relationships are moderated by countries differing on the cultural dimension of individualism-collectivism. Surveys were conducted in Denmark (n=1045) and Brazil (n=617). Relatedness was found to be the strongest driver of consumers' intended interaction activity, but the importance of group relatedness versus company relatedness differed between countries. The possibility for beneficial outcomes, for the consumers themselves and for the market, drives consumers in both countries. Perceived skills within the product category were not found to be important for consumers' interaction engagement. The main implication realised from this study is the cross-country moderation, as to the importance of the two dimensions of relatedness, which is likely to be rooted in the different levels of individualism-collectivism characterising the two countries. Future research should focus on additional cultural dimensions that may moderate different motivation factors. When managing virtual communities for product innovation in collectivistic cultures, companies should focus on promoting the community as a group of fellow consumers, whereas in individualistic cultures, more emphasis should be on the consumers' ability to relate to the values of the company behind the community. Additionally, participants should be ensured that their engagement is beneficial by being able to see results of their contributions. This paper is among the first to examine role of culture in consumers' motivations to engage in virtual communities for product innovation, by investigating the moderating effect of country.

Introduction

In order to stay competitive, companies must constantly develop successful products of superior value to consumers (Griffin and Hauser, 1996, Cooper and Kleinschmidt, 2007, Henard and Szymanski, 2001). This requires an understanding of the market, which implies knowledge generation on consumer needs to be used in innovation (Narver and Slater, 1990, Poolton and Barclay, 1998). Along with the recognition that openness towards external actors is a requirement for successful innovation (Dahlander and Gann, 2010, Chesbrough, 2003), the role of consumers as a valuable source of innovation is emphasised (Von Hippel et al., 2012, Nishikawa et al., 2013, Poetz and Schreier, 2012, Lüthje, 2004). Some companies therefore choose to integrate consumers in their innovation process through company-consumer collaboration (Greer and Lei, 2012). Such collaborations have the potential to increase the success of companies' innovation performance (Troy et al., 2007, Witell et al., 2010).

Virtual communities (VC) can be used as a tool for integrating consumers in the innovation process (Fuchs and Schreier, 2011, Schreier et al., 2012, Nambisan, 2002) because VCs can create an ongoing dialogue between consumers and companies for knowledge sharing (Sawhney et al., 2005). They *'comprise a large, loosely knit, and geographically distributed group of individuals engaged in a shared practice of problem solving, knowledge exchange, or social interactions that mainly occur through computer-mediated communications'* (Hsu et al., 2012, p. 73). Different motivation factors for VC engagement have been studied such as learning (von Hippel, 2007, Wiertz and Ruyter, 2007), recognition from peers and companies (Füller et al., 2007, Jeppesen and Frederiksen, 2006, Jeppesen and Molin, 2003, von Hippel, 2007), self-identity (Lakhani and Panetta, 2007, Ma and Argawal, 2007), and empowerment (Füller et al., 2009).

Generally, human motivation is rooted in basic psychological needs for *competence*, *autonomy*, and *relatedness* (Ryan and Deci, 2000), and to satisfy these needs, individuals may engage in various behaviours, including social interactions (Patrick et al., 2007). Despite being based on common needs (Ryan and Deci, 2000), behavioural motivations may, at a more detailed level, differ between cultures (e.g. Hofstede, 1983b). Therefore, it is important to understand the role of culture to optimise the management of marketing and innovation activities in different countries (Hofstede, 1983a, Nakata and Sivakumar, 1996, Thompson and Chmura, 2015, Kumar, 2014). Cultures differ on various dimensions characterising the society (Hofstede, 1983b, Hofstede, 2001), but the focus of this study is on the dimension of

individualism-collectivism as this dimension refers to the relationship between individuals which is important when discussing VCs as they consists of groups of people.

Especially in high-technology domains, identification of consumers' motivations for participating in VCs have been in focus (e.g. Jeppesen and Frederiksen, 2006, Wasko and Faraj, 2000, Leimeister et al., 2009, von Hippel, 2007, Lerner and Tirole, 2002, Wiertz and Ruyter, 2007, Jeppesen and Molin, 2003). However, to our knowledge, no previous studies have taken into consideration that these motivation factors may differ between cultures. Despite potential member of VCs being geographically distributed, the moderating effect of culture can still be relevant when considering VCs aimed at co-creating products for geographically specific markets. Companies can then collaborate with consumers from these target markets in order to develop the most well suited products. However, assuming that consumers from different cultures also differ in the motivations for participating in VC-based co-creation, it is important to understand how the VC should be managed optimally within the different cultures representing the target market. This study therefore extends existing research on VCs for product innovation by introducing country as a moderating factor differing on the cultural dimension: individualism-collectivism, which may affect the importance of motivation factors driving individuals to interact in VCs.

The findings generate ideas for the scientific community and innovation research, as well as for practitioners interested in implementing VCs for product innovation in different countries. The aim of this study is to develop and test a conceptual model of how motivation factors rooted in the need for relatedness, competence, and autonomy, influence behavioural interaction intention in a VC aiming at product innovation, and to understand how these relationships are moderated by countries differing on the cultural dimension of individualism-collectivism.

Background

Motivation rooted in relatedness

The need for relatedness is *'the desire to feel connected to others'* (Deci and Ryan, 2000, p. 231) and captures the sense of belongingness to others (Deci and Ryan, 2000). Relatedness with others and the feeling of belonging to a group is an essential human desire (Asforth et al., 2008), and joining the social networks and interacting with companies as well as other consumers offer a possibility to create social bonds (Etgar, 2008, Achrol and Kotler, 1999).

VCs can act as places to belong and provide the possibility to relate to actors who have similar interests (Kurikko and Tuominen, 2012).

Relational capital implies that individuals have a strong identification with and trust in a network (Chang and Chuang, 2011, Wasko and Faraj, 2000). Identification, trust, and relatedness are thereby concepts that are hard to separate. People act in congruence with their identity (Oyserman, 2015, Shavitt et al., 2009), and VC interaction is likely to occur only if consumers consider the VC congruent with their identity.

Identification with the VC and thereby the motivation to engage in VCs may differ depending on the VC being either consumer-hosted or company-hosted (Lee and Chang, 2011, Teichmann et al., 2015). When a company hosts a VC for product innovation purposes, the participating consumer may perceive him-/herself as part of the VC group representing consumers and/or part of the innovation team representing the company. Two areas of relatedness are therefore relevant: relatedness to the VC as a group (i.e. group relatedness) and relatedness to the VC-hosting company (i.e. company relatedness).

Group relatedness

According to the social identity theory, the consumers identify with an in-group that they believe to be similar to themselves, and at the same time separate themselves from outgroups considered as different (Bagozzi and Dholokia, 2006). The ability to identify with VCs as *'the degree to which the member sees him- or herself as part of the group'* (Casaló et al., 2010, p. 900) depends on development of the in-group distinction. The feeling of belonging to the group develops an emotional involvement with the group (Bagozzi and Dholokia, 2006) and a sense of oneness (Casaló et al., 2010). A consumer's identification with a particular VC group thus reflects the strength of his-/her feeling of belongingness to the members in the VC group (Algesheimer et al., 2005), and the stronger the feeling of VC group belonging, the higher is the perceived value of the VC for its participants (Casaló et al., 2010).

Identification with the VC group is an antecedent of community engagement which is likely to lead to VC participation (Algesheimer et al., 2005, Casaló et al., 2010). Connecting with other relevant persons is one of the benefits for consumers to participate in VCs for innovative purposes (Nambisan and Baron, 2009) as the shared identity positively influences the we-intentions whereby consumers intend to *'work jointly with others or to see it jointly with the others that a certain state or event comes about'* (Bagozzi and Dholokia, 2006, p.

1103). Community identification increases consumer interactions both directly and through its influence on community trust (Hsu et al., 2012). Also Chang and Chuang (2011) emphasise trust and identification as relational aspects supporting consumers' knowledge contribution in VCs. Still, Nambisan (2002) proposes the relative importance between social and individual identity to differ depending on the consumer's role in the innovation process. Social identity (i.e. perceiving oneself as member of the group) is dominating in VCs aiming at product support. However, the social identity is overruled by individual identity (i.e. perceiving oneself as an independent agent of innovation) in VCs focusing on product development.

Still, the following hypothesis is derived:

H1: VC group relatedness increases intended VC interaction behaviour

Company relatedness

O'Reilly and Chatman (1986) treat identification as a basic aspect of psychological commitment to an organisation and consider organisational identification a desire for affiliation. Consumers' identification with companies is increasingly sought by marketing managers, as they can help establish a long-term and deep relationship with consumers (Bhattacharya and Sen, 2003). Individuals who identify with the company act as part of it (Asforth et al., 2008) and will be more inclined to seek contact with the company as well as collaborate with its members (Dutton et al., 1994). The person is also likely to be more productive and contribute to organisational aims to a larger extent (Lee, 1971, Bhattacharya and Sen, 2003). As O'Reilly and Chatman (1986) conclude, commitment based on identification is strongly related to pro-social behaviours (i.e. employee behaviours benefitting the organisation without being a direct part of the job description and not expected by the organisation).

Individuals are more likely to support companies perceived as congruent with their own identity (Asforth and Mael, 1989) and to establish a relationship that results in company-directed behaviours (Bhattacharya and Sen, 2003). Identification with the company yields an expectation of fairness in the collaboration, and this expectation makes individuals more likely to contribute (Franke et al., 2013). For company-hosted VCs integrating consumers in innovation, the perceived fairness of the collaboration is especially important (Franke et al., 2013). This organisational identification implies that the consumer will be more likely to

interact in the VC to help the company with its innovation purpose. The following hypothesis is therefore derived:

H2: Perceived company relatedness increases intended VC interaction behaviour

Motivation rooted in competence

The need for feeling competent relates to the capability of mastering any required behaviours (Van den Broeck et al., 2010). In order to feel competent in a domain, a person has to understand and possess the relevant skills to complete the relevant behaviours (Ryan and Deci, 2000, Patrick et al., 2007). Perceived competence creates a motivation to test and extend one's capabilities, whereas lack of perceived competence is likely to decrease motivation (Van den Broeck et al., 2010, Ryan and Deci, 2000). Despite competence being divided into objective competence which is an external evaluation, and subjective competence (i.e. perceived competence) which is the individual's own perception of his/her skills and abilities (Proksch et al., 2015, Harter, 1982), only perceived competence is addressed in this study.

Perceived competence has been investigated as a motivation factor (e.g. Harter, 1982, Klint and Weiss, 1987). In consumer behaviour, the way people evaluate their own competences is often addressed as self-efficacy which is a factor affecting human motivation and behaviour (e.g. Kim et al., 2008, Bandura, 1982). The individual is motivated by reasons corresponding to his-/her perceived competences: individuals are likely to continue a behaviour if they feel competent because they are motivated to demonstrate and improve their skills (Klint and Weiss, 1987, Harter, 1978). In the area of product innovation as a collaboration between company and consumers, this would imply that consumers who feel competent and skilled in the domain of interest are more motivated to engage in the product innovation activities. The following hypothesis is therefore derived:

H3: Perceived skills increase intended VC interaction behaviour

Motivation rooted in autonomy

Autonomy can be defined as feeling *'volitional in one's actions, to fully and authentically endorse one's behaviours, and to act as the originator of one's own behaviour'* (Patrick et al., 2007, p. 434). This definition implies that the individual feels a psychological freedom and

perceives his-/her behaviour to be self-determined (Ryan and Deci, 2000). In consumer behaviour, autonomy can be reflected in the feeling of empowerment in influencing the outcomes of the behaviour. For consumer engagement in product innovation, features supporting integrity and autonomy are considered as crucial for the participating consumers' psychological well-being (Mosteller and Mathwick, 2014). Consumers engage in product innovation based on their own decisions grounded in a preference for controlling their environment and influencing the final, future product outcome (Etgar, 2008). Also Füller et al. (2009) describe how consumers can obtain the feeling of empowerment (i.e. perceived influence on product design and decision-making) by engaging in online innovation of products. Consumers take an active role in creating product benefits for themselves.

However, consumers may not do this for individual benefits in particular, but instead aim at *'transcending their personal sphere to acknowledge the welfare of a wider society and contribute to the common good'* (Martinez-Canas et al., 2016, p. 8). By engaging in VCs for product innovation, consumers may feel that they contribute to a better societal well-being. The following hypothesis is derived:

H4: Perceived outcome benefits increases VC interaction behaviour

Country and cultural differences

Culture can, in part, explain why individuals differ in their characteristics and motivations for different behaviours (e.g. Lynn and Gelb, 1996, Hofstede, 1983b, Thompson and Chmura, 2015, Abbasi et al., 2015, Hornik and Tupchiy, 2006), and has proven to play a big role in consumer behavioural relationships (e.g. Jin et al., 2008, Luna and Gupta, 2001, Park et al., 2015). Culture is *'the collective programming of the mind that distinguishes one group or category of people from another'* (Hofstede and McGrae, 2004, p. 58). Countries differ in culture on various dimensions, and one such dimension is individualism versus collectivism which refers to the degree of integration of individuals into groups (Hofstede, 1991, Hofstede, 2001). This may be highly relevant when focusing on groups of individuals in the online environment such as VCs consisting of consumers. In individualistic cultures, ties between people are loosely knit, and the individuals focus largely on themselves and people very close to them. In collectivistic cultures, ties between people are strong, and the group is in focus instead of the individual. People are integrated into groups, and the group protects the individual in return for loyalty (Hofstede and McGrae, 2004, Hofstede, 1991). Both individualism and collectivism in a culture can promote innovation (Nakata and Sivakumar,

1996), but the process may be approached differently depending on the culture (Kumar, 2014, Chiu and Kwan, 2010).

In terms of consumer integration in product innovation, the cultural dimension of individualism–collectivism may influence the relationship between the specific motivation factors and consumers' willingness to participate. Especially for relatedness, the group aspect can play a stronger role within collectivistic cultures where the group is prioritised above the individual. The individual's own relatedness with the company may be a more dominant player within individualistic cultures where the individual is prioritised above the group. Furthermore, concern for the well-being of the society as a whole may be stronger in collectivistic cultures, and therefore the perceived outcome benefits for the consumers in general and the market are likely to be more important in a collectivistic culture compared to an individualistic culture. The following hypotheses are derived:

H5a: The relationship between group relatedness and intended VC interaction behaviour is stronger in a collectivistic culture compared to an individualistic culture.

H5b: The relationship between company relatedness and intended VC interaction behaviour is stronger in an individualistic culture compared to a collectivistic culture.

H5C: The relationship between perceived outcome benefits and intended interaction behaviour is stronger in a collectivistic culture compared to an individualistic culture.

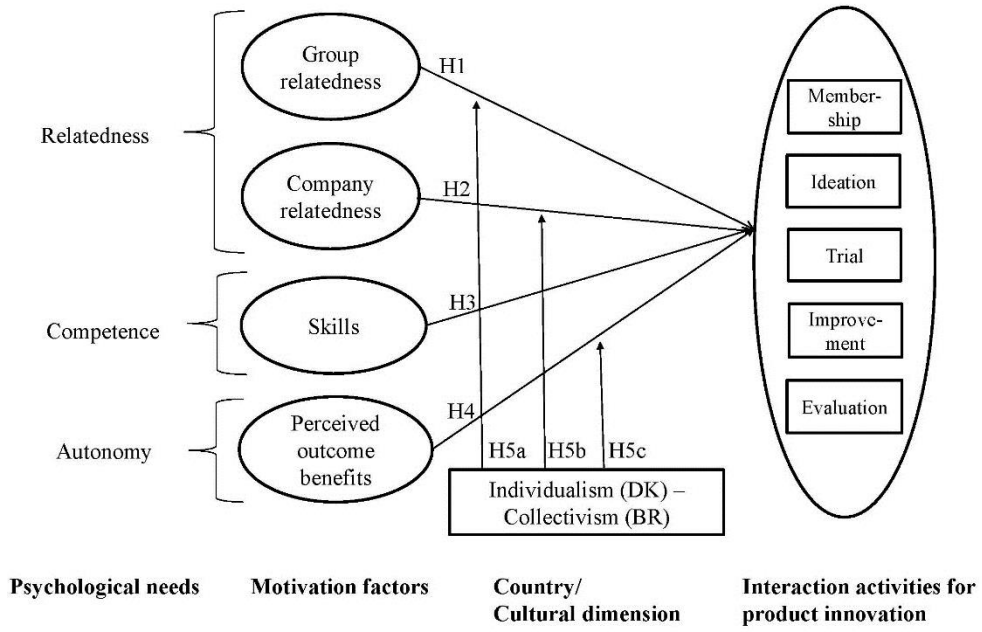

Figure 1: Conceptual model.

Figure 1 presents the suggested relationships between motivation factors rooted in psychological needs, intended interaction activities, and the cultural dimension based on country.

Method

Respondents and questionnaire procedure

The data were collected in Denmark (n = 1045) and Brazil (n = 617). Denmark represents a culture high in individualistic values, whereas Brazil represents a culture relatively low in individualistic values (Hofstede, 1991, Hofstede, 2001). In Denmark, data were obtained through an online survey, and respondents were selected through a market research agency with a pre-existing consumer panel available. The distribution between females and males were 50.4% and 49.6% respectively, and the average age was 44 years. In Brazil, data were collected through face-to-face surveys in Porto Alegre (capital of Rio Grande do Sul, which is the southernmost state of Brazil). The sample was collected in parks and farmers' markets by interviewers from an academic research centre. Females made up 55.6% of the sample whereas 44.4% were males. The average age was 37 years. Sampling methods were different between the two groups to attempt the representativeness of both analysed contexts. In Brazil, the street-intercept type of survey was applied to guarantee good representativeness as pre-existing consumer panels that could be reached via online surveys could not be used.

Respondents were introduced to the concept of a VC aimed at designing a food product for weight management together with a company (Figure 2). The idea was to choose a specific product that most consumers, in both Brazil and Denmark, could relate to and that allows for measurement of perceived skills in the product innovation domain. Confirming its relevance, the data revealed that 67.1% of the Danish respondents and 63.3% of the Brazilian respondents actively tried to lose or maintain their weight. Furthermore, considering the weight management food product to be a socially responsible product, the social justice aspect of the product is likely to make it more relevant for consumers to engage in product innovation together with a company (Martinez-Canas et al., 2016). The VC was presented as in Figure 2. Respondents were then asked about the motivation factors as well as their intention to engage in different interaction activities in the VC. Demographic questions were asked in the end.

'An online community is a virtual group existing online consisting of users as members. The idea is that users can meet online to discuss different topics by posting messages in the forum. In this survey, we are specifically focusing on online food communities with a focus on weight management – thus, the topics discussed in the online forum are on weight-management related food.
Imagine an online food community hosted by a food-company, where users can interact, share, and compare one's own food ideas and perceptions of other people's food ideas (e.g. recipes) in relation to weight management. Users can present their food ideas, suggestions, or simple thoughts, as well as give comments to other's ideas, discuss, and develop them together with other users and the company. The company can use the provided information in their development of new food products for weight management'.

Figure 2: Description of the virtual community.

Measurement model

An overview of all measures can be found in Table 1. All variables were treated as latent constructs and measured by multiple items. Furthermore, they were adapted to the food domain. Items representing perceived skills, group relatedness, company relatedness, and perceived outcome benefits were measured using a 7-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. Items underlying intended interaction activity were also measured on a 7-point scale running from 'not interested at all' to 'very interested'. Both the Danish and the Brazilian version of the questionnaire went through a back-translation to ensure that their meaning remained as intended.

Items measuring 'perceived skills' were adapted from the scale on perceived cooking skills developed by Hartmann et al. (2013). Considering their irrelevance in the Danish and the Brazilian food culture, two items were removed from the original scale, and one item was added. Four items measuring 'group relatedness' were based on the scale by Chiu et al. (2006) for measuring identification with a VC as a group of other people. Two items measuring 'company relatedness' were developed for this study to address the identification with and trust in the company, which are normally highly correlated (Franke et al., 2013). Items measuring 'perceived outcome benefits' were also developed for this study to reflect the tangible beneficial outcomes for consumers as well as for the food market as a whole. Finally, five items measuring intended interaction activities were developed to capture behaviour in VCs for product innovation. These activities included membership of the VC, sharing ideas in the VC, trying out ideas coming from the VC, helping to improve current products, and evaluating products in the VC. These items represented possible interaction activities considered relevant for product innovation in a VC context. Negatively phrased questions were reversed for further analysis.

Table 1: Constructs and measurement model

Constructs & items	Denmark						Brazil					
	Mean	Std.dev.	t-value	λ	CR[c]	AVE[d]	Mean	Std.dev.	t-value	λ	CR[c]	AVE[d]
PERCEIVED SKILLS					0.894	0.587					0.920	0.659
I consider my cooking skills as sufficient	5.24	1.741	20.136	0.745***			5.05	2.050	21.192	0.860***		
I am able to prepare a hot meal without a recipe	5.99	1.589	21.903	0.837***			5.37	2.057	21.349	0.866***		
I am able to reuse leftovers in new meals[a]	5.66	1.642	21.345	0.806***			4.98	2.241	18.008	0.735***		
I am able to make soup[b]	5.51	1.885	20.964	0.787***			5.39	1.894	20.042	0.815***		
I am able to make sauce[b]	5.21	1.995	20.628	0.770***			5.61	1.971	21.096	0.856***		
I am able to bake a cake	5.39	1.964	-	0.636***			5.11	2.366	-	0.728***		
GROUP RELATEDNESS					0.929	0.766					0.939	0.792
For me the online community would be an interesting platform to join…												
…if I felt a sense of belonging to the community	3.95	1.811	34.099	0.900***			4.09	2.011	30.939	0.892***		
…if I had a feeling of togetherness or closeness in the community	3.75	1.769	34.498	0.908***			4.12	2.000	32.669	0.917***		
…if I had a strong positive feeling towards the community	3.96	1.826	33.750	0.894***			4.31	1.943	30.333	0.883***		
…if I was proud of being member of the community	3.55	1.866	-	0.794***			4.40	1.946	-	0.868***		
COMPANY RELATEDNES					0.810	0.681					0.904	0.825
…if I could be sure that the company would not cheat me[a]	4.75	2.077	-	0.790***			5.44	1.934	-	0.868***		
…if I could identify with the company[a]	4.21	1.874	28.109	0.859***			5.39	1.894	23.565	0.947***		
OUTCOME BENEFITS					0.835	0.717					0.877	0.781
I believe that consumer interaction with companies in new product development projects could bring tangible benefits for:												
Consumers[a]	5.82	1.384	16.869	0.867***			5.69	1.677	10.866	0.880***		
The food market[a]	5.54	1.409	-	0.826***			5.67	1.688	-	0.887***		
INTERACTION ACTIVITY					0.968	0.857					0.952	0.798
In an online community hosted by a food company, how interested would you be in…												
…being a member?[a]	3.69	2.023	-	0.871***			3.36	2.082	-	0.818***		
…providing ideas about new products?[ab]	3.88	1.973	43.801	0.908***			3.93	2.105	29.060	0.915***		
…trying out new products?*	4.63	2.064	44.534	0.915***			4.42	2.147	27.323	0.881***		
…taking part in improving products?[a]	4.39	2.051	51.622	0.971***			4.11	2.184	29.968	0.932***		
…evaluating products/share my experience?[a]	4.42	2.076	50.019	0.959***			4.10	2.159	29.157	0.917***		
MODEL GOF STATISTICS												
Sample size (n)	1045						617					
χ^2	545.334						464.392					
Df	142						142					
p-value	0.000						0.000					
CFI	0.976						0.968					
NFI	0.968						0.954					
RMSEA	0.052						0.061					
RSMR	0.0324						0.0283					

[a]developed for this study [b]unconstrained factor loadings across groups ***p-value < 0.001 [c]CR = $\frac{(\Sigma_{i=1}^{n} L_i)^2}{(\Sigma_{i=1}^{n} L_i)^2+(\Sigma_{i=1}^{n} e_i)}$ [d]$AVE = \frac{\Sigma_{i=1}^{n} \lambda_i^2}{n}$

Results

In the following, the steps carried out in the data analysis are presented. First, reliability as well as convergent and discriminant validity of the measurement model were examined in order to ensure that items consistently measure constructs as intended (Anderson and Gerbing, 1988). This was followed by a confirmatory factor analysis (CFA) of each sample. Second, the invariance across groups was examined. Both configural and metric invariance were tested. Third, Structural Equation Modelling (SEM) was conducted as a multi-group analysis to test the moderating effect of culture on the suggested relationships (H5). Fourth, the hypotheses (H1-H4) were tested for the individual country samples.

Reliability and validity of the measurement model

The analysis was conducted in AMOS version 22. Results on reliability and validity of the measurement model appear in Table 1 and show an acceptable goodness-of-fit in both the Danish and the Brazilian sample ($CFI_{DK} = 0.976$, $CFI_{BR} = 0.968$, $NFI_{DK} = 0.968$, $NFI_{BR} = 0.954$, RMSEA ranging from 0.052 to 0.061, and χ^2 over degrees of freedom (df) between 3.84 and 3.27). For each construct in both samples, the composite reliability (CR) and the average variance extracted (AVE) were computed to check the reliability of each scale (Hair Jr. et al., 2010). All values for CR and AVE were above the cut-off points of 0.8 and 0.5 respectively supporting the scale reliability. Measurement models for both samples revealed acceptable levels of convergent validity with all factor loadings being above 0.6 with p-values < 0.01 (Anderson and Gerbing, 1988).

Correlations between constructs appear in Table 2. Based on Fornell and Larcker (1981), discriminant validity was assessed for the model in both samples. The square root of AVE of any two constructs should be larger than the correlation coefficient between the constructs, and the results indicated that all pairs of reflective constructs fulfilled this requirement emphasising the support of discriminant validity. Overall, it is concluded that the suggested constructs possess a satisfactory level of fit as well as reliability and convergent and discriminant validity in both the Brazilian and the Danish sample.

Table 2: Correlations between constructs.

Constructs	Denmark					Brazil				
	1	2	3	4	5	1	2	3	4	5
Skills(1)	0.766[a]	0.135	0.234	0.207	0.211	0.812[a]	0.288	0.225	0.068	0.228
Group relatedness (2)		0.875[a]	0.787	0.293	0.646		0.890[a]	0.587	0.211	0.587
Company relatedness (3)			0.825[a]	0.394	0.772			0.908[a]	0.317	0.506
Outcome benefits (4)				0.847[a]	0.454				0.884[a]	0.258
Interaction (5)					0.926[a]					0.893[a]

[a]$\sqrt{AVE}$

Measurement model invariance across groups

Following the check for reliability and validity, invariance in factor structure across the Danish and Brazilian samples was checked. The fit of the configural invariance model is good (Table 3) indicating the same factor structure to be appropriate in both samples. The metric invariance was then tested by constraining each factor loading to be equal across samples. This full metric constrained model was then compared with the configural invariance model. The results showed a significant difference in the model between the two samples (increase in χ^2 from 1009.786 to 1051.907 with p-value ≤ 0.001) indicating that the same factor structure is inappropriate across samples. This means that some factor loadings differ significantly between groups and should be allowed to variate for further analysis. To identify these factor loadings, a number of partial invariance tests were conducted, and for each a specific factor loading was constrained to be equal across samples whereas the remaining factor loadings were kept to be variable. Each of the partially constrained models was compared to the configural invariance model, and the results indicated that three of the factor loadings were significantly different across samples and were therefore allowed to vary. After unconstraining the selected factor loadings in a partial metric invariance model (see Table 3), results showed an insignificant difference between the model in the two samples (increase in χ^2 from 1009.786 to 1023.346 with p-value = 0.258) indicating a similarity in factor structure across the Brazilian and Danish samples. The analysis now supported configural and partial invariance.

Table 3: Measurement invariance across groups.

Invariance model	χ^2	Df	χ^2/df	CFI	NFI	RMSEA	SRMR	AIC
Configural	1009.786	284	3.556	0.973	0.963	0.039	0.0324	1201.786
Full metric	1051.907	298	3.530	0.972	0.962	0.039	0.0324	1215.907
Partial metric	1023.346	295	3.469	0.973	0.963	0.039	0.0285	1197.874
Assuming configural model to be correct:								
p-value	0.258							

Model testing and cultural moderating effects

In order to test the significance of the structural differences between Denmark and Brazil, a multi-group SEM was conducted. As a first step, an unconstrained structural model was established based on the partial metric model established before in which all structural relationships were allowed to vary across samples. This model had an acceptable fit (RMSEA = 0.039, CFI = 0.973). Second, a fully constrained structural model was compared to the unconstrained structural model in which all structural relationships were invariant. A significant difference was found in the model between the Danish and Brazilian samples. An overview of the results of the multi-group SEM is found in Table 5.

Third, all individual structural relationships were compared across the two samples to identify the specific relationships on which the Danish and Brazilian samples differed. Therefore, invariance tests with chi-square differences were conducted by comparing the unconstrained structural model to each of the constrained structural models having one of the structural relationships set to be invariant (Table 4). Significant differences in the χ^2 value appeared in three out of four hypothesised relationships (H1, H2, and H4): group relatedness → intended interaction, company relatedness → intended interaction, and perceived outcome benefits → intended interaction. This implies that the strength of these relationships differs significantly between the Danish sample and the Brazilian sample.

Table 4: Overview of the significance of cross-country effects.

Model	Con-straint	χ^2	df	CFI	RMSEA	$\Delta\chi^2$	Δ df	p-value assuming uncon-strained as correct	Signifi-cant difference between DK and BR
Uncon-strained		1023.346	295	0.973	0.039	-	-	-	
Full con-strained		1082.491	299	0.971	0.040	59.145	4	0.000	Yes
Constraints on:									
Model 1: Group relatedness → Interaction	b1_1 = b1_2	1043.815	296	0.972	0.039	20.469	1	0.000	Yes
Model 2: Company relatedness → Interaction	b2_1 = b2_2	1059.820	296	0.972	0.039	36.474	1	0.000	Yes
Model 3: Skills → Interaction	b3_1 = b3_2	1023.657	296	0.973	0.038	0.311	1	0.5770	No
Model 4: Outcome benefits → Interaction	b4_1 = b4_2	1029.988	296	0.973	0.039	6.642	1	0.0099	Yes

Finally, the conceptual model (Figure 1) was tested for the Danish and Brazilian samples individually based on the partially constrained SEM (Table 5). H1, H2, and H4 were supported for both groups. Thus, in both Denmark and Brazil, group relatedness, company relatedness, and perceived outcome benefits positively related to intended interaction behaviour. H3 was not supported in any sample thus indicating no significant relationship between perceived skills and intended interaction behaviour.

Table 5: Overall SEM model testing hypothesised relationships for individual groups.

		Denmark		Brazil	
Structural relationships		*b*	*t-value*	*b*	*t-value*
Group relatedness → Interact		0.115*	2.457	0.430***	9.622
Company relatedness → Interact		0.604***	10.949	0.221***	4.769
Skills → Interact		0.026$^{n.s.}$	1.417	0.034$^{n.s.}$	1.417
Outcome benefits → Interact		0.179***	6.525	0.093*	2.482
MODEL FIT					
CMIN	1023.657				
Df	296				
p-value	0.000				
CMIN/df	3.458				
CFI	0.973				
NFI	0.963				
RMSEA	0.038				
SRMR	0.0286				

*p-value < 0.05 ***p-value < 0.001

The relationship between group relatedness and intended interaction behaviour was significantly higher for the Brazilian sample, in which the influence was strong compared to the weak influence in the Danish sample. On the other hand, the relationship between company relatedness and intended interaction behaviour was significantly higher in the Danish sample than in the Brazilian sample. Perceived skills indicated no significant influence in any of the samples, but the perceived coefficient of outcome benefits was significantly higher for the Danish sample, although the difference was small.

Discussion

This study investigated how motivation factors rooted in consumers' psychological needs for relatedness, competence, and autonomy influence their behavioural interaction intention in a VC aimed at product innovation together with a company. Focus was specifically on the moderating effect of country in terms of the cultural dimension: individualism-collectivism. Therefore, two samples were employed based on this dimension: a Danish sample representing a culture scoring high on individualistic values, and a Brazilian sample representing a culture scoring relatively low on individualistic values.

The following discusses the role of relatedness, perceived skills, and perceived outcome benefits in driving intended interaction in a VC aimed at product innovation. Focus is on how the individualism-collectivism characterising the two countries can explain the cross-country moderation.

The role of relatedness as a main contributor to VC interaction

The need for relatedness appeared to be the basis for the most important motivation factors for both Danish and Brazilian consumers. This finding supports that social networks and interaction with companies and consumers contribute to fulfilling the need for belonging (Etgar, 2008, Achrol and Kotler, 1999, Kurikko and Tuominen, 2012). The significant influence of both within-group relatedness in the community and relatedness to the company highlight the relevance of considering both aspects in VCs for product innovation. Still, the results also indicate a difference in the importance between these two types of relatedness across countries emphasising the relevance of culture in explaining differences in individuals' motivations (Hofstede, 1983b). Whereas group relatedness was a strong determinant for Brazilian consumers' intention to interact in VCs, it had relatively low importance among Danish consumers. For the Danish consumers, company relatedness was the strongest determinant for intended interaction, but it had lower relevance among Brazilian consumers.

This difference aligns with the values characterising the Brazilian and Danish societies respectively. The collectivistic value of prioritising the group above the individual corresponds well with a perceived importance of relating to the VC as a group of people in Brazil (Algesheimer et al., 2005, Casaló et al., 2010). As the social identity theory states, individuals wish to belong to an in-group of similar others (Bagozzi and Dholokia, 2006, Hogg and Terry, 2000), and for Brazilian consumers, identification with the people forming the VC is therefore important.

For Danish consumers, living in a highly individualistic culture, the group-aspect of relatedness seems to be less important than relatedness to the company. Company relatedness is the strongest factor driving their intention to engage in VC interaction thus suggesting that those who can identify strongly with the company rather than with the other participants are more interested in participating in VCs aimed at product innovation. This implies that for Danish consumers it is important that the company has an image and values that they can identify with, and similarly that they can trust the company. This finding is in line with literature claiming that also organisational identification can reflect the need for affiliation (O'Reilly and Chatman, 1986). We argue that this apparent importance of company relatedness in comparison to group relatedness reflects the individualistic values of consumers. The individual identity in VCs for product innovation becomes more important than social identity as suggested by Nambisan (2002), and the consumer perceives him-/herself more as an individual contributor to innovation than as a member of the group.

Trust as part of relatedness plays an important role in consumers' willingness to participate in the VC. As Franke et al. (2013) suggest, perceived fairness in the collaboration is an important driver for consumers engaging in innovation together with companies. If they can trust and identify with the company, they are more willing to engage in behaviours that benefit the company (Asforth and Mael, 1989, O'Reilly and Chatman, 1986, Bhattacharya and Sen, 2003). Also for Brazilian consumers, the company aspect of relatedness is positively related to interaction intention, which indicates the importance of the ability to identify with and trust the VC-hosting company, but not to the same extent as for the more individualistic Danish consumers.

The role of perceived skills

Perceived skills were not significantly linked to intended interaction among neither Danish nor Brazilian consumers. As such, these results imply that feeling capable in the domain of

the product innovation behaviour has no impact on consumers' intention to engage in the VC whether being Danish or Brazilian. This would contradict with earlier findings in motivation in other areas (e.g. Van den Broeck et al., 2010, Harter, 1982, Klint and Weiss, 1987, Harter, 1978), but also within research on self-efficacy in consumer behaviour (e.g. Kim et al., 2008, Bandura, 1982). However, a reason may be the measure of the perceived skills undertaken. This study specifically addressed consumers' perceived cooking skills, which is a broad measure and only partly linked to weight management activities and thereby the specific task of developing food products for weight management together with the company. Thus, perceived skills within an overall product domain do not necessarily predict intended VC interaction behaviour for a more specific sub-category of products. Furthermore, most respondents rated their skills rather high in food preparation, which could mean that most of them felt that they were capable of the task, and therefore the minor differences in perceived skills were not reflected in the willingness to take part in interaction activities for product innovation. In future studies, perceived skills, that are more specific to those needed in the product innovation task, may be better predictors of participation willingness.

The role of perceived outcome benefits

Both for Brazilian and Danish consumers, results indicated that a perceived beneficial product outcome is a driver of the intended VC interaction behaviour. A reason can be found in the role of empowerment (e.g. Füller et al., 2009, Martinez-Canas et al., 2016, Mosteller and Mathwick, 2014, Etgar, 2008) which corresponds with the basic psychological need for autonomy as a motivation factor among all human beings (Ryan and Deci, 2000). Knowing that one's behaviour can provide beneficial outcomes may provide consumers with a feeling of empowerment by being able to influence the products that are available to consumers in the market. The feeling of contributing to a better outcome supporting social well-being may be even more important when considering a product supporting weight management. Martinez-Canas et al. (2016) state that consumers are more willing to engage in product innovation for an outcome benefitting the welfare of a wider society.

Results indicate that the relationship between these perceived outcome benefits and intended VC interaction is more important for Danish consumers compared to Brazilian consumers. This may be surprising, as collectivistic values of prioritising the group over the individual yield an expectation of a collectivistic culture having a higher preference for gaining an outcome that benefits consumers and the food market in general. On the other hand, the feeling of empowerment obtained by the individual consumer by being able to shape the

outcome benefits may correspond well with individualistic values of prioritising oneself as a consumer in decision-making. In other words, because consumers perceive the outcome as benefitting themselves as individuals, consumers in individualistic cultures may be more prone to participate in interaction activities for product innovation based on perceived outcome benefits.

However, it is important to remember that the perceived outcome benefits for consumers and the market seem to be a valued factor in both individualistic and collectivistic cultures: both Brazilian and Danish consumers are driven by the ability to achieve better outcomes for consumers and the food market.

Summing up, the results demonstrated relatedness to be by far the strongest driver of consumers' intended interaction activity, but the importance of group relatedness versus company relatedness differed strongly between cultures, which is in line with the respective individualistic and collectivistic values characterising the societies. Furthermore, the possibility for beneficial outcomes for consumers and the food market in general drove consumers in both cultures. Finally, perceived skills within the product domain were not perceived as important when it comes to intention to engage in VC interaction activities in either country.

Limitations and future research

This study took a cultural perspective on companies' integration of consumers in VCs for product innovation by looking at two countries differing on one specific dimension, individualism – collectivism, as a moderating factor of the relationships between motivation factors and intended interaction. Although this gave a narrow peek to the possible moderating effect of culture in the willingness to participate in VC based product innovation activities, the results suggest that studying other cultural dimensions, such as power distance, masculinity, or uncertainty avoidance (Hofstede, 1983b) may be highly relevant in order to understand consumers' interests in these activities. Furthermore, samples from other countries are necessary to support or question the current findings.

In addition to the cultural differences, the two countries differ in their variation of socio-economic levels within the society. Brazil has more socio-economic variations within the society compared to Denmark, which may for example relate to the Internet access among consumers. According to the Brazilian Institute of Geography and Statistics, 54.9% of the Brazilians' domiciles have internet access (data from 2014) (IBGE, 2016). This may of

course bias the results concerning this study on virtual communities. However, these numbers may not be precise. According to Nicolaci-da-Costa and de Matos-Silva (2014), despite the socio-economic differences in Brazil, there is a homogeneous level of access to digital communication technologies among people. The majority of people have Internet access – although it is not always by legal means (Souza e Silva et al., 2011).

Different data collection procedures were chosen in the two samples (online survey and face-to-face-survey) to optimise the data collection in each country respectively. Using the two different sampling methods may have caused some biases in relation to e.g. flexibility in participation and interviewer bias. However, the data collection methods present the most commonly used ones in both countries for securing representativeness.

The selected target product, food for weight management, is likely to have individual and societal relevance in both countries. However, some cultures may be more enthusiastic about food per se compared to others (Tellis et al., 2009), and replicating the study with other types of product innovations would be of interest in order to see whether the results are generalizable to VCs in other product domains as well. Comparison of the relationship between motivation factors and intended interaction behaviour in VCs across different product domains would enable us to determine whether and how consumer behaviour varies in diverse domains.

The motivation factors addressed in this study are all rooted in the need for relatedness, competence, or autonomy. Better measures related to competence such as perceived skills within the specific product development tasks or within online interaction in general could be applied. For VCs, online interaction skills may be a relevant aspect of consumers' perceived competence for driving their interaction behaviour as well.

The different motivation factors can furthermore be linked to consumer integration at different stages in the innovation process (Nakata and Sivakumar, 1996). Whereas this study treated interaction activity as one latent construct due to the correlations among the measures, future research may wish to distinguish between interaction activities as types of actions and input at various stages in the innovation process.

Finally, these results are based on a survey, and interpretation of them should therefore be careful when it comes to causality. To overcome this problem, the conceptual model builds on well-established theory (Ryan and Deci, 2000). In relation to that, interaction activity as

the dependent variable was addressed as the intentional behaviour. Optimally, future research should look at actual behaviour by addressing motivation factors among consumers in already existing VCs.

Implications

This study contributes to the literature on consumer interaction in VCs for product innovation by taking into account the moderating effect of culture on the relationships between motivation factors and intended interaction. This research is relevant in order to understand how to operate VCs aimed at consumer integration in innovation in different cultures. This cultural aspect provides some rather interesting managerial implications.

In both cultures, relatedness is by far the strongest driver of intended VC interaction. However, for the collectivistic Brazilian consumers, relatedness to the VC as a group of people was very strong, whereas it was of less importance for the individualistic Danish consumers. As relatedness plays an important role in consumers' engagement in intended interaction activity, this should be a main focus for VC managers. However, they need to be aware of the culture they are operating in, in order to emphasise the right type of relatedness for the consumers. In collectivistic cultures, managers need to consider the consumers' identification with the community and reflect this in the values signalled from the VC by facilitating interaction among members and using group-based incentives to attract peer consumers. The VC must be promoted as a group of fellow consumers. In other words, creating a shared identity to support the feeling of group relatedness is important. This may require that the company provides an active community moderator that can set up group conversations among the members about certain topics. Bagozzi and Dholokia (2006) propose synchronous communication tools (i.e. group chats) to facilitate interpersonal relationships among participants. It might also be useful to store information on current members such as personal details and contribution history. This information might be used to present the identity of the VC and establish trust in the other members (Bagozzi and Dholokia, 2006). The VC should be designed for participants to gain an understanding of each other and the social environment (Nambisan and Baron, 2009), and to foster relationships instead of just focusing on the VC content (Hsu et al., 2012).

On the other hand, relatedness to the VC hosting company must be emphasised in individualistic cultures, although this should not be ignored in collectivistic cultures either. Managers need to focus on company relatedness by supporting the feeling of trust and

identification with the company. Thus, peer consumers constituting the VC are less important, whereas the company characteristics should be promoted in order to attract potential members. In other words, the company needs to put effort in promoting itself and its values in relation to the VC. For example, company employees can be involved in the VC discussions on different product groups. In line with this, online events can be arranged where participants can interact with experts from the company who are invited to join a discussion on a certain product topic. In this way, the community can be a way of connecting VC participants with the company (Nambisan and Baron, 2009). Companies can also publicly acknowledge that consumers have participated in designing the product in order to make it part of their identity. However, considering the fairness perception among consumers, it is important that the company does not present itself as exploiting consumers for product development purposes (Franke et al., 2013). Participants should still see the co-creation process as a way of helping companies develop better products for consumers – not just as free resources.

A second important factor in both cultures was the perceived outcome benefits. Consumers need to be ensured that their participation actually is beneficial by showing them how their results are used and how they have contributed to the market. This can be achieved for example by regular feedback or open dialogue in the community. Participating consumers need to experience a feeling of influence in shaping the innovation outcome. An option is to present participants with the outcome products they have helped in designing – either online or by providing them with the physical product. To show appreciation, companies can further invite the participants for product launch 'events' where the co-created products are presented.

Managers should not expect that people with broad skills within the product domain are the most motivated participants in the VC. Instead, their feeling of relatedness and the possibility for a better outcome for the consumers and the market may drive the participation. This suggests that managers do not need to put resources into attracting people with broad skills, but there may be domain specific skills that are essential for the capability of contributing to the product innovation tasks. Balancing between broad domain-specific skills and product-specific skills can be a challenge if the individual members of the VC have to be changed from one product innovation to another. Defining the skills that are relevant for the VC membership is one of the tasks that managers of these communities need to contemplate carefully.

Considering the innovation process from idea generation to product launch, it may be optimal to include different cultures or consumers with different motivational backgrounds at certain stages in the innovation process. In a conceptual paper on national culture and new product development, Nakata and Sivakumar (1996) suggest that high levels of individualism supports new product development in its initial stages due to nonconformity and personal visions being in focus. On the other hand, higher levels of collectivism is suggested to support new product development during the later stages due to interdependence and collaboration being in focus. This may suggest that individual cultures are more suited for VCs concerning initial new product development tasks, such as idea generation from the individual consumers. More collectivistic cultures might be well suited for more collaborative tasks that could appear later in the new product development process when the purpose becomes more unified. Some may also be interested in including consumers from different cultures in the same VC. Here, managers must be aware of motivational similarities and differences between cultures in their communication in and management of the VC.

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Paper 3: Improving internal communication between marketing and technology functions for successful new food product development

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Abstract

In order to increase the new product development (NPD) success for novel food products, it is crucial to understand how information can be optimally disseminated within companies. This systematic literature review concentrates on factors influencing internal communication between market and technology experts within the NPD process from a food industry point of view. The review provides practical implications for improving internal communication in food companies and identifies knowledge gaps. By focusing on optimising organisational structure, team composition, management support, and knowledge management, food companies can enhance internal communication between market and technology functions during the NPD process.

Introduction

To succeed in a highly competitive market, food companies must develop new successful products valued by consumers (Stewart-Knox and Mitchell, 2003, Grunert et al., 1996, Barrena and Sánchez, 2012). The new product development (NPD) literature explains the desired outcome of a new product development process as the commercialisation of a successful and profitable product within a reasonable time frame (Griffin and Hauser, 1996), and the most important determinant for successful NPD performance is having a superior product as perceived by consumers (Henard and Szymanski, 2001, Cooper and Kleinschmidt, 2007). Increased sales can only be realised if the product satisfies the needs of the target consumers (Costa and Jongen, 2006). Yet, a significant percentage of food products fail in the market causing high costs for the food companies (Rudolph, 1995, Gresham et al., 2006). Although much research has emphasised the necessity of integrating 'the voice of the consumer' in NPD by focusing on external communication between consumers and companies, consumer information must not only be acquired, but also disseminated and applied within the company, calling attention to the importance of internal communication (Gresham et al., 2006, Kohli and Jaworski, 1990). Improving the NPD process requires input from both market and technical experts (Calantone and Benedetto, 1988, Cooper and Kleinschmidt, 2007, van Trijp and Steenkamp, 2001), and it is therefore necessary to clarify how better communication can be established between the marketing and research & development (R&D) departments of a company.

The issue of internal communication has only scarcely been addressed in research conducted in the food industry. This review takes a food industry perspective on internal communication by considering on the one hand exchange of information between marketing and R&D during the NPD process, and on the other hand the factors that influence internal communication within the food industry or similar industries. The objective of this literature review is 1) to find out what are the barriers and facilitators of internal communication between technology and market/consumer experts and 2) to translate the current knowledge into practical implications for internal communication in the NPD processes in the food industry as well as 3) to reveal the existing knowledge gaps.

This review will concentrate on product innovation, and process innovation will hence not be dealt with. The NPD process is usually viewed as consisting of different sequential phases, and in this review Grunert et al.'s (1996) presentation of Urban and Hauser's theory, which divides the NPD process into four phases: *opportunity phase, design phase, testing phase,*

and *introduction phase*, is used. Information about consumers and competitors is to be gathered by the marketing function in the first phase, communicated to the R&D function, used in the design and testing phase, resulting in a final product ready for introduction in the last phase. However, it should be noted that this sequential modelling of the NPD process serves a normative purpose. In reality, the NPD process is not a linear system, and often activities are occurring in parallel rather than in sequence, and interactivity in form of looping, iteration, and back-and-forth play is characterising each stage (Cooper, 2008, van Trijp and Steenkamp, 2001).

Methods

This paper is based on a systematic literature review. The literature included was limited to peer-reviewed articles dating no longer back than 1990, with focus on product or technology innovation in the food industry or similar industries. Similar industries are characterised as low and medium technology SMEs, since the food industry mainly consists of SMEs (Traill and Grunert, 1997, FoodDrinkEurope, 2013). In the effort to find food related literature, cross-industry studies including food companies were also included.

The search was conducted in four databases: *ProQuest*, *Science Direct*, *Scopus*, and *Ebsco*, by using the keywords ‘innovation’, ‘new technology development’, or ‘NPD’ in the title or abstract (phase 1). In order to narrow down the results stepwise, an internal search (phase 2) for literature including ‘communication’, ‘R&D’, or ‘cross-functional communication’ was conducted. In phase 3, an internal search was made for literature including ‘knowledge management’ or ‘market orientation’ in title or abstract. In *Ebsco* this phase was skipped since it revealed a too narrow number of results. In phase 4, an internal search was made on literature including ‘NPD’, ‘food innovation’ or ‘communication’. This revealed a feasible pool of literature for *Scopus* and *Ebsco*, but for *Science Direct* ‘internal communication’ had to be added to narrow the results to a manageable number. For *ProQuest* an additional narrowing had to be made which was based on the search for ‘food’ and ‘NPD’ (Table 1).

Table 1: Phases of literature conduct (numbers refer to number of articles extracted).

DATABASE (10/5-2012)	Phase 1: Innovation OR new technology development OR NPD	Phase 2: Communication OR R&D OR cross-functional communication	Phase 3: Knowledge management OR Market orientation	Phase 4: NPD OR food innovation OR (internal)* communication	Phase 5: Food AND NPD	Extraction based on abstract	Adding central references	Total	Specifically/ partly addressing food industry
Scopus	770,265	179,871	3,708	316	-	7			
Ebsco	42,834	2,079		367	-	4			
ScienceDirect	28,482	16,657	2,980	*809	-	14			
ProQuest	20,080	14,817	8,517	4,879	112	3			
SUM					**1,604**	**28**	**9**	**37**	**13/9**

The articles found (N=1604) were scanned based on titles and/or abstracts, and relevant articles (N=28) were extracted and read thoroughly in full length. In addition, relevant and central references within this literature were identified (N=9) bringing the total number of articles to 37. Of these, 13 articles specifically addressed the food industry, and 9 articles partially addressed the food industry by including food companies in their data collection. The remaining articles addressed industries considered to be similar to the food industry. These were included to support or challenge the findings. For literature to be finally included in the review it had to 1) conceptually, theoretically, or empirically address internal communication in the food or similar industry with regard to new product development, and 2) be peer reviewed and published in a scientific journal. Most of the articles were excluded due to their focus on high technology industries or for not addressing internal communication with regard to new product or technology development.

The literature on innovation, especially in a specific domain such as food, is scattered among different disciplines and therefore difficult to reach by systematic approaches in databases that cover only part of the material. It is therefore acknowledged that the literature screening criteria may have excluded relevant literature. However, in order to minimise potential omissions, different data bases were used in the search and key words for the different stages in the search process were discussed and agreed upon by the authors. Similarly, to reduce the role of subjective evaluation, the screening criteria for including or excluding the abstracts in the first round of extracted literature were discussed and agreed upon by the authors.

A first perusal of the extracted literature showed that two types of factors were found to influence the effectiveness and efficiency of the internal communication process: first, the need for internal communication varies according to level of uncertainty and NPD phase, and

second, there are structural and process mechanisms that can facilitate communication. In this review, we first look at these internal communication facilitators, namely the organisational structure, team composition, management support, and knowledge management, and then factors that influence the required level of communication. The final part of the manuscript derives the recommendations for facilitating the internal communication process and acknowledges the knowledge gaps requiring further research at the end.

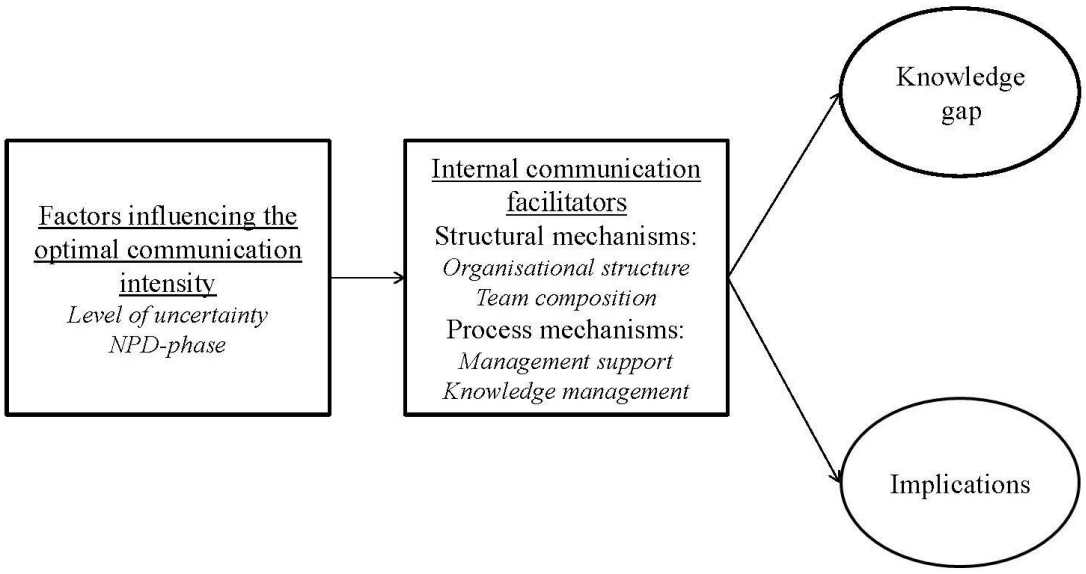

Figure 1: Overview of areas addressed in the literature review.

Facilitators of Internal Communication

Organisational structure

One structural mechanism influencing internal communication is the organisation structure. Structure can be defined as the "rules, policies, procedures, processes, hierarchy of reporting relationships, incentive systems, and departmental boundaries that organize tasks within the firm" (Dasgupta and Gupta, 2009, p. 213).

Both the level of formalisation and the level of centralisation are aspects of the organisational structure that affect how communication flows in NPDs. *Formalisation is* described as *'the emphasis placed on following rules and procedures in job performance'* (Moenaert et al., 1994, p. 34) and requires explicit performance standards, clear division of responsibilities, and well-defined guidelines (Griffin and Hauser, 1996, Moenaert et al., 2000). Formalised procedures will improve internal communication by forcing team members to share information at fixed time intervals by for example having scheduled face-to-face meetings. Without these formal procedures, information sharing will only happen rarely and on the

specific initiative of the team members (Moenaert et al., 2000). In line with these results, Costa and Jongen (2006) suggested that one of the main-barriers to consumer-led food product development is the lack of concrete formal guidelines for implementing consumer-led NPD in the daily practices of the food companies. Knowledge on market, competitors, and consumers collected by the marketing department must be implemented in the development of the product already in the early NPD phases, which requires clear guidelines on how to disseminate and use this information within the company (Costa and Jongen, 2006). However, too much formalisation may discourage participation in discussion and leave disputes to be solved by formal rules instead of negotiations (Song and Thieme, 2006, Souder and Moenaert, 1992).

Moenaert et al. (2000) suggest that communication can be improved by setting well-defined goals. Lack of common goals is often impeding dissemination of information within companies leading to functions working in different directions, either because information is not shared or because shared information is interpreted differently between functions (Adams et al., 1998). Dayan and Basarir (2010) found that goal clarity, i.e. the team's shared awareness of what should be achieved, facilitates better dissemination of information between team members by keeping a clear view of what the team is aiming at. For example, the market problems with a new product experienced by FoodCorp (a food company included in the research) were due to the lack of goal congruence resulting in low credibility and transparency of the communication across functions involved in the NPD (Moenaert et al., 2000).

Turning to the other aspect of the organisational structure, *centralisation* refers to the level at which organisational decision-making is carried out (Song et al., 1996). In centralised organisations, decisions are made at the higher levels of the organisation, whereas in de-centralised organisations, teams are empowered to make decisions (Song et al., 1996). Dayan and Basarir (2010) found the empowerment of teams to be a significant influencer on the team's ability to swiftly adapt to changing circumstances, indicating ability to disseminate information promptly. Team members' power to manage their own team encourages members to openly express their views in decision-making during the NPD process, leading to better communication flow between marketing and R&D (Moenaert et al., 2000). A high level of centralisation may hinder information exchange between functions (Song et al., 1996). However, in many companies a high level of centralisation characterises the organisational structure, indicating problems in overcoming this barrier to internal

communication (Griffin and Hauser, 1996, Lee and Wong, 2011, Suwannaporn and Speece, 2003).

Team Composition

Another structural mechanism facilitating internal communication is building *cross-functional teams* that consist of experts from different functions (Suwannaporn and Speece, 2003, Griffin and Hauser, 1996, Song et al., 1996, Dasgupta and Gupta, 2009). However, research indicates that many companies are not able to establish well-working cross-functional teams (Adams et al., 1998, Jespersen, 2007). Lack of trust related to personality or stereotype barriers is considered to be one of the most difficult barriers to overcome (Griffin and Hauser, 1996). García et al. (2008) used trust to measure the inter-functional climate in various companies, including food companies, and found trust to be positively related to inter-functional integration. To encourage trust, they suggested that managers foster physical proximity among team members, ensure team members' positional stability, use formal programs for developing better understanding among functions, and encourage personal mobility.

In the food industry, the major problem is that only a very limited amount of market knowledge is actually integrated in the NPD process (Suwannaporn and Speece, 2003, Suwannaporn and Speece, 2000). The NPD process may begin with a consensus among functions, but it then develops into independent activities carried out in isolation from each other. For example, marketing may give the product specification to R&D, but R&D then develops the product with no further communication with marketing. This lack of communication is likely to cause failure of the food product as market research is not structurally included in the NPD process (Suwannaporn and Speece, 2000).

In order to obtain a better internal communication flow, internal linkages between different functions need to be strong. For inter-functional integration to succeed, different partners in cooperation need a common goal to work towards (García et al., 2008). This requires cross-functional collaboration in teams that goes beyond formal communication like for example exchange of documents (Adams et al., 1998). In FoodCorp, face-to-face team meetings were found to be crucial for the collaboration during the NPD (Moenaert et al., 2000). The better the relationship between the functions, the higher the quality and quantity of the information exchanged between them (Song et al., 1996).

Still, a challenge facing many companies is the physical distance between functions (Song et al., 1996, Moenaert et al., 2000, Griffin and Hauser, 1996). Even small food companies, similar to other SMEs, face this challenge, as they often collaborate with external consumer experts (Munksgaard and Freytag, 2011, Avermaete et al., 2004). Actually, this practice is regarded as crucial for small, low-tech firms, and therefore firms recognising the importance of market research often cooperate with an external market research institute (Avermaete et al., 2004). As a result, consumer experts and technology experts are often located in different companies resulting not only in a physical distance between them, but also a possible discrepancy in goal priorities. Still, also in situations requiring external partners, cross-functional teamwork is important. For example, in a study by Munksgaard and Freytag (2011), an important characteristic of the relationship between the food company and its external partner was the creation of an innovation forum allowing face-to-face meetings between partners, leading to more collaboration.

Management support

One process mechanism facilitating internal communication is management support. Management can facilitate internal communication between functions by proactively supporting an interactive culture in the company (Griffin and Hauser, 1996, Anderson, 2008). Confirming this with an empirical study made in the food sector, Brachos et al. (2007) found that top management support of interactions between functions is crucial for facilitating knowledge sharing within the companies. Top managers can show their support of knowledge transfer for example by frequently emphasising the importance of knowledge sharing for their employees and by establishing the right organisational context to facilitate the knowledge sharing. This organisational context may be established by an appropriate reward system for both functions based on the NPD success. However, often the marketing function is rewarded based on measures such as increased market share, whereas the R&D function is rewarded based on technology development or technology improvements. This will lead to the two functions targeting different focus areas and therefore limit the knowledge transfer between functions. Instead of rewarding persons or functions individually, Griffin and Hauser (1996) suggested a joint reward system where both marketing and R&D are rewarded for success.

Furthermore, high interactional justice, i.e. '*the quality of interpersonal treatment people receive from decision makers during the decision-making procedures'* (García et al., 2008, p. 723) is suggested to facilitate trust, whereas low perceived interactional justice decreases

trust and thereby the level of inter-functional integration (García et al., 2008). The perceived lack of justice may appear if managers are biased towards advocating their own area of interest as being the most important factor in NPD success. Results from the food industry showed a general lack of top management support for inter-functional communication due to managers' bias towards their individual expertise areas (Suwannaporn and Speece, 2010).

Knowledge management

Another process mechanism influencing internal communication is knowledge management. Knowledge management can be defined as *'a system that promotes collaborative environment for capturing and sharing existing knowledge, creates opportunities to generate new knowledge, and provides the tools and approaches needed to apply what the organisation knows in its effort to meet its strategic goals'* (Dasgupta and Gupta, 2009, p. 208). Systematic and effective knowledge management enables better knowledge sharing across functions (Dasgupta and Gupta, 2009). However, research within the food industry has shown that even though many companies are aware of the importance of knowledge management, they fail to develop a deliberate policy for it (Massa and Testa, 2009, Massa and Testa, 2011).

There are two strategic approaches to knowledge management, *personalisation strategy* and *codification strategy*, which may also be used in combination. With the *personalisation strategy*, knowledge is connected to the individual person and shared by human-to-human interaction (tacit knowledge) (Dasgupta and Gupta, 2009, López-Nicolás and Meroño-Cerdán, 2011). Personalisation improves the quality and the ability to innovate (López-Nicolás and Meroño-Cerdán, 2011). With the *codification strategy*, knowledge is codified and stored in documents or databases where everyone within the company can make use of it (explicit knowledge) (Dasgupta and Gupta, 2009, Cillo, 2005). Codification is a way to enhance communication between people by improving access and usability of the knowledge (López-Nicolás and Meroño-Cerdán, 2011).

Different types of knowledge management systems will fit different companies (Cooper, 2003). If companies are market oriented, they focus on consumer and market trends and therefore their knowledge management systems support knowledge acquisition, storing, and distribution, entailing a certain level of codification. The technology oriented companies obtain information from few external sources such as research centres and universities, and the knowledge management systems mainly support knowledge application, implying a

certain level of personalisation (Massa and Testa, 2011, Massa and Testa, 2009). Within the food industry companies often rely on tacit knowledge and ignore that codification may be used to improve the NPD process, thus making acquired information difficult to share (Scozzi et al., 2005, Benner et al., 2003). Investigating codified knowledge management, a case study by Cillo (2005) included one food company which used internal brokers in its knowledge management. Internal brokers are individuals or teams within the organisation who modify market knowledge or technology knowledge before transferring it from one context to another in order to ensure effective dissemination of information between various functions. The results showed that the knowledge broker enables better communication between functions by translating the knowledge obtained on consumers and the food technology and making it useful for different departments (Cillo, 2005). Importantly, for bigger companies needing much information in NPD, a certain level of codification will be necessary in order to ensure optimal knowledge sharing (Massa and Testa, 2011, Scozzi et al., 2005). Even for SMEs with a lack of own specialised resources, codification of information for NPD may be helpful in order to structure and exploit the knowledge (Scozzi et al., 2005). Thus, a certain level of codification may be helpful in food companies, as they often rely on information from external experts (Avermaete et al., 2004). Yet, codification may also act as a barrier to appropriate information acquisition, because people try to avoid ambiguity by re-defining appearing problems into already existing scenarios for which they have the knowledge (Adams et al., 1998).

Quality Function Deployment (QFD) is one of the most cited tools that help translating market information into useful knowledge for different functions involved in NPD (Cillo, 2005, Griffin and Hauser, 1996). Based on QFD, Benner et al. (2003) presented a conceptual model on how to disseminate information between consumer experts and technology experts for successful NPD within the food industry. By structuring the relevant information, the model provides the information needed for each actor in the NPD process and it forces actors in the NPD to review the information systematically to determine the best option (Benner et al., 2003)

Factors influencing the optimal communication intensity

Whether increasing interaction of functions leads to more successful NPD, depends on several factors. The optimum level of interaction can be matched with the level needed for reducing uncertainty in the NPD process (Griffin and Hauser, 1996), which entails that different situational determinants will influence the need for internal communication.

Uncertainty and optimal communication intensity

External uncertainty

External uncertainty in NPD refers to the competitive intensity, market turbulence, and technological change in the market (Lee and Wong, 2011). The higher the level of external uncertainty, the higher the need for environmental scanning including obtaining and sharing information in the development of new products (Lee and Wong, 2011, Carbonell and Rodríguez-Escudero, 2009, Ngamkroeckjoti et al., 2005, Ngamkroeckjoti and Speece, 2008, Weerawardena et al., 2006). As indicated by Ju (2012), the food industry is highly market driven and market research is the most important influencer of NPD success, indicating a relatively high level of external uncertainty and therefore a stronger need for cross-functional collaboration to deal with this external uncertainty. In line with this, Gemser and Leenders (2011) found that under conditions of perceived low external uncertainty investments in cross-functional communication may be a waste of resources, since companies not prioritising cross-functional teams will be likely to achieve the same results as those investing large amounts in cross-functional communication. This is especially important for SMEs that have no ambitions to develop radically new products and that need to be aware of the level of external uncertainty when planning their NPD activities due to their limited resources.

Internal uncertainty

Internal uncertainty refers to the uncertainty related to innovation strategy and goals of NPD within the company. Incremental innovation causes low levels of internal uncertainty, whereas radical innovation means a high level of internal uncertainty (Carbonell and Rodríguez-Escudero, 2009). According to several authors (Cooper, 2003, Gomes et al., 2003, García et al., 2008), the more complex a project is, the higher is the risk of failure and thereby the uncertainty, which requires better knowledge sharing.

In general, SMEs are dependent on shelf space at retailers, which is difficult to obtain with radical innovations. This will make these food companies more inclined to limit their screening activities for truly new products and focus on incremental innovations, which require low level of investments and carry low perceived risk. As screening activities are best practiced by cross-functional teams interacting at early NPD phases where decisions are made about goals and product-related quality (Gomes et al., 2003), the cross-functional communication may be considered of less worth in companies with limited novelty of innovation goals (Jespersen, 2007).

NPD-phase and optimal communication intensity

Due to the ability of cross-functional collaboration to integrate market and technology information into the early NPD stage where primary decisions about the goals and product-related quality are made (Gomes et al., 2003), in the early phases of NPD more internal communication is needed compared to the later phases (Song and Montoya-Weiss, 1998, Griffin and Hauser, 1996, Becker and Lillemark, 2006, Gomes et al., 2003). Thus, cross-functional synergies will mainly appear in relation to opportunity identification and engineering, which take place in the first part of the NPD-process, but not in relation to the marketing of the product, which takes place in the last part of the NPD-process (Love and Roper, 2009). This prioritisation may help to avoid product failure without wasting resources. As the food industry is highly market driven, enabling companies to incorporate consumer demands from the beginning of the process by using appropriate market research is crucial (Suwannaporn and Speece, 2003).

Implications for the food industry: recommendations to improve internal communication

Figure 2 provides a schematic overview of our results. Internal communication between market and technology experts is enabled by organisational structure, team composition, management support, and knowledge management. The level of communication needed depends on 1) the level of external uncertainty, 2) the level of internal (technological) uncertainty characterising the innovation strategy (radical vs. incremental), and 3) the specific phase of the NPD. These will influence the need for internal communication independently.

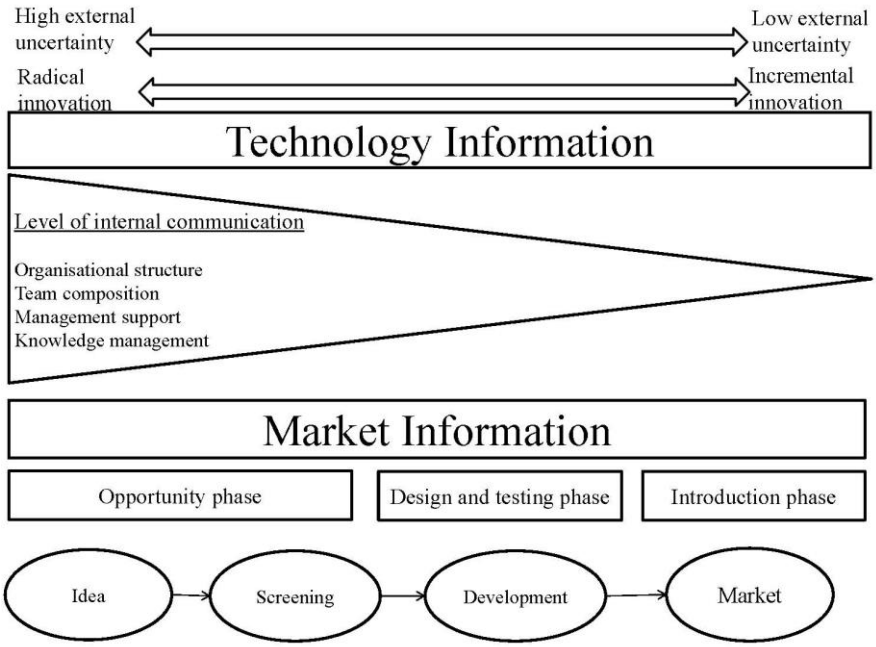

Figure 2: Schematic overview of the internal communication between market and technology experts in the NPD process.

Our findings can be translated to a set of implications for the food industry (Table 2). Food companies are encouraged to integrate technology and market information, especially in the opportunity phase and to some extent during the development phase. Furthermore, the level of internal communication should increase with the radicalness of the product to be developed. Regarding the external environment, with rapid changing conditions leading to high external uncertainty, companies must be able to quickly adapt to changing consumer and competitor trends which requires a higher level of internal communication. The food industry is currently primarily characterised by incremental innovation, but in order to establish more radical innovation increasing internal communication should be emphasised accordingly. Furthermore, due to the food industry being highly market driven, the importance of internal communication should be stressed.

Turning towards the structural mechanisms enabling internal communication, well-defined goals that are interpreted similarly by various functions should be established in order to ensure that all functions are working in the same direction. Thus, market and technology experts should interact and set shared goals together. Still, a balance between centralisation and formalisation must be established, where individual work teams are empowered to make decisions. Team work consisting of marketing and R&D personnel should be prioritised when internal communication is needed, including informal activities on a daily basis. Formal communication is not enough to establish a high level of collaboration.

Table 2: Implications for the food industry.

Recommendation	Explanation
In the opportunity phase of NPD, market and technology information should be integrated	Integrating market information and technology information is mainly relevant in the early phases of NPD. In the later phases, marketing and R&D may benefit from working more independently as long as common understanding and goals have been established in the beginning.
The level of internal communication should increase with the degree of novelty in product development. Radical innovations require more internal communication than incremental innovations	A higher level of internal communication is needed for radical product developments, due to the higher level of internal technological uncertainty.
Rapid changes in market conditions require a higher level of internal communication within NPD	With rapid changing external conditions leading to high external uncertainty, companies must be able to quickly adapt to changing consumer and competitor trends, requiring a higher level of internal communication.
Marketing and technology experts should set shared goals	In order to ensure that all functions are working in the same direction, clear goals should be established that are interpreted similarly by various functions. This requires a common language between the functions.
A balance between centralisation and formalisation should be established	Parallel to shared goals, the individual work teams should be empowered to make decisions, as this may motivate them to collaborate to a higher extent.
Team work consisting of marketing and R&D personnel should be prioritised if internal communication is needed	Formal communication is not enough to establish a high level of collaboration – informal activities are required as well. Collaboration should be established between the functions on a daily basis ensuring informal activities in addition to formal activities.
Top managers should prioritise the development of a trustful and collaborative climate	A trustful and collaborative climate can be established by managers keeping an open mind towards various functions and by encouraging open discussions.
A platform of existing knowledge should be established on which to base problem solving:	Both implicit and explicit knowledge management is important in innovation.
By building capability to exploit explicit knowledge	Explicit knowledge can be stored in databases in a form that is understandable for all functions in need for this information. A certain level of explicit knowledge management is necessary to support the concept of continuous learning.
By building capability to exploit implicit knowledge	Sharing of implicit knowledge should be encouraged by establishing a trustful climate for employees to discuss formally as well as informally. Implicit knowledge should be recognised as important input to the NPD process in order not to limit innovation.

Regarding process mechanisms enabling internal communication, top managers in food companies are encouraged to prioritise the development of a trustful and collaborative climate by showing appreciation and keeping an open mind towards various functions, and by encouraging open discussions. A platform of existing knowledge building capability to exploit explicit and implicit knowledge should be established as a basic tool that can be used in problem solving. Explicit knowledge can be stored in databases in a form that is understandable for all functions in need for this information. A certain level of explicit knowledge management is necessary to support the concept of continuous learning. Sharing

of tacit knowledge should be encouraged by establishing a trustful climate for employees to discuss formally as well as informally. Tacit knowledge should be recognised as important input to the NPD process in order to foster innovation.

Limitations and future research

Integration of product and technology knowledge with marketing information in food product development could benefit from more research carried out specifically within the food industry. Even though recommendations are given based on the results obtained from combining the food industry with other industries represented by low-tech SMEs, food companies may have specific characteristics that could be considered in more detail in relation to the need for internal communication. Furthermore, much of the research actually conducted within the food industry is carried out in a geographically limited area, mainly Asia (from the 13 extracted articles specifically focusing on the food industry, 6 where based on data collected in Asia), which may have a very different organisational approach to internal communication compared to Western companies. Therefore, more research is needed in European/Western food companies to account for the possible differences in organisational environments between Eastern and Western cultures (Hofstede and McGrae, 2004).

Finally, research is mainly concentrated on communication between marketing and R&D functions within the company. There is an outsourcing tendency in the food industry, and as food companies often collaborate with both consumer scientists and technology experts from outside the company, future research could look at the communication with such external collaboration partners. This review concentrated on NPD as a process happening within the company, but we need to improve our understanding of how communication could facilitate success of innovation processes when developing capabilities, e.g. new technologies for radical innovations, in complex knowledge networks with partners from various commercial and academic organisations. Future research should investigate how the communication in this more complex cross-organisational structure can be facilitated, and how knowledge can be communicated optimally via personal and codified knowledge management systems. It is therefore relevant for future research to look into where and when communication is most beneficial in relation to product success in the food industry.

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Paper 4: Challenges in Cross-Functional Communication Implementation: Differences related to organisation size and functional focus

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The paper has been revised and resubmitted to R&D Management.

Abstract

Successful innovation depends to a large extent on the combination of marketing insight and technology insight. Existing research has focused on identifying factors supporting the cross-functional communication between these two areas. This study provides a complementary perspective by exploring the perceived challenges facing organisations in their implementation of these supporting factors. Twenty-seven semi-structured interviews were conducted with technology experts or marketing experts from SMEs or large organisations operating in the food sector. The perception of the implementation challenges differed along two dimensions: organisation size and functional focus of experts involved. Considering organisation size, the main differences concerned the external vs. internal aspect of cross-functional communication. SMEs face problems related to lack of internal skills and access to external knowledge. On the other hand, large organisations typically experience problems related to the lack of respect characterising the organisational climate. Regarding the functional focus, the main difference relates to different perspectives on the innovation process as being driven by technology or market needs. Managers are encouraged to take a long-term perspective on the innovation process in addition to the short-term perspective, and they need to signal this priority in the balance of resources, goals, and practices in order to successfully implement the factors supporting cross-functional communication.

Introduction

Cross-functional communication is crucial for innovation success (Henard and Szymanski, 2001), and identification of factors supporting communication between functions has been covered extensively in the literature (see for example Jacobsen et al., 2014, Griffin and Hauser, 1996). Despite extensive research on supportive factors, there is a knowledge gap on how these factors have been and can be implemented in individual organisations. This implementation may be a challenge due to the generalised manner in which the factors have been described in existing literature, when implementation challenges may actually differ depending on role and context of the professionals involved. This study therefore addresses this implementation issue by asking the question: *How are the implementation challenges perceived differently by professionals located in large organisations vs. small/medium sized enterprises (SMEs) as well as in technology functions vs. marketing functions?* The results provide managers with a complementary perspective on the factors supporting cross-functional communication, by looking at differences in these perceived implementation challenges related to company size and functional focus of the experts involved.

Background

Innovation is essential for companies to survive and succeed in the long-term perspective (Baumol, 2002, de Visser et al., 2010), but successful innovation depends on many factors (Henard and Szymanski, 2001, Montoya-Weiss and Calantone, 1994). Developing a product perceived as superior by consumers is recognised as a key success factor (Cooper and Kleinschmidt, 2007, Cooper, 1987, Zirger and Maidique, 1990). This often requires a market-oriented approach to innovation. Market-orientation implies that a joint, integrated, and collaborative response is necessary in order to respond to the needs and wants of the market (Kohli and Jaworski, 1990). The market-oriented approach to innovation therefore states that knowledge on consumer needs must not only be acquired, but also disseminated between functions, and translated into successful innovations (Ottum and Moore, 1997). Generating information on consumer needs is a focus often possessed by the marketing function, but successful innovation requires a combined contribution from market expertise and technological expertise (Zirger and Maidique, 1990) to transform this consumer information into a final product. The marketing and technology functions provide expert knowledge that is required in for example setting new product goals, identifying opportunities for product improvement, engineering design, and revealing consumer needs. Therefore, marketing and

technology responsibilities in innovation cannot be treated separately (Griffin and Hauser, 1996).

The necessity to integrate input from technology and marketing functions emphasises the importance of cross-functional communication, but also the potential for conflict in their communication (e.g. Cooper and Kleinschmidt, 2007, Gupta et al., 1986a, Griffin and Hauser, 1996, Thieme et al., 2003). Coming from different backgrounds, creates the challenge that individual experts in marketing and technology do not always understand each other across these functions. This potential for conflict has led to identification of various factors (see Table 1) supporting cross-functional communication between technology and marketing functions (e.g. Pearson and Ball, 1993, Song and Thieme, 2006, Gupta and Wilemon, 1990, Nakata and Im, 2010, Griffin and Hauser, 1996).

The following briefly presents the factors addressed in existing research for supporting cross-functional communication based on the literature (Jacobsen et al., 2014). Furthermore, organisation size and functional focus are introduced as relevant dimensions to consider when exploring the differences in perceived implementation challenges of the supporting factors. The food industry is then presented as a relevant sector for studying effective cross-functional communication. Following this background, the method is outlined, and results of the current research are presented and discussed. Finally, the implications are proposed, followed by the limitations and suggestions for future research.

Factors supporting cross-functional communication

This study takes its starting point in different factors that are identified as supporting cross-functional communication between marketing and technology functions in innovation (e.g. Griffin and Hauser, 1996, Song et al., 1996, Moenaert et al., 2000, Song and Thieme, 2006, Moenaert et al., 1994, Dasgupta and Gupta, 2009, Carbonell and Rodríguez-Escudero, 2009, Cooper, 2003, Brachos et al., 2007). These factors have been transformed into a set of recommendations that promote cross-functional communication in innovation (Jacobsen et al., 2014), using the food sector as an example of a fast-moving consumer goods (FMCG) industry (see Table 1 for the final factors and recommendations). The recommendations are related to formalisation/decentralisation in the organisation, knowledge management systems, cross-functional teams, development of a common language/shared vision, and management support. As these recommendations are rather generic, a crucial question is how experts interpret implementation challenges differently depending on their functional focus

(marketing vs. technology) and the different types of organisations (SMEs vs. large companies) in which they are located. The recommendations are used in this study as stimuli in the interviews.

Table 1: Factors for supporting cross-functional communication (based on Jacobsen et al., 2014).

Cross-functional supporting factors	Recommendation
Balanced level of formalisation and de-centralisation	The individual work teams should be empowered to make decisions as this may motivate them to collaborate to a higher extent.
Knowledge management systems to exploit explicit and implicit knowledge within the organisation	Both implicit and explicit knowledge management is important in innovation. Explicit knowledge can be stored in databases in a form that is understandable for all functions in need for this information. A certain level of explicit knowledge management is necessary to support the concept of continuous learning. Sharing of implicit knowledge should be encouraged by establishing a trustful climate for employees to discuss formally as well as informally. Implicit knowledge should be recognised as important input to the NPD process in order not to limit innovation.
Common language and shared vision between marketing experts and technology experts	In order to ensure that all functions are working in the same direction, clear goals should be established that are interpreted similarly by various functions. This requires a common language between the functions.
Cross-functional teams consisting of a mix of marketing and technology personnel	Formal communication is not enough to establish a high level of collaboration – informal activities are required as well. Collaboration should be established between the functions on a daily basis ensuring informal activities in addition to formal activities.
Management support of a trustful and collaborative climate	A trustful and collaborative climate can be established by managers keeping an open mind towards various functions and by encouraging open discussions.

Differences between large organisations and SMEs

The market-oriented approach to innovation requires a joint, integrated, and collaborative response from the functions involved (Kohli and Jaworski, 1990). It therefore appeals primarily to larger organisations possessing the required resources for innovation across functions internally, and less to SMEs, which are typically required to network with external collaboration partners possessing the required expertise. For this reason, a market-oriented approach to innovation may result in SMEs and large organisations facing different challenges in their innovation processes (Freel, 2000), when their capabilities to approach the innovation process are disparate (Freel, 2005). Compared to large organisations, SMEs possess limited competences and resources to exploit new opportunities and create pioneering

innovations, and therefore access to external expertise networks is essential for their innovation performance (Freel, 2005, De Propris, 2000). In order to succeed in these external collaborations, duties and responsibilities between partners need to be carefully planned and defined (Hoffmann and Schlosser, 2001). Thus, in order to keep a market-oriented approach to innovation, SMEs often face the requirement of establishing a joint approach to the innovation together with external partners possessing complementary skills.

Some studies (e.g. Dooley et al., 2015, van de Vrande et al., 2009, Hewitt-Dundas, 2006) conclude that large organisations are more inclined to engage in collaborative innovation compared to SMEs. However, considering the ratio of open innovation activities over the number of employees, SMEs actually have higher open innovation intensity (Spithoven et al., 2013). Whereas SMEs must open up to a wider range of collaborates to access external information and technology, large organisations are not as dependent on open innovation activities.

Differences between technology functions and marketing functions

Implementation challenges for cross-functional communication factors may differ depending on the focus of communicators involved. Whereas technology functions consist of individuals with an engineering or science background, marketing functions consist of individuals with a business background (Griffin and Hauser, 1996, Gupta et al., 1986a). Technology functions and marketing functions value achievements of the innovation process differently, e.g. technology experts often have a long-term perspective, whereas marketing experts have a short-term perspective (Gupta et al., 1986b). Early research has acknowledged differences between organisational roles (Saxberg and Slocum, 1968, Lorsch and Lawrence, 1965), and recently Fischer and Henkel (2012) claimed that technology functions and marketing functions differ in their respective thought-worlds. A thought-world is *'a community of persons engaged in a certain domain of activity who have a shared understanding about that activity'* (Dougherty, 1992, p. 182). This suggests that people belonging to different functions (i.e. marketing or technology) are likely to have different perceptions of the implementation challenges regarding the cross-functional factors.

Shared mental models is an aspect of the so-called team sense-making capability, which impacts new product development (NPD) performance positively (Akgün et al., 2012). In terms of innovation, people from different thought-worlds have difficulties understanding each other because they process information selectively and do not have shared mental

models. Understanding people from their own individual specialisation is less effortful than trying to understand those possessing another thought-world. This is a deeply rooted problem in the collaboration between technology functions and marketing functions that inhibits the possibility for learning and reaching a comprehensive understanding (Dougherty, 1992). Although people from different thought-worlds may agree on the general goals, they might at the same time have completely different interpretations of these goals (Dougherty, 1992). Thus, different thought-worlds hinder cooperation, communication quality, and trust between functions (Homburg and Jensen, 2007, Kyriazis et al., 2012).

Industry settings: The case of the food industry

The time span of the innovation processes in the food sector can vary considerably, depending on the innovation being a new product platform or an additional product added to an already existing platform (Earle and Earle, 2008). The sector is characterised by a high level of incremental compared to radical innovations (Baregheh et al., 2012) and a high number of product turn-overs in the market (Traill and Meulenberg, 2002), which makes it a good representative of the FMCG industry. The rapid-changing and competitive market conditions (Grunert et al., 1996, Stewart-Knox and Mitchell, 2003), combined with the consumer products being the main market (Earle and Earle, 2008), makes effective communication between technology and market experts highly relevant regardless of the duration of the NPD cycle. Irrespective of the incremental innovation dominance, consumer orientation in product development requires inclusion of both functions by integrating consumer insight into product development, which is a key to successful food NPD (Grunert et al., 2008, van Kleef et al., 2005).

Method

The factors supporting cross-functional communication (Table 1) were used as stimulus material in a series of interviews. In this study, cross-functional communication includes communication between functional disciplines located within the same or separate organisations. More specifically, the large companies often host most of the required expertise internally, whereas the SMEs have to find some required expertise outside their own organisation. In our approach, we have focused on communication between functions within the innovation processes, which are often conducted in more or less temporary teams consisting of professionals with varying expertise coming from within or outside the process owner's organisation. Companies may face a need for external network collaboration in their cross-functional activities, as the functional disciplines are located in separate organisations.

To illustrate in-depth which challenges organisations face in their consideration of implementing the cross-functional communication factors, a qualitative approach with semi-structured interviews was adopted. The qualitative approach was chosen due to its appropriateness in exploring the participants' perception of the implementation challenges, and in providing an understanding of the everyday knowledge of these (Flick, 2008, Bazely and Jackson, 2013).

Recruitment and interviewees

Twenty-seven interviews were conducted with experts employed in either marketing or technology-related positions within SMEs or large organisations participating in innovation projects in the food industry. Potential interviewees were invited to the interview by email (160 people belonging to a pan European Internet community (Connect4Action, 2011) and other industry networks) shortly describing the purpose of the study. The online community was built as part of a project focusing on communication challenges in the process of developing new food products and technologies (Connect4Action, 2011). The selection criteria required that interviewees 1) were interested in the topic, 2) represented an organisation located in Europe, 3) had experience with innovation processes in the food industry, and 4) were willing to participate.

Interviewees were categorised according to their primary functional focus into either technology focus or marketing focus and size of the organisation with which they were affiliated (Figure 1). Most of the interviewees representing SMEs came from rather small organisations with less than 100 employees, but included even smaller consultancies and start-ups as well. Large organisations included mainly large manufacturing companies, but also some experts from research institutes collaborating closely with companies in innovation projects. The geographical distribution of interviewees represents different areas within Europe (Northern Europe: 6; United Kingdom/Ireland: 4; Italy/Portugal/Spain: 4; Benelux: 9; Eastern Europe: 2; France/Germany: 2).

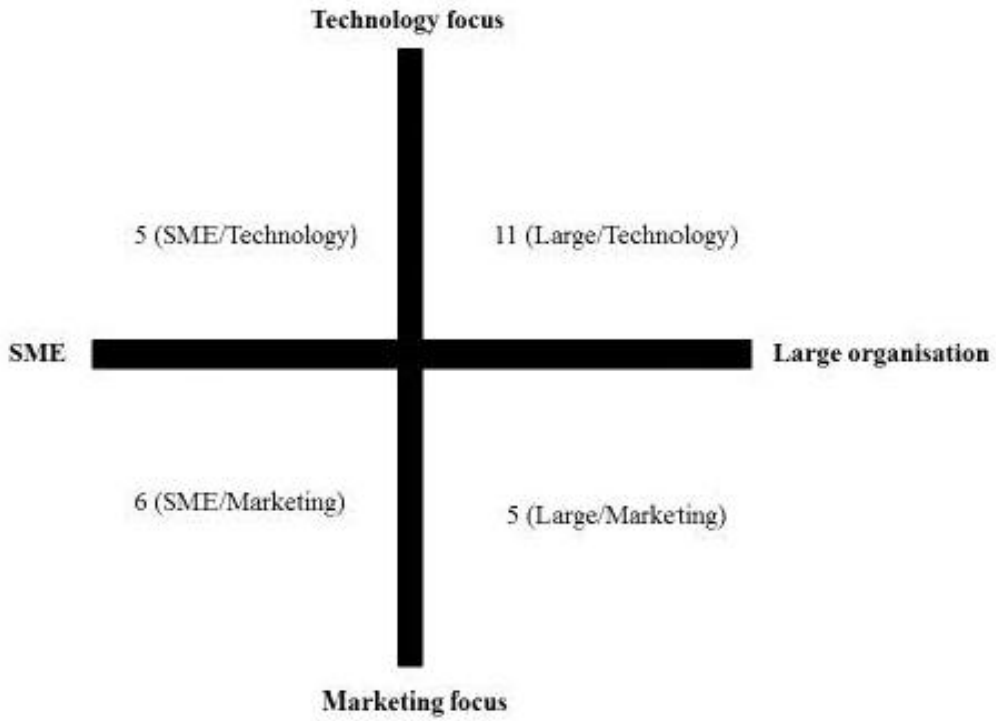

Figure 1: Profile distribution of interviewees according to organisation size and functional focus.

Interview procedure

For preparation and reflection, interviewees received a short overview of the interview and a detailed description of the factors supporting cross-functional communication (Table 1) in advance. Interviews were carried out in English in person or by phone, recorded, and transcribed.

The semi-structured interviews followed an interview guide. Initially, interviewees were asked to provide information on their background, current position, and the organisation with which they were affiliated. They were asked about their experience regarding innovation processes and types of innovation teams in which they had worked. The rest of the interview centred on the supporting factors (Table 1) with questions regarding their implementation. Interviewees were first asked to reflect on the general relevance of the supporting factors for cross-functional communication in the innovation process. Afterwards, the interview focused on each factor one by one: whether the interviewees agreed with its relevance, whether their organisation had already implemented it, and if not, whether it would be feasible to implement in the organisation. These questions aimed to elicit the true perceptions of and experiences with the implementation challenges of each supporting factor.

The semi-structured approach allowed interviews to flow according to interviewees' interests and to deviate from the order of themes set in the interview guide; however, the interviewer ensured that interviewees had reflected on all intended topics.

Coding procedure

The interviews were transcribed, and after reading through the material several times, the data were coded through three rounds of coding using a thematic approach. This procedure is argued to be the optimal approach to research where *'theoretically based groups comparisons are to be conducted in relation to a specific issue'* (Flick, 2006, p. 312). The thematic approach is based on the assumption that groups may differ in their views on the world (Flick, 2006). Our study consists of four of such pre-established groups related to the interviewee's organisational role (i.e. functional focus) and context (i.e. organisation size) (Figure 1). The interview statements were divided into categories derived from the material. Each interview was coded one by one, continuously developing the codes from the material. This implies that the thematic structure resulting from the coding of one interview underlies the coding of the further interviews, in order to reach a satisfying level of comparability between the groups. The thematic structure is thus developed based on the first interview and then continuously adapted as new (sub)themes emerge from the data (Flick, 2006).

In the first round, the coder (first author) identified four general themes in the data related to implementation challenges: role of consumer research, communication in the innovation process, market situation, and organisation of teams and projects. In the second round, these four themes were further divided into a detailed set of ten sub-themes. After a third round of coding, a set of specific topics were identified from the detailed set of sub-themes and considered sufficient for interpretation. The coding was conducted using the NVivo10 software.

All comments were coded within specific topics and then related to the cross-functional supporting factor to which it had a connection. For each factor, data was then categorised based on the characteristics of the interviewee (organisation size and functional focus). Challenges for each of the four groups (Figure 1) could therefore be extracted and compared, in order to assess the group-related differences in perceived implementation challenges for the cross-functional communication factors. This implies that similarities and differences in perceived implementation challenges relating to organisation size or functional focus

represented by the interviewee (SME/Marketing, SME/Technology, Large/Marketing, and Large/Technology, see Figure 1) were derived.

Results

Overall, there was an agreement on the relevance of all factors supporting cross-functional communication, but having them implemented was regarded as an idealistic goal difficult to achieve in the innovation process. However, the implementation challenges also differed according to the interviewees' backgrounds. The following continues with a detailed focus on how the challenges differed according to organisation size and functional focus.

Organisation size: differences in perceived challenges between experts from SMEs and large organisations

Perceived implementation challenges of the factors differed in many ways between experts from SMEs and large organisations (Table 2). SMEs, which often either consisted of only technology experts or marketing experts, were concerned about their limited in-house skills making them dependent on large external networks in accessing market information or technology information. Large organisations emphasised lack of respect between functions in their organisational culture. The following will present the perceived challenges as they relate to each of the five factors supporting cross-functional communication.

Formalisation/decentralisation: SMEs differed from large organisations in their struggle to establish formalised communication procedures across functions. Although both SMEs and large organisations found the implementation of a balanced level of formalisation and decentralisation challenging, the SMEs expressed the additional challenge of lacking formal procedures and relying too extensively on informal communication. One interviewee explained how creativity should be allowed, but that certain boundaries and guidelines must be set for people to navigate within the innovation process:

'…you need to give room to creative people, but you have to create frameworks. Because that is very important for creative people. You have to be able to think out of the box, so for that you need to create a system' (SME/Technology).

Table 2: Perceived implementation challenges for experts in SMEs and large organisations.

Supporting factor	SMEs	Large organisations
Balanced level of formalisation and decentralisation	Too much reliance on informal communication creates loss of organisational knowledge Right level of formalisation and decentralisation is hard to establish with external partners	-
Knowledge management systems to exploit explicit and implicit knowledge within the organisation	Extensive reliance on implicit knowledge sharing by coincidence instead of systematic knowledge capturing hampers knowledge dissemination Employee turnover decreases organisational learning because knowledge rests with individuals Lack of trust between external partners hampers systematic knowledge sharing Lack of financial resources for establishing knowledge sharing with external partners decreases the relevance of knowledge management systems	Separate systems for knowledge sharing implemented only for the individual functions leads to functions working independently Lack of skills for maintaining such large systems makes the knowledge management systems overloaded with information and thereby useless
Cross-functional teams consisting of a mix of marketing and technology personnel	Team establishment with external partners provides a large gap between functions in team commitment No well-established network across functions makes collaborations difficult**	Problems in identifying the right internal resources result in less optimal teams* Too extensive reliance on informal team establishment internally results in individual functional teams
Common language and shared vision between marketing experts and technology experts	Different vision for different companies makes it difficult to establish a common goal with external collaborators Lack of internal skills hampers the understanding of scientific collaboration partners	Lack of respect between functions leads to functions working in different directions Different educational backgrounds makes it difficult to standardise the language in a way understandable to all
Management support of a trustful and collaborative climate	-	Bias among top managers towards functions of own educational background leads to prioritisation of one function over the other Top managers perceived mainly as resource providers who should be convinced creates competition internally

*only for participants representing marketing functions **only for participants representing technology functions

SMEs relied more on external partners than large organisations, which made it hard for the technology focused SMEs to establish formalised procedures with the marketing function and for the marketing focused SMEs to establish formalised procedures with the technology function. Whereas an informal and decentralised approach to communication may be optimal within SMEs with only one functional focus (i.e. either technology or marketing), a more structured approach may be needed for communication with functions located externally to clarify the roles and expected contribution of each partner in the innovation process. Innovation happening in collaboration between functions located in separate organisations resulted in SME-interviewees experiencing a large knowledge gap between functions. One interviewee expressed this gap as hampering the innovation process:

'…the actual product development went a long, long way. It was about three quarters of the way through before a major issue with the packaging was highlighted. Now that could have been overcome if they'd been involved with the packaging side and they had a better cross-functional team communication.' (SME/Marketing)

Knowledge management systems: Whereas SMEs were mainly concerned with the individual knowledge leaving the organisation due to lack of knowledge management systems, large organisations emphasised that their already implemented systems did not work optimally for cross-functional knowledge sharing.

Knowledge management systems were given low priority by all interviewees, although most large organisations had systems in place for saving and sharing knowledge. Here, implementation concerns were related to the skills and efforts required for maintaining such systems. SMEs, however, mainly relied on informal knowledge sharing often happening by coincidence although the large amount of implicit knowledge was deemed as a problem due to the high employee turnover as explained by one interviewee:

'People will move from one position to the other and you won't find that information anywhere. Also in transfer between companies or persons: how do you capture this implicit knowledge?'(SME/Technology)

The aspiration was in systems that could capture implicit and explicit knowledge on a systematic and regular basis, but with relatively little effort and low costs; the latter a wish especially among SMEs. Knowledge management systems may work efficiently for smaller organisations due to their limited amount of employees, but may become a problem when

referring to communication between functions located in different organisations. When cross-functional communication implies knowledge sharing with external collaboration partners, trust was emphasised because organisations may be reluctant to share sensitive information with potential future competitors. Further concerns related to overcoming the short-term focus because it takes time to build up a strong relationship and implement knowledge sharing between organisations. In most large organisations the lack of cross-functionality in the existing systems resulted in knowledge primarily being shared between employees with common functional focus. One interviewee explained how information from prior innovation projects is searched for in different databases depending on the function:

'When R&D [i.e. technology] people look for information for successes and failures from previous projects, they look into the R&D [technology] database. But the marketing people look in the Market Inside database.' (Large/Marketing)

Cross-functional teams: Relying on informal procedures for team establishment may be an obstacle for both SMEs and large organisations. However, for SMEs, the necessity of collaborating externally made the lack of team commitment a struggle, whereas for large companies it was a question of efficiency in the use of internal resources. Within large organisations, implementation of cross-functional teams was concerned with the identification of internal skills and including them at the right time in the innovation process. As one interviewee explained, including the right people at the right time is important in order to be able to adapt quickly to changing circumstances:

'Because it is possible that a stakeholder is positive towards an idea at the beginning and halfway he isn't anymore. That you want to know [in order] to act accordingly' (Large/Marketing)

Furthermore, people tend to discuss innovation issues informally even when a formalised procedure might be beneficial for identifying people possessing the needed skills for solving the problems.

Common language and shared vision: Whereas SMEs struggled mainly with understanding and agreement with external partners, large organisations faced the challenge of disrespect between functions.

SMEs did not face major challenges related to establishing a common goal and shared vision internally, but this differed when collaborating with external partners. The challenges were

related both to organisational boundaries and to different backgrounds; especially collaboration with scientific experts, regardless of the function they represented, was a struggle, as many SMEs do not possess the skills to understand the specific terms used.

For large organisations, the lack of respect between functions indicated an absence of recognition of the other function's importance in the innovation process and reluctance towards developing a common language and shared vision. The use of standardised commonly agreed expressions in order to ensure a common language was suggested as an important element for large organisations with employees from many different backgrounds. However, experts often used their own technical terms to impress the other function rather than to build a shared understanding:

'Optimally, the communication should be in a situation where people have time to listen to each other and actually try to see the world from each other's perspective.' (Large/Marketing)

'People should be willing to explain what they're doing and what is the goal of it, not just impress.' (Large/ Technology)

Still, despite the lack of respect between functions, the importance of making an effort to understand the other function was emphasised by interviewees representing both functions.

Management support: Regarding management support in cross-functional communication, SMEs were mainly concerned with bias towards short-term results, but for large organisations, there was an additional issue with bias derived from the educational background of the managers. One technology expert explained that having a manager with a technology focus was a strong support for the technology function:

'We were lucky enough that the project was taken by the R&D vice president of the institute. We had really whatever we needed in regard to meeting the scientific support and whatever we may have needed' (Large/Technology)

This may indicate that managers are affected by their functional background in their support of the respective functions. Management was perceived as a resource provider that needs to be convinced in order to attain the required support, and the constant competition for resources between functions was indicated as a barrier towards cross-functional

communication. This was primarily the case within larger organisations, whereas SMEs may be saved from this as they often consist of only one major function.

Functional focus: differences in perceived challenges between marketing experts and technology experts

The perceived implementation challenges of the supporting factors also differed according to functional focus (Table 3). Technology experts and marketing experts approach the innovation process from different angles: technology functions take pride in the product, whereas marketing functions focus on the product perception by potential consumers. The following will relate the perceived challenges to each of the five factors supporting cross-functional communication.

Formalisation/decentralisation: Marketing and technology experts differed mainly in their perception of the right level of formalisation of the cross-functional communication in the innovation process. Technology experts had a general concern that innovation processes were hindered due to bureaucratic and formalised procedures hampering creativity. As explained by one interviewee representing a technology function, less structured and bureaucratic communication procedures are ideal in the innovation process:

> '*A decentralised organisation where R&D [technology] and marketing can work together, can be quick on their feet, is more desirable than a centralised and of necessity more bureaucratic organization.' (Large/Technology)*

This view indicates that a decentralised and unstructured approach is a priority for technology functions, which may be related to a strong preference for creativity in innovation. On the other hand, marketing experts emphasised the use of formalised procedures in order to define responsibilities in the innovation process.

Knowledge management systems: No particular differences were identified between functional experts. Still, the marketing experts located in large organisations highlighted the lacking cross-functional usability of the systems expressing a concern for limited marketing integration in innovation. The separate systems resulted in both explicit and implicit information being lost between functions often despite well-functioning internal communication within the individual functions.

Table 3: Perceived implementation challenges for marketing experts and technology experts.

Supporting factor	Marketing	Technology
Balanced level of formalisation and decentralisation	Lack of formalised procedures results in unclear definitions of responsibilities and clarification of roles in the innovation process	Bureaucratic and formalised procedures are hampering creativity
Knowledge management systems to exploit explicit and implicit knowledge within the organisation	Knowledge management systems implemented within individual functions result in functions working separately **	-
Cross-functional teams consisting of a mix of marketing and technology personnel	Consumer research included too late in the innovation process diminishes the product impact of market knowledge	Lack of consumer research skills internally makes it difficult to identify the relevant persons for the team* Marketing experts not seeing the value of the innovation until later in the process makes it irrelevant to include market knowledge in the early innovation stages**
Common language and shared vision between marketing experts and technology experts	Being less tied to the specific product/technology, marketing experts have a short-term focus which conflicts with the long-term focus of technology experts	Being more tied to the specific product/technology, technology experts have a long-term focus which conflicts with the short-term focus of marketing experts
Top management support of a trustful and collaborative climate	Reward systems based on individual performances hampers team-based collaboration Lack of emphasis on the importance of consumer science from top management signals irrelevance of market knowledge in the innovation process	Low tolerance of product failures hampers people's creativity

*only for participants representing SMEs **only for participants representing large organisations

Cross-functional teams: In the establishment of cross-functional teams, marketing and technology experts mainly differed in their perception of the right point in time to engage in such teamwork. Technology experts recognised the importance of marketing, but found it hard to integrate as a permanent partner in cross-functional teams. Even large organisations having marketing expertise in-house rarely constituted cross-functional teams, but instead established innovation teams consisting only of technology experts:

> *'Only sometimes they go to the consumer and see how the consumer looks to the new technology and development.' (Large/Technology)*

This indicates a strong technology focus in innovation processes with a lack of constant consumer science presence in innovation teams: marketing experts are included only at later stages when most product-related decisions are already made. Thus, despite of the agreement

of both technology and marketing being necessary in innovation, cross-functionality is lacking because marketing is not included as an equal partner throughout the process. As explained by an interviewee:

'Technology development is taking place first and then later on the consumer perspective, which I represent, is taken into account. So we normally first get contacted when the technology development in the various projects are at the stage where the consumers are relevant to consider instead of taking us into account earlier in the processes.' (Large/Marketing)

Common language and shared vision: The main difference between the two functions related to their different perceptions of the innovation process. Whereas technology experts focused on the long-term value provided by product innovations, marketing experts often possessed a short-term focus. This may be rooted in the different pace of working in the two functions. Marketing experts have the ability to quickly change position and deliver fast results when there is a need to respond to changing market demands. Technology experts are more connected to the individual products and assess the long-term value of innovations, which require high investments in specific technologies or gaining expertise on product types.

Management support: Divided perspectives could be derived from comments about reward systems: although both functions share a focus on rewards, only marketing experts mentioned team rewards as the optimal reward structure and were concerned about being excluded from the innovation process. As mentioned by one of the interviewees, team rewards could support collaboration:

'They would probably feel more like being part of the same team if they're also then rewarded as one team.' (SME/Marketing)

Because marketing experts were concerned about being excluded from the innovation process, they understood the management's role as supporting the inclusion of marketing in the innovation process instead of just focusing on financial results. Technology experts had a different view, and a system rewarding people for their provided ideas was suggested as optimal in the innovation process:

'Those employees whose ideas were chosen as good and implemented, they are rewarded with some financial reward for their success.' (Large/Technology)

Discussion

Extensive existing research has focused on identification of various factors for supporting cross-functional communication (e.g. Griffin and Hauser, 1996, Gupta et al., 1986a, Gupta and Wilemon, 1990, Song and Thieme, 2006). These factors are rather generic, which is also supported by the fact that all interviewees agree on their relevance for supporting cross-functional communication in the innovation process. However, considering their implementation, the perceived challenges differ depending on the role and context (i.e. functional focus and company size) of the interviewees. This study provides a complementary perspective to existing research by focusing on the implementation of factors that support cross-functional communication. More specifically, the study addresses how perceived implementation challenges differ depending on the experts' organisation size and functional focus.

Reflecting on the overall results across the two dimensions (organisation size and functional focus), the perceived challenges for implementing the factors supporting cross-functional communication evolved around three major issues. First, a general perception of the short-term focus dominating over the long-term focus was regarded as an obstacle in developing the communication between marketing and technology functions. Second, balancing resources, goals, and practices appears as a general challenge, although the perception of the best solution varies between experts' functional focus and size of the organisation. Third, both of these overall issues are related to the management, which can influence companies' readiness to invest in long-term innovation activities including factors supporting cross-functional communication and the balance between resources, goals, and practices.

The first two major issues, 1) the need for a long-term focus and 2) a balancing act of resources, goals, and practices, are discussed in separate sections focusing on how differences in the perceived implementation challenges depend on the experts' organisation size and functional focus. The third issue, management support, is addressed in the implications following the discussion.

The need for a long-term focus

Across organisation size and functional focus, the lack of long-term focus in the general way of organising the innovation management process was related to many of the challenges in implementing the factors that would support communication. Despite the dominance of short NPD-cycles in the food industry, a long-term focus is still needed on innovation, in order to

successfully implement the factors supporting cross-functional communication. This implies that managers need a longer investment horizon for facilitating competencies for cross-functional communication and thereby (future) innovation success. Most of the described factors were recognised as contributing to an ideal situation, but implementing them successfully was not feasible in reality due to the resources required in attaining them. Organisations seem to have a tendency to concentrate on short-term return on investment in the innovation processes without prioritising investments in activities benefitting a long-term perspective. Implementing basic promotors of cross-functional communication would require both time and human resources. Long-term oriented activities, such as developing a knowledge sharing system or working towards a common language and shared vision, would not necessarily benefit the on-going innovation immediately. However, in the long-term perspective, they are likely to build in-house capacity to exploit knowledge in an efficient manner for innovation in the future.

Across organisation size, the focus on short-term financial incentives from the innovation process was acknowledged as a barrier for creating capabilities for cross-functional communication. However, the struggle with financial interests was perceived differently by experts from large organisations and SMEs. SMEs were facing the constraint of not having sufficient resources and ability to find the required external collaboration partners, which is also highlighted in existing literature (Freel, 2005, De Propris, 2000). As an example, establishing a formal and systematic communication procedure or a common knowledge management system with potential external collaborators requires the SMEs to take a long-term perspective demanding extensive resources without immediate benefits. Large organisations were facing an organisational culture challenge in terms of limited recognition between functions due to different thought-worlds as a likely result of their different backgrounds (Dougherty, 1992, Griffin and Hauser, 1996, Gupta et al., 1986a). As mentioned in the interviews, the marketing function may not be included in the technology-driven product development until very late in the innovation process – too late according to the marketing experts. Due to the different thought-worlds, development of cross-functional respect would require a change in company culture, which entails taking a long-term focus. Thus, SMEs lack a long-term perspective on building up an external network due to shortage of resources, whereas large organisations lack a long-term perspective on prioritising an organisational culture respecting both functions equally in their resource allocation.

Considering the differences in functional focus, the short-term and long-term perspectives existing side-by-side may help in overcoming the challenges of the two functions viewing the time focus differently: marketing functions are working in an agile manner in a fast-changing environment, whereas technology functions are more dependent on facilities and equipment that are not easily changed. This is in line with existing literature emphasising the different time perspectives between marketing and technology functions (Gupta et al., 1986b). The two functions being either technology-oriented or market-driven are therefore facing different perceived challenges in the implementation of the supporting factors. Being rooted in different thought-worlds (Fischer and Henkel, 2012, Dougherty, 1992), functional time perspectives may be difficult to change, but they can perhaps be merged. Additional investment in building communication capabilities could benefit both functions by supporting an overall cross-functional understanding even when the time perspective on the everyday tasks is different. Following Akgün et al. (2012), this may create shared mental models, which may influence the level of understanding between functions positively.

A balance between resources, goals, and practices

Many of the implementation challenges also relate to the balancing act between resources, goals, and practices. The perception of the optimal balance differed according to the experts' organisation size as well as functional focus indicating that each organisation needs to find its own balance depending on their existing practices and goals related to innovation processes.

For SMEs, agreeing on resources, goals, and practices with external partners can be demanding and require a high level of formalisation compared to organisations with functions located in-house. Also in large organisations, balancing resources, goals, and practices is a managerial task that reflects what signals the management sends out directly or indirectly about its priorities. Giving priority to particular functions through individual reward systems was mentioned as a problem in the interviews creating a competing atmosphere. Efforts required by the functions to attain the management's support can create tension between them, which may result in unproductive use of resources in internal competition rather than in achieving the goals that would benefit the whole organisation. This indicates a lack of perceived interactional justice within the organisation, and, in line with García et al. (2008), this is likely to decrease trust between functions and thereby also the cross-functional communication.

Furthermore, an optimal balance between resources, goals, and practices is perceived differently by marketing functions and technology functions. Marketing functions understand the optimal balance as a formalised constant collaboration, including establishment of common goals from the early stages of the innovation process. For technology functions, this is not perceived to be an optimal balance. They emphasise allocation of the resources for creativity and exploration in the innovation process, and then integration of marketing only at later innovation stages. Thus, both functions indicate a need for finding the right balance between resources, goals, and practices, but their perceptions of the optimal solution differ. This study indicates that there is a preference for communicating with people from a shared thought-world, and this seems to hamper the knowledge exchange between marketing and technology functions in the innovation process. Our finding is in line with existing research (e.g. Homburg and Jensen, 2007, Kyriazis et al., 2012, Dougherty, 1992) claiming the different thought-worlds to be a major problem for the cross-functional communication. The respective functions may agree on the goal of developing a successful product, but they have very different interpretations of how to reach that goal.

Summing up, the overall challenges to successful implementation of the supporting factors were rooted in the current lack of long-term focus on innovation and in finding the right balance of resources, goals, and practices. However, the perception of the challenges, and how to overcome them, differed between experts from large organisations and SMEs as well as marketing functions and technology functions. With the lack of internal skills, SMEs often need to collaborate with external partners to gain access to external knowledge. On the other hand, large organisations typically have both the marketing function and technology function in-house, but experience problems due to the lack of respect characterising the organisational climate. The main difference due to functional focus appeared to be their perspectives on the innovation process: both functions agree on the importance of technology and marketing in theory, but disagree on their respective relevance at the different stages in the innovation process.

Implications

The factors supporting cross-functional communication were generally found relevant across the experts' organisation size and functional focus, but implementation of them requires adaption to each individual organisation.

The need for a long-term focus and the balancing act of resources, goals, and practices lead back to the management as an overall supporting factor. In large organisations, the relevant management allocating resources and making strategic decisions is more distant, whereas in smaller companies and start-ups, this management role is likely to be closer to actors (or even take part) in the innovation process. The importance and challenge of management support indicated in this study is in line with existing research (e.g. Barczak and Wilemon, 2003, Griffin and Hauser, 1996, Carbonell and Rodríguez-Escudero, 2009).

Innovation managers should consider both the short-term and long-term perspectives in innovation. From a short-term perspective, investment in improving cross-functional communication capabilities may be considered as an expense, whereas from a long-term perspective it becomes an investment generating innovation benefits in the future based on functional alignment. However, adopting and maintaining a long-term perspective may be unappealing to managers due to the slow and perhaps risky return on investment of these communication activities. Still, managers should promote cross-functional communication by stressing the long-term value of the factors that can support more efficient innovation processes. Providing the resources to implement the supporting factors sends a strong signal from the management that long-term focus is a priority for the organisation. Without this signal, cross-functional communication is unlikely to be implemented successfully.

Depending on the size of the company, innovation managers need to approach the implementation of the supporting factors in different ways. Awareness of how innovation activities are organised between internal and external partners in their organisation is crucial. For most SMEs, managerial implications are characterised by the need to focus on establishing cross-functional communication with other organisations, which requires a well-functioning network. Managers in SMEs may therefore prioritise the development of networks, ensure that these networks contain relevant key actors, and minimise the potential damage of an individual leaving the organisation by involving several employees in these networks. For large organisations, managers' focus should be on developing the internal culture of the organisation to support cross-functional communication. Apart from investing the resources, managerial focus must show appreciation for both functions in the innovation process and in this way foster recognition and collaboration between functions.

In relation to the functional focus, innovation managers must contribute to building respect for expertise between functions. Despite the different thought-worlds, formal initiatives may

help create a trustful climate for knowledge sharing across functions, but trust and respect also depend on the informal climate in the organisation, which may be hard to influence through direct managerial actions. In order to achieve an open and trustful climate for both formal and informal communication, practices that support these goals need to be adopted as part of the organisational culture. Achieving the desired organisational culture requires a long-term focus from innovation managers and thereby resources to parallel the long-term goals. Demanding cooperation between functions, by using for example team incentives, is likely to promote trust and respect because it clearly indicates that innovation managers appreciate the expertise from both functions as valuable and needed. Moreover, managers should be aware that their own functional background may influence their judgements, and they need to show respect and appreciation to all key players in the innovation process regardless of their expertise.

Limitations and future research

The current study is of an exploratory character and takes a qualitative approach in form of semi-structured interviews. Although the qualitative approach has limitations in terms of generalisability, it captures the reflected challenges in implementing factors supporting cross-functional communication. Quantitative studies would be valuable continuations to reach a higher level of generalisation in differences along the two dimensions (i.e. organisation size and functional focus).

Interviewees were recruited through a project community focusing on effective communication in food innovation, and they are therefore likely to have a concern for this particular issue to a larger extent than other employees. Due to this sampling procedure, interviewees are likely to be biased towards those who find the communication issues important, but this might also be an advantage as these informants are likely to be vocal on the topic. Furthermore, the final sample included a majority of interviewees from the Northern and Benelux countries, which may have biased the perceptions of cross-functional communication.

This study provides indications on different perceptions of challenges facing organisations in their implementation of factors supporting cross-functional communication. Existing research indicates that the impact of technology and marketing integration on innovation performance depends on the degree of product innovativeness (Calantone and Rubera, 2011, Brettel et al., 2011) and whether the organisation operates in a high-tech or low-tech industry (Troy et al.,

2007). The reported research focused on a FMCG industry, and further research could explore whether the differences in perceived challenges are relevant in industries characterised by a higher level of radical and high-tech innovation. As experienced from this study, there is not one cross-functional communication model that fits all companies. The practical models for cross-functional communication must be developed for different types of organisations. Furthermore, future studies may wish to differentiate between various types of SMEs, as they vary greatly in size and focus (from highly specialised micro companies to moderate-sized companies producing several products).

Finally, this study focused on communication between technology functions and marketing functions, but communication between other key actors, such as regulatory functions or stakeholders, may also be relevant in the innovation process. Furthermore, this study distinguishes between individuals with a technology focus or marketing focus. Looking from the perspective of multi-knowledge individuals who possess knowledge in the area of both technology and marketing could be interesting as these individuals might have a positive influence on performance in cross-functional innovation teams by their support of knowledge sharing (Park et al., 2009).

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Appendix 1: Interview guide

The procedure for the interviews:
A) the framework and recommendations based on the framework together with the checklist and list of tools will be send 2-3 working days beforehand to the interviewees
B) The interview will go through the four themes set as objectives for the interview. In the beginning of the interview, the introductory questions should establish what experience the interviewee has on NTD/NPD projects/activities and in what kind of role the interviewee he/she has had in these activities.
Interview protocol
Introducing the interviewer and the overall aim of the interview as in the recruitment letter. Making sure that the respondent have received and read the material sent beforehand. Emphasising that we are interesting in respondent's own opinions and experiences and that the data will be reported anonymously without revealing interviewee's identity or affiliation.
0) Previous experience in NTD/NPD activities?
- Have you participated in NTD/NPD projects activities; how much experience you have on these?
- What has been your role in NTD/NPD?
- What kind of teams you have been involved in? What kind of expertise has been included? Where did the team members come from (different organisations)?
1) Does the framework reflect the communication needs required by companies when developing new technologies and new products?
Presenting the framework as recommendations; Interviewees' experiences and opinions on the different recommendations:
-How important are they?
2) Are the recommendations based on the framework actionable within companies? Is the check list tool usable?
Interviewees' experiences and opinions in general and specifically to the individual recommendations or groups of them; how is their working environment is functioning in relation to recommendations?
- Are they in line what is practiced? - Should they be practiced? Are they feasible in NTD/NPD processes?
3) How would interviewees' prioritise the different recommendations? - which recommendations are the most important ones in interviewee's opinion?
- which are most feasible ones? Easiest to implement?
4) Is improving communication between food technology/science experts and consumer/market science experts important in your working environment? What kind of tools would best support that?
- picking up the most important recommendations and reflecting those against the tool list - reflect the possibility/feasibility to use different tools in one's own working environment.
5) How would you describe successful communication between technology/science experts and consumer/marketing experts in new technology/product development processes
- after the detailed questions on recommendations and tools above to come back to an overall perception of successful communication.
- how do you see the link between successful communication between food science and consumer expert in NTD/NPD and the success of the final technology/product? Is there a link and how important is it?

Appendix 2: Coding manual

Code 1	
Label	ROLE OF CONSUMER RESEARCH
Description	Answers related to the use of consumer research in the companies' innovation processes
Code 1.1	**Consumer response to ideas, concepts, and prototypes**
Description	Answers related to conducting consumer research to be used in NPD
Code 1.1.1	**Co-creation**
Description	Answers related to collaborating with consumers continuously through the innovation process
Code 1.1.2	**Competence for consumer research**
Description	Answers related to the competence within companies for doing consumer research
Code 1.1.3	**Consumer response to final product (after launch)**
Description	Answers related to information on consumer behavior after product launch (e.g. sales figures)
Code 1.1.4	**Difference between idea, concept, and prototype**
Description	Answers related to conducting consumer research at different stages in the innovation process
Code 1.1.5	**Difference between product types**
Description	Answers related to conducting consumer research for different types of food products
Code 1.1.6	**Difference between SMEs and large companies**
Description	Answers related to the difference in abilities for conducting consumer research between companies of different sizes
Code 1.1.7	**Gathering information through medium**
Description	Answers related to obtaining consumer information through a medium (e.g. newspapers, Internet, etc.)
Code 1.1.8	**Market pull vs. technology push**
Description	Answers related to the focus on market need vs. development of new technology in the innovation process
Code 1.1.9	**Methods**
Description	Answers related to methods used in conducting consumer research – also at different stages
Code 1.1.10	**Outsourcing responsibility**
Description	Answers related to sharing responsibility for integrating consumer insights in innovation
Code 1.1.11	**Use of social media**
Description	Answers related to the use of social media in conducting consumer research
Code 1.2	**Consumer response to technical terminology**
Description	Answers related to conducting consumer research to be used for the naming of the technology
Code 1.2.1	**Inability of consumers to provide information on technology**
Description	Answers related to consumers' inability to provide information on food technology too early in the process
Code 1.2.2	**Openness**
Description	Answers related to openness towards consumers as a way to gather information about their response to technical terminology
Code 1.2.3	**Word associations**
Description	Answers related to consumer perception of a (potentially unknown) technology based on words associations

Code 2	
Label	COMMUNICATION IN THE INNOVATION PROCESS
Description	Answers related to the communication aspects of the innovation process
Code 2.1	**Develop a common language and a shared vision**
Description	Answers related to the development of a common language and a shared vision within the company or project teams
Code 2.1.1	**Acknowledge the other function**
Description	Answers related to the acknowledgement of and respect for the other function
Code 2.1.2	**Alignment of language**
Description	Answers related to alignment of language to enable functions to understand each other
Code 2.1.3	**Common goal**
Description	Answers related to developing a common goal between functions in the innovation process
Code 2.1.4	**Different backgrounds**
Description	Answers related to the different backgrounds of functions hampering the communication.
Code 2.1.5	**Facilitator**
Description	Answers related to the use of a facilitator in communication between functions
Code 2.1.6	**Implementation**
Description	Answers related to implementation of a common language and shared vision in the company
Code 2.1.7	**Inequality in power**
Description	Answers related to the inequality in power between the functions
Code 2.1.8	**Link to innovation success**
Description	Answers related to the link between developing a common language/shared vision and the innovation success
Code 2.1.9	**Priority**
Description	Answers related to the prioritization of developing a common language/shared vision
Code 2.1.10	**Tools**
Description	Answers related to tools for developing a common language/shared vision
Code 2.2	**Identify and involve all key actors**
Description	Answers related to the identification and inclusion of different actors during the innovation process (and sub-processes)
Code 2.2.1	**Balance of efficiency and inclusion**
Description	Answers related to balancing the level of inclusion/identification of key actors in the innovation process
Code 2.2.2	**Co-creation**
Description	Answers related to identifying/including key actors for co-creation or open innovation
Code 2.2.3	**Common practice**
Description	Answers related to the common practice of companies for identifying/including key actors in the innovation process
Code 2.2.4	**Difference between companies**
Description	Answers related to the differences between companies in their ability/perceived relevance of including/identifying key actors
Code 2.2.5	**Implementation**
Description	Answers related to the implementation of a procedure for identifying/including key actors
Code 2.2.6	**Legal constraints**

Description	Answers related to identifying key actors who may cause a legal constraint to the innovation process
Code 2.2.7	**Link to top management**
Description	Answers related to the link between top management and identification/inclusion of key actors
Code 2.2.8	**Network access**
Description	Answers related to getting access to potential key actors
Code 2.2.9	**Perceived importance**
Description	Answers related to the perceived importance of identifying/including key actors in the innovation process
Code 2.2.10	**Stages in the innovation process**
Description	Answers related to the identification/inclusion of key actors at different stages in the innovation process
Code 2.2.11	**Tools**
Description	Answers related to potential tools for identifying//including key actors in the innovation process
Code 3	
Label	MARKET SITUATION
Description	Answers related to the market situational aspects of the innovation process
Code 3.1	**Assessment of the innovation novelty and uncertainty of market conditions**
Description	Answers related to the internal and external conditions of novelty and their relation to communication between functions
Code 3.1.1	**Current practice**
Description	Answers related to the current practice of companies in assessing the level of innovation novelty and market uncertainty
Code 3.1.2	**Difference between companies**
Description	Answers related to the difference between companies in assessing innovation novelty and market uncertainty
Code 3.1.3	**Different innovation stages**
Description	Answers related to the assessment of innovation novelty and market uncertainty at different stages in the innovation process
Code 3.1.4	**Innovation novelty**
Description	Answers related to assessment of innovation novelty
Code 3.1.5	**IP rights**
Description	Answers related to Intellectual Property rights in relation to assessing innovation novelty
Code 3.1.6	**Legal constraints**
Description	Answers related to legal constraints in product novelty
Code 3.1.7	**Responsibility**
Description	Answers related to the responsibility of assessing innovation novelty and market uncertainty
Code 3.1.8	**Perceived importance**
Description	Answers related to the perceived importance of assessing innovation novelty and market uncertainty
Code 3.1.9	**Standard procedure**
Description	Answers related to creating a standard procedure for assessing innovation novelty and market uncertainty
Code 3.1.10	**Uncertainty of market conditions**
Description	Answers related to assessing the uncertainty of market conditions
Code 3.2	**Social and ethical concerns**
Description	Answers related to the feeling of responsibility for communicating ethical and social issues of the product or technology

Code 3.2.1	**Differences between companies**
Description	Answers related to the difference in social/ethical concerns between companies
Code 3.2.2	**Innovation stages**
Description	Answers related to the social/ethical concerns at different stages in the innovation process
Code 3.2.3	**Lack of concern**
Description	Answers related to the lack of social/ethical concern
Code 3.2.4	**Organisational level**
Description	Answers relating social/ethical concerns to certain levels of the organisation
Code 3.2.5	**Responsibility**
Description	Answers related to the feeling of responsibility in social/ethical matters
Code 3.2.6	**Company image**
Description	Answers related to social/ethical concerns as a way to shape company image towards consumers
Code 4	
Label	**ORGANISATION OF INNOVATION TEAMS AND PROJECTS**
Description	Answers related to the organizational influence on the innovation process
Code 4.1	**Balance between formalization and decentralization**
Description	Answers related to the internal structures of the company and its influence on communication between functions
Code 4.1.1	**Current practice**
Description	Answers related to the current practice within companies in balancing formalisation and decentralisation
Code 4.1.2	**Difference between companies**
Description	Answers related to the difference between companies in their balancing of formalisation and decentralisation
Code 4.1.3	**Efficiency**
Description	Answers related to the efficiency of balancing formalisation and decentralisation
Code 4.1.4	**Empowerment of teams**
Description	Answers related to the empowerment of teams in decision making
Code 4.1.5	**Formalisation in the wrong place**
Description	Answers related to formalising procedures in the wrong areas within the company
Code 4.1.6	**Informal communication**
Description	Answers related to the necessity of informal communication culture
Code 4.1.7	**Perceived importance**
Description	Answers related to the perceived importance of balancing formalisation and decentralisation
Code 4.1.8	**Resource constraints**
Description	Answers related to the role of resource constraints in balancing formalisation and decentralisation
Code 4.1.9	**Role clarification**
Description	Answers related to role clarification in balancing formalisation and decentralisation
Code 4.1.10	**Tools**
Description	Answers related to tools used for balancing formalisation and decentralisation
Code 4.2	**Knowledge management systems**
Description	Answers related to the use of knowledge management systems in the communication during the innovation process

Code 4.2.1	**Difference between companies**
Description	Answers related to the difference between companies in establishing KMS for explicit/implicit information sharing
Code 4.2.2	**Explicit knowledge**
Description	Answers related to KMS for sharing explicit knowledge
Code 4.2.3	**Idea generation**
Description	Answers related to KMS for idea generation
Code 4.2.4	**Implicit knowledge**
Description	Answers related to KMS for sharing implicit knowledge
Code 4.2.5	**Information overload**
Description	Answers related to information overload in using KMS
Code 4.2.6	**Lack of trust**
Description	Answers related to the lack of trust in using KMS
Code 4.2.7	**Organisational learning**
Description	Answers related to organisational learning in using KMS
Code 4.2.8	**Network**
Description	Answers related to KMS for networking
Code 4.2.9	**Priority**
Description	Answers related to the prioritisation of KMS within companies
Code 4.2.10	**Resource constraints**
Description	Answers related to resource constraints in using KMS
Code 4.2.11	**Success vs. failure stories**
Description	Answers related to the use of KMS to disseminate failure/success stories
Code 4.2.12	**Tools**
Description	Answers related to the use of tools for managing KMS
Code 4.3	**Organisation of cross-functional teams**
Description	Answers related to the organisation of cross-functional teams or collaboration internally or between companies and its influence on communication between functions
Code 4.3.1	**Difference between companies**
Description	Answers related to the difference between companies in organising cross-functional teams
Code 4.3.2	**Different innovation stages**
Description	Answers related to the use of cross-functional teams at different stages in the innovation process
Code 4.3.3	**Informal collaboration**
Description	Answers related to informal collaboration between functions
Code 4.3.4	**Link to top management**
Description	Answers related to the link between top management and use of cross-functional teams
Code 4.3.5	**Open innovation**
Description	Answers relate to cross-functional teams as a potential for open innovation
Code 4.3.6	**Priority**
Description	Answers related to the prioritisation of cross-functional teams within companies
Code 4.3.7	**Role flexibility**
Description	Answers related to cross-functional teams as a potential for role flexibility
Code 4.3.8	**Team collaboration between different functions**
Description	Answers related to team collaboration between different functions within the company
Code 4.3.9	**Time constraints**
Description	Answers related to time constraints in using cross-functional teams

Code 4.4	**Top management support**
Description	Answers related to top management's role in supporting the communication between functions during the innovation process
Code 4.4.1	**Biased focus**
Description	Answers related to the biased focus from top management
Code 4.4.2	**Link to other factors**
Description	Answers related to the link between top management and other suggested factors
Code 4.4.3	**Different stages in the innovation process**
Description	Answers related to the use of top management support at different stages in the innovation process
Code 4.4.4	**Priority**
Description	Answers related to the prioritisation of top management support within companies
Code 4.4.5	**Professional background**
Description	Answer related to the different professional backgrounds of top managers
Code 4.4.6	**Provision of resources**
Description	Answers related to the top management role in providing resources for internal communication in innovation
Code 4.4.7	**Reward system**
Description	Answers related to the reward system and its influence on internal communication
Code 4.4.8	**Shaping the culture**
Description	Answers related to the top management support in shaping thee culture for internal communication

Overall conclusions

In order to increase the new product development (NPD) success in the food industry, companies must be able to develop products corresponding to consumers' needs and wants. The objective of this dissertation was to understand how companies can integrate consumer insight in new food product development through information acquisition and dissemination.

This dissertation contributes in two ways to the understanding of the integration of consumer insight in NPD. The two first studies (study 1 and 2) focus on information acquisition in the NPD process by investigating consumers' motivation to interact in virtual communities for knowledge sharing and product innovation. Thereafter, the two other studies (study 3 and 4) focus on the information dissemination by investigating the cross-functional communication between marketing functions and technology functions in the NPD process. Following the market-oriented approach to innovation, information acquisition and information dissemination are both highly relevant for supporting the integration of consumer insight in NPD.

How can consumers be motivated to interact with food companies and each other in virtual food communities for knowledge sharing and product innovation?

Starting with information acquisition, food companies can integrate consumers in NPD via virtual communities. This requires, however, that companies understand *why* consumers would be willing to participate in interaction via such communities. According to the first study, consumers with a pre-existing interest in food and general online interaction are more willing to interact. However, the motivation to self-present to and learn from the community, are the reasons *why* they intend to engage in interaction. Both motivation factors are therefore highly relevant for driving community interaction, but it is important to keep in mind that these two motivation factors are associated especially with consumers' interest in food and, to some extent, their general online interaction propensity.

Looking more specifically at virtual communities aimed at product innovation as a collaboration between consumers and companies, the second study shows that relatedness and, to some extent, the perceived outcome benefits are the dominating motivation factors for consumers to participate. The cross-country differences in the importance of especially relatedness as a motivation for community interaction indicate that the role of country and culture should not be underestimated. The way in which consumers wish to relate to the virtual community is highly country dependent, and companies need to understand this aspect in order to offer consumers the best reasons to integrate in the NPD process.

How can companies support cross-functional communication in the new product development process?

Looking at the information dissemination, the findings show that cross-functional communication between marketing experts and technology experts is still a major problem in the food industry. Cross-functional communication is necessary in order to integrate consumer insight in NPD, and the third study therefore extracts factors that support cross-functional communication from existing literature. It concludes that factors related to management support, organisational structure, team composition, and knowledge management are all supporting communication between the functions, and the need for cross-functional communication depends on internal and external uncertainty issues. It is clear that more research is needed on the actual implementation of these factors within the individual companies.

Thus, the fourth study takes an exploratory approach to investigating the issues faced by companies in their implementation of the suggested supporting factors. Across company size and functional focus there is a general agreement that cross-functional communication is crucial for successful NPD and of the relevance of the factors. However, depending on the company size and the functional focus of the experts involved, there seems to be a difference in perceptions of how these factors should be implemented. Taken together, the results of the last two studies indicate why, despite the extensive research on cross-functional communication, it is still a major struggle for most companies to actually implement the supporting factors. There is no doubt that the implementation struggle leads back to the management, who must keep the different understandings of people and organisations in mind when taking a long-term view on innovation and in balancing the resources, goals, and practices. In this way, barriers to the implementation of the factors for supporting cross-functional communication may be overcome.

Overall, this dissertation focuses on two types of communication flows that must work optimally in order to support the integration of consumer insight in new food product development: 1) the consumer information flowing from consumers to companies (information acquisition), and 2) the information flowing between marketing and technology functions (information dissemination). The main conclusions of this dissertation are as follows:

1) Companies can use virtual food communities for acquiring information. By providing possibilities supporting self-presentation, learning, relatedness, perceived skills, and perceived outcome benefits, companies can motivate consumers to participate in virtual communities for knowledge sharing and product innovation, and thereby companies can acquire consumer information to be used in NPD.
2) In order to manage the virtual food communities optimally, companies need to consider the motivation factors in relation to consumers' pre-existing interests in food and general online interaction, as consumers are not equally likely to be motivated to either self-present or learn from the virtual food communities in the first place. Furthermore, the role of culture in terms of individualism-collectivism plays an important role in consumers' motivation to interact in virtual communities especially for the way in which they wish to relate to the community. Therefore, companies must keep in mind the country in which the virtual communities are operating.
3) When acquired, the information should be disseminated between marketing and technology functions. This cross-functional communication can be supported by implementing factors related to organisational structure, team composition, knowledge management, and especially management support. However, the size of the company and the functional focus of the people result in different perceptions of the implementation challenges. By taking a long-term view on the innovation process and prioritising a balancing act of resources, goals, and practices that are carefully adapted to the individual company and its people, the factors supporting cross-functional communication may be easier to implement. Inclusion of consumer insight in NPD by better information dissemination can then be supported.

Contributions and implications

Research contributions

The dissertation primarily consists of applied science, and the main contributions are therefore of more practical than theoretical character. From an overall theoretical perspective, the dissertation contributes to a behavioural scientific foundation of market-oriented innovation; more specifically on consumer insight integration in new product development.

As stated in the introduction, the studies in this dissertation are all related to the overall concept of integrating consumer insight in NPD as an important aspect of market orientation in the innovation process. Still, they contribute to different streams of literature. Study 1 and 2 target the marketing and consumer behaviour literature, whereas study 3 and 4 target the

innovation and NPD literature. The following will discuss the contribution of each study more specifically.

The first study investigates the mediating role of motivation to self-present and learn in the relationship between consumers' pre-existing interests and their willingness to interact in virtual food communities. Despite existing research on motivations for interaction in online groups (e.g. Jeppesen & Frederiksen, 2006; Wasko & Faraj, 2000), research in the food industry is limited. Recent research indicates that consumers use the online setting for communicating about their food-related experiences (e.g. Carr et al., 2015; Hilverda, Kuttschreuter, & Giebels, 2017; Vidal, Ares, & Jaeger, 2016), but only limited research addresses *why* consumers tend to interact on food issues in virtual communities. The first study therefore adds mainly to the literature on online consumer behaviour in the food domain. The findings provide a good starting point for understanding the drivers that promotes consumer interaction in virtual food communities. The main contribution is therefore contextual. The mediating model suggests that motivation to self-present and learn are the reasons why consumers intend to interact in virtual communities based especially on their level of food involvement and, to some extent, their general online interaction propensity.

The second study focuses more specifically on the consumers' motivations for interacting in virtual communities for developing a new product together with a company. The main contribution of this study is the demonstration of the moderating role of country as the cultural dimension representing different orientations: individualism vs. collectivism. Despite the existing research on consumer motivation for online interaction with firm-hosted communities (e.g. Jeppesen & Frederiksen, 2006), not much research exists on how these motivation factors differ between countries. Still, given the world wide use of the Internet, companies from many different countries could potentially benefit from collaborating with consumers through virtual communities, and differences in consumer motivations related to cultural dimensions are therefore highly relevant to understand, in order to operate the community optimally in the target market. This study adds to the literature on consumer behaviour and virtual community interaction, but from a cross-country perspective. The cross-country perspective may be especially relevant for developing products in the food industry, as consumers from different cultures differ in their likings and preferences for food (Cervellon and Dubé, 2005, Prescott and Bell, 1995).

The third study is relevant primarily from a food innovation management perspective. A lot of existing research has highlighted the importance of various factors in supporting cross-functional communication, but this study takes a food-oriented approach to this issue. The food industry is characterised by incremental innovations, but at the same time, it faces rapid changing market conditions. This external uncertainty demands a high level of cross-functional communication between marketing and technology functions in order to keep a market-oriented perspective in the product development. By studying the food industry as a special case for cross-functional communication, the third study adds to the food innovation literature by identifying factors that are relevant for the food industry (and similar industries) in order to support cross-functional communication. The findings are translated into recommendations to be used by food companies. Furthermore, the study identifies gaps in existing knowledge and highlights the fact that research within the food area on cross-functional communication is scarce, but needed.

The fourth study provides a complementary perspective to existing research in the area of cross-functional communication during the NPD process by approaching the supporting factors (identified in study 3) from a practical perspective. The main contribution from this study is the differences in perceived implementation challenges that appear between experts representing different functional focuses and organisations of different sizes. It provides a potential reason for the continuous struggle for cross-functional communication implementation within companies and adds a practical perspective to the innovation management literature.

Managerial implications

This thesis provides some practical implications to be used for better integration of consumer insight information in food product development – both in relation to information acquisition and dissemination.

Consumer information acquisition from virtual communities

If managed optimally, virtual communities can be an important aspect of a company's business model (Hagel, 1999) as a source of innovation (Fuchs and Schreier, 2011, Schreier et al., 2012). Also for food companies, virtual communities can be a rich source of information when consumers share information on their food experiences. As food is part of consumers' everyday life, it is a domain that most people are able to relate to.

The first study suggested that general online interaction propensity and especially food involvement are important pre-requisites for driving consumer interaction in virtual food

communities. However, as motivation to self-present and learn are the reasons *why* these consumers engage in either information provision or usage, these factors are important to address in the management of virtual food communities. The indirect effects emphasised that the mediating role of the motivation factors are strongest in the relationship between food involvement and interaction, and lower (but still significant) in the relationship between general online interaction propensity and interaction. This is also implied from the direct effects showing food involvement to be a stronger determinant than general online interaction propensity on both motivation to self-present and motivation to learn. Therefore, managers must be aware that only those consumers possessing a high interest in food are likely to be engaged through the suggested motivation factors. Furthermore, the motivation to self-market appears to be the main reason why food involved consumers engage in information provision. Motivation to learn is a reason as well, but to lesser extent. Instead, motivation to learn is a very important reason for consumers' engagement in information usage. The following will provide some practical implications from the study (see also paper 1) for managing virtual food communities based on the two motivation factors.

Motivation to self-present to the community appeared to be the strongest mediator of the relationship between food involvement and intended interaction. Concrete suggestions for providing consumers with the opportunity to self-present could include visibility of performance measurements. An example could be grading systems that could be accessed by peers from whom the information provider aim to be recognised. In relation to the grading system and social status, a ranking system could be established. Peer-based crowdsourcing communities, are often based on systems where peers use a ranking system for grading each others' ideas (Brabham, 2010). According to Cabiddu et al. (2013), the possibility for ranking ideas in the community is a strong tool for self-presenting either towards peers or perhaps the community host. Based on the rankings, ideas can be classified in categories such as 'popular', 'recent', or 'top-of-all-time'. This may be done purely based on peer-rakings, or it may be done by expert evaluations conducted by the community hosts. Leimeister et al. (2009) suggest three options in order to allow consumers to present themselves and their domain specific skills in the community. One is by creating a user profile where consumers are allowed to present themselves in a description section that can be accessed by other users. Also Cabiddu et al. (2013) find this tool to be important for consumers' self-presentation, and encourage the possibility for consumers to add a very detailed description of themselves. Another is by facilitating idea submission via submission forms allowing for a detailed

explanation of the novelty and relevance of the idea, in order to show one's knowledge and skills. A third option for facilitating self-presentation is by linking individual participants to their provided information. In this way, provided ideas can be linked to one or more user profiles with for example names, pictures, and/or contact details (Leimeister et al., 2009). Given the dominating influence of food involvement, self-presentation possibilities should focus on consumers' food expertise as this is the area in which consumers are likely to strive to show their knowledge.

Turning to the motivation to learn, the food community should be a relevant source of information. Its profile must be emphasised within the food setting in order to attract the relevant consumers who possess the required knowledge for increasing the information quality. Consumers want information meeting their needs. It is therefore important that they have easy access to the information in the community e.g. by being able to view submitted ideas and related feedback in an easy and usable way. Leimeister et al. (2009) suggest that the information therefore needs to be 'browsable, sortable, searchable, and paginated' (p. 212). Managers of virtual food communities are encouraged to make the submitted ideas accessible based on for example date, author, or ranking. Furthermore, ideas should be divided into subjects, so the relevant information can easily be found by entering a search term or by filtering. Implementing tools that allow consumers to engage in bi-directional communication with peers can foster continuous interaction by constant feedback on provided information. Thus, the possibility for receiving comments on provided information is an important tool for fostering learning. This may require an active moderator who provides relevant stimuli to the community and supports the discussions around topics that are new or under scrutiny. Cabiddu et al. (2013) and Leimeister et al. (2009) both suggest the possibility for communicating with experts in the field as an important way of meeting consumers' motivation to learn from the community. Managers of virtual communities could therefore consider including food domain experts, who can engage in virtual community interaction with consumers. In this way, consumers may learn from feedback generated by both peers and experts.

In the second study, focus was still on consumers' motivation for interacting in virtual food communities, but with a specific NPD purpose, and the study introduced a cross-cultural moderator. Based on the results of this study, managerial implications for community managers are provided (see also paper 2).

As relatedness plays an important role across countries in consumers' engagement in intended interaction in VCs on product innovation, this should be the main focus of VC managers. Still, at a more specific level, they need to be aware of the culture they are operating in, as the most appealing type of relatedness for the consumers must be emphasised. In collectivistic cultures, relatedness to the VC as a group of peers is important for consumers. Managers therefore need to consider the consumers' identification with the community and reflect this in the values signalled from the VC by facilitating interaction among members and using group-based incentives to attract peer consumers. The VC must be promoted as a group of fellow consumers. A shared identity should be created in order to support the feeling of group relatedness. This may require that the company provides an active community moderator that can set up group conversations among the members about certain topics. Bagozzi and Dholokia (2006) propose synchronous communication tools (i.e. group chats) to facilitate interpersonal relationships among participants. It might also be useful to store information on current members such as personal information and contribution history. This information might be used to present the identity of the VC and establish trust in the other members (Bagozzi and Dholokia, 2006). The VC should be designed for participants to gain an understanding of each other and the social environment (Nambisan and Baron, 2009), and to foster relationships instead of just focusing on the VC content (Hsu et al., 2012).

In individualistic cultures, relatedness to the VC hosting company must be emphasised. Managers need to focus on company relatedness by supporting the company identification. Thus, peer consumers constituting the VC are less important, whereas the company characteristics should be highlighted in order to attract potential members instead. In other words, the company needs to put effort in promoting itself and its values in relation to the VC. For example, company employees can be involved in the VC discussions on different product groups. In line with this, online events can be arranged where participants can interact with experts from the company who are invited to join a discussion on a certain product topic. In this way, the community can be a way of connecting VC participants with the company (Nambisan and Baron, 2009). Companies can also publicly acknowledge that consumers have participated in designing the product to make it part of their identity, but considering the fairness perception among consumers, it important that the company does not present itself as exploiting consumers for product development purposes (Franke et al.,

2013). Participants should still see the co-creation process as a way of helping companies develop better products for consumers – not just as free resources.

Also the expected outcome benefits are perceived to be important in both cultures. Consumers need to be ensured that their participation actually is beneficial by showing them how their results are used and how they have contributed to the market. This can be achieved for example by regular feedback or open dialogue in the community where consumers experience a feeling of influence in shaping the innovation outcome. An option is to present participants with the outcome products they have helped in designing – either online or by providing them with the physical product. To show appreciation, companies can further invite the participants for product launch 'events' where the co-created products are presented.

Managers should not expect that people with broad skills within the product domain are the most motivated participants in the VC. Instead, their feeling of relatedness and the possibility for a better outcome for the consumers and the market may drive the participation. This suggests that managers do not need to put resources into attracting people with broad skills, but there may be domain specific skills that are essential for the capability of contributing to the product innovation tasks. Balancing between broad domain-specific skills and product-specific skills can be a challenge if the individual members of the VC have to be changed from one product innovation to another. Defining the skills that are relevant for the VC membership is one of the tasks that managers of these communities need to contemplate carefully.

Considering the innovation process from idea generation to product launch, it may be optimal to include different cultures or consumers with different motivational backgrounds at certain stages in the innovation process. In a conceptual paper on national culture and new product development, Nakata and Sivakumar (1996) suggest that high levels of individualism supports new product development in its initial stages due to nonconformity and personal visions being in focus. On the other hand, higher levels of collectivism are suggested to support new product development during the later stages due to interdependence and collaboration being in focus. This may suggest that individualistic cultures are more suited for VCs concerning initial new product development tasks, such as idea generation from the individual consumers. More collectivistic cultures might be well suited for more collaborative tasks that could appear later in the new product development process when the purpose becomes more unified. Some may also be interested in including consumers from different

cultures in the same VC. Here, managers must be aware of motivational similarities and differences between cultures in their communication in and management of the VC.

Information dissemination between functions

Turning to dissemination of the information between the marketing and technology functions, the third and the fourth study provided some managerial implications on how to optimise this process (see also paper 3 and 4).

The results of the third study suggested that the need for cross-functional communication depends on the NPD-stage as well as the level of internal and external uncertainty. Managers of the NPD-process should emphasise the integration of marketing and technology especially in the early phases of innovation. If a common understanding of the process and its goals has been well established between functions in the initial phases, the functions may benefit from working more independently later in the innovation process. Furthermore, for more radical innovations, the level of cross-functional communication should be higher. Thus, if the company develops a product outside their current competencies, managers should be more concerned with establishing the cross-functional communication. Similarly, in environments with rapid changing market conditions, such as the food industry, managers must prioritise the cross-functional communication in order to be able to quickly adapt to changing market conditions.

Managers can facilitate the cross-functional communication in various ways, but most important is that it signals its support throughout the organisation by prioritising the development of a trustful and collaborative climate. This can be done by encouraging open discussions and showing equal appreciation of both functions for example through joint reward systems. Second, a shared goal must be set, which is interpreted similarly by both functions. This can be a challenge due to the different backgrounds characterising the professionals in the respective functions, and therefore requires that the management takes action towards establishing a common language in order for the functions to understand each other. This may be facilitated through more collaboration via cross-functional teams constituted by both marketing experts and technology experts, and the management needs to consider the importance of this constitution in the innovation teams. Furthermore, a balance between formalisation and decentralisation should be found, meaning that the individual teams must empowered to make their own decisions in order to drive their motivation for collaboration. However, a certain level of formalisation must still be emphasised in order to ensure the cross-functional communication. Finally, the management should consider the

development of a knowledge management system for sharing both implicit and explicit knowledge between functions, as both knowledge types are important for innovation. Explicit knowledge sharing can be facilitated by storage in databases in a form that is understandable to and accessible by both functions. This requires, however, continuous management of the system in order to keep it updated and relevant. In addition, the management can facilitate implicit knowledge sharing through a collaborative and trustful organisational climate, where people engage in formal as well as informal knowledge sharing across functions.

Whereas the third study focused on the identification of facilitating factors for cross-functional communication, the fourth study addressed their implementation challenges as perceived by experts representing either technology or marketing from either SMEs or large organisations. These factors (formalisation/decentralisation, cross-functional teams, common language, management support, knowledge management systems) were agreed to be important by all participants, but in order to be successfully implemented they must be adapted to the individual organisation. By providing this complementary perspective on the implementation challenges faced by organisations, the fourth study takes a practical approach to the support of cross-functional communication in the NPD process.

The need for a long-term focus and the balance of resources, goals, and practices in innovation is rooted in management. Managers must consider the long-term perspective in addition to the short-term perspective on innovation in order to implement the cross-functional communication factors. Looking from a short-term perspective, implementing these factors may be a demanding investment in terms of resources, which may not provide immediate benefits. However, in the long-term perspective, these factors, if prioritised, are likely to improve cross-functional communication and thereby NPD success. Managers should promote cross-functional communication by stressing the long-term value of the factors that can support more efficient innovation processes. Providing the resources to implement the supporting factors sends a strong signal from the management that long-term focus is a priority for the organisation. Without this signal, cross-functional communication is unlikely to be implemented successfully.

Considering the differences between functions, managers must continuously support a respectful climate where functions are treated equally. Marketing and technology experts come with different backgrounds - managers should acknowledge their different thought worlds and undertake formal initiatives to create a trustful climate for collaboration.

However, a respectful climate also depends on the informal knowledge sharing, which may be more difficult to influence through direct managerial initiatives. In order to achieve an open and trustful climate for both formal and informal communication, practices that support these goals need to be adopted as part of the organisational culture. This requires a long-term perspective on innovation in general by the management, and the required resources must be allocated. Demanding cooperation between functions, by using for example team incentives, is likely to promote trust and respect because it clearly indicates that innovation managers appreciate the expertise from both functions as valuable and needed. Moreover, managers should be aware that their own functional background may influence their judgements, and they need to show respect and appreciation to all key players in the innovation process regardless of their expertise.

Overall, this dissertation has contributed to a behavioural scientific understanding of integrating consumer insight information innovation. Practical implications have been proposed with particular focus on 1) motivating consumers' to interact in virtual communities for knowledge sharing and new food product development, and 2) cross-functional communication between marketing and technology functions during the innovation process.

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Declaration of co-authorship

Full name of the PhD student: Lina Fogt Jacobsen

This declaration concerns the following article/manuscript:

Title:	What Drives Consumer Interactions in Virtual Communities? The relationship between individual interests, motivations, and behavioural interaction intention
Authors:	Lina F. Jacobsen, Ana Alina Tudoran, Liisa Lähteenmäki

The article/manuscript is: Published ☐ Accepted ☐ Submitted X☐ In preparation ☐

If published, state full reference:

If accepted or submitted, state journal: Journal of Interactive Marketing

Has the article/manuscript previously been used in other PhD or doctoral dissertations?

No X☐ Yes ☐ If yes, give details:

The PhD student has contributed to the elements of this article/manuscript as follows:

A. Has essentially done all the work
B. Major contribution
C. Equal contribution
D. Minor contribution
E. Not relevant

Element	Extent (A-E)
1. Formulation/identification of the scientific problem	A
2. Planning of the experiments/methodology design and development	A
3. Involvement in the experimental work/clinical studies/data collection	A
4. Interpretation of the results	B
5. Writing of the first draft of the manuscript	A
6. Finalization of the manuscript and submission	B

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Authors:	Lina F. Jacobsen, Marcia D. De Barcellos, Alexia Hoppe & Liisa Lahteenmäki

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Element	Extent (A-E)
1. Formulation/identification of the scientific problem	B
2. Planning of the experiments/methodology design and development	B
3. Involvement in the experimental work/clinical studies/data collection	C
4. Interpretation of the results	A
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Authors:	Lina Fogt Jacobsen, Klaus G. Grunert, Helle Alsted Søndergaard, Bea Steenbekkers, Matthijs Dekker, Liisa Lähteenmäki

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No X☐ Yes ☐ If yes, give details:

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B. Major contribution
C. Equal contribution
D. Minor contribution
E. Not relevant

Element	Extent (A-E)
1. Formulation/identification of the scientific problem	C
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3. Involvement in the experimental work/clinical studies/data collection	B
4. Interpretation of the results	B
5. Writing of the first draft of the manuscript	B
6. Finalization of the manuscript and submission	B

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Authors:	Lina F. Jacobsen, Hans van Trijp, Kathleen Wagner, Liisa Lähteenmäki

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If accepted or submitted, state journal: Plan to be submitted in Journal of Product Innovation Management

Has the article/manuscript previously been used in other PhD or doctoral dissertations?

No X☐ Yes ☐ If yes, give details:

The PhD student has contributed to the elements of this article/manuscript as follows:

A. Has essentially done all the work
B. Major contribution
C. Equal contribution
D. Minor contribution
E. Not relevant

Element	Extent (A-E)
1. Formulation/identification of the scientific problem	C
2. Planning of the experiments/methodology design and development	B
3. Involvement in the experimental work/clinical studies/data collection	C
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