Measuring Customer Involvement in

New Service Development Projects

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Declaration

The author hereby declares that no portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Christine Larbig-Wüst

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Dedication and Acknowledgements

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Abstract

Service marketing managers are being required to develop new services that succeed in the market and are valuable for customers. Services Marketing literature therefore stresses the need to innovate with customers and to integrate their view into the new service developed. However, consensus about the positive effects of customer involvement in new service development (NSD) has not been reached. Drawing on the theory of organisational knowledge creation and the concept of marketing orientation, we argue that customer involvement is not related to successful new services per se. However, we propose it contributes to the increase of a firm's customer knowledge stock, the tacit and explicit dimension. The study results demonstrate that the increase in a firm's tacit customer knowledge stock significantly affects market success, project success and sustainable competitive advantage, while the increase of explicit customer knowledge stock positively influences the acceptance of new service concept ideas initiated by customers. Both the explicit and tacit customer knowledge stock is positively influenced by the level of customer involvement.

Furthermore, the internal resource-based antecedents to customer involvement decisions are investigated. Our findings illustrate that a firm's prior tacit knowledge about customers inhibits integration of customers in NSD, whereas prior explicit customer knowledge positively affects customer involvement. As for market-driven NSD, customer orientation, and project innovativeness, the study shows different effects on stages of customer involvement.

Finally, the research reveals that service firms manage customer involvement differently related to the facets of the construct, namely (1) methods and (2) stages of customer involvement. Distinct management approaches are compared and contrasted to unearth salient decision parameters.

The research is based on interviews, one expert survey and one main survey, incorporating 131 respondents of diverse service firms in nine countries. Responses have been analysed in two structural equation models by Partial Least Squares (PLS) and explored by cluster analysis.

We suggest that Service Marketing managers should be more attentive to the act of customer knowledge creation to manage customer integration in NSD effectively. Particularly, they should be aware of the role of tacit customer knowledge in order to develop successful new services. A tight customer orientation is not worthwhile throughout NSD, since new markets may be neglected when working too close with current customers. Furthermore, contrary to prevalent research, NSD executives should combine beneficial methods of customer involvement instead of focusing on one method. Using different methods helps managers to create divergent perspectives on customer preferences and needs, required to generate new ideas. Finally, we propose that customer involvement in NSD should not be seen as a short-term investment.

1 Introduction

1.1 Introduction

Services are important for the wealth of modern economies. The provision of services accounts for more than fifty per cent of Gross Domestic Product (GDP) in each Member State of the European Union (EUROSTAT, 2009). In 2005, the relative growth of services (3.7 per cent) led the U.S. economy (Bureau of Economic Analysis U.S. Department of Commerce, 2006). Commercial service innovations significantly contributed to this economic growth (Department of Trade and Industry (DTI), 2007).

Moreover, the European Commission has proved a positive relationship between Knowledge Intense Business Services (KIBS), such as computer services and Research & Development (R&D) services, and national innovation performance (European Commission, 2008). However, firms offering KIBS and R&D services are not the sole innovative service providers. Evidence on a firm level demonstrate that successful and innovative firms can be found throughout the services sectors in every OECD country (Organisation for Economic Co-operation and Development, 2005); a fact that has raised the interest of researchers in Services Marketing for the past few decades.

Given today's dynamic markets (e.g. Fitzsimmons and Fitzsimmons, 2000; Edvardsson et al., 2000; Zeithaml et al., 2006), evoked by market deregulations, heightened customer expectations, the entrance of new technologies and the growing demand of services (De Brentani, 1995; Lovelock et al, 2001; Zeithaml et al., 2006), service providers constantly need to enhance and expand their product portfolio to stay competitive. However, new service development is complex encompassing design of intricate intangible features that fulfil customer needs (Johne and Storey, 1998). One of the major challenges a service provider faces in this regard is the identification of market needs to respond accordingly (De Brentani, 1991) and reduce risk of market failure.

Failure rates of new service development tend to be high. Clancy and Shulman (1991) report a new service failure rate of 80%, for instance, in the financial service industry. Storey and Kelley (2001) disclose in their study that 30% of new service development projects of service firms in UK did not meet objectives, caused by the lack of an efficient development process and upfront homework (e.g. Alam and Perry, 2002; De Brentani, 1991), and the dearth of customer orientation and input (Martin and Horne, 1995).

A common and straightforward approach to integrate the customer's view into the new service is to solicit customers to provide information about their preferences and needs to be transformed in appropriate service features and processes by the service company. Thus, customers become an integral part of firms' NSD process (e.g. Alam and Perry, 2002; Parasuraman, 1987; Skiba and Herstatt, 2008). However, previous research in this field has demonstrated that integrating users can either lead to positive new service development outcomes (e.g. Martin and Horne, 1995; Sandén et al., 2006) or may distract firms from inventing successful new services (e.g. Enkel et al., 2005); a controversy that is taken up in section 1.2.2.

We believe that looking into the concept of customer involvement in new service development through the lens of a customer's participative role in NSD does not dwell on what customers contribute to co-development of new services, the co-operative act of customer value creation (Vargo and Lusch, 2004). This value creation process incorporates the generation, exchange and application of market knowledge (Day, 1999). Approaching the question about successful customer integration from the perspective of customer knowledge creation lies at the heart of this thesis. In this context, we address several aspects, as outlined in chapter 1.3.1.

1.2 Customer Involvement in New Service Development

This chapter provides an overview of existing definitions on customer involvement since it may help the reader to understand why customer involvement is associated with the act of customer knowledge creation. It provides the basis of the definition used in this research. Further specialist definitions are introduced later.

The point of departure of our research is the rationales of working with customers in NSD. A literature review on benefits and challenges introduces into the concept and outlines important considerations on success and failures associated with customer co-innovation that are addressed in the research aims of this thesis. Subsequently, two recent examples illustrate the multiple facets of the concept and its integration in the organisation's culture.

1.2.1 Definition of the Concept

Due to fragmented literature on the construct (Alam, 2006a) and various perspectives adopted by researchers in the past, consensus about a consistent definition has not been reached. "*Customer involvement*", "*customer integration*", "*customer interaction*" and "*customer participation*" have often been used interchangeably referring to the customer's role as active information provider (e.g. Alam and Perry, 2002; Alam, 2006a; Cermak and File, 1994; Fang, 2008; Gales and Mansour-Cole, 1991; Kristensson et al., 2004; Magnusson, 2003; Matthing et al., 2006; Skiba and Herstatt, 2008) or, when integrated to contribute to a firm's knowledge creation process, as "*co-creator*" or "*co-developer*" (Emden et al, 2006; Fang, 2008;Jeppesen and Molin, 2003; Sawhney et al., 2005). While the first definitions refer to the act of learning more about customers by applying typical market research methods, the latter represents the idea of shifting part of the responsibility of customer knowledge creation to the buyer (Edvardsson et al., 2006).

Even though these definitions refer to distinct forms of customer input, that is to say knowledge or information, they both reflect that customer involvement is associated with the customer's intellectual contribution to new service development (Matthing et al, 2004). The degree to which customers may intellectually contribute to the new service is managed in conjunction with time-related and methodical considerations to achieve pre-set NSD objectives (Sandén et al., 2006). Thus, we define customer involvement in NSD as "*the successful generation and application of customer knowledge (intelligence) in new service development projects by managing level, stages and methods of customer integration*".

1.2.2 Benefits and Challenges

A firm's primary aim of involving customers in NSD is to develop novel services that meet the requirements and needs of the market. It has been demonstrated by multiple researchers that the integration of customers is an important success factor in NSD (De Brentani, 1989; De Brentani, 1991; De Brentani, 1995). By integrating the voice of the customer into NSD, firms increase their understanding of user needs and wishes (e.g. Anderson and Crocca, 1993; Sinkula, 1994; Veryzer, 1998) which improves product quality (Damodaran, 1996). Customer involvement may also help in reducing development cycle time, i.e. "time to market" (Alam, 2006b), because continuous acceptance testing by customers can take place during the innovation process (e.g. Gupta and Wilemon, 1990; Iansiti and MacCormak, 1997). Numerous researchers stress that customers help to develop superior and differentiated new services when their creativity is harnessed (e.g. Alam and Perry, 2002; Magnusson, 2003; Matthing et al., 2006; Ulwick, 2002; Von Hippel, 1986; Wikström, 1996).

Moreover, when interacting with customers directly, NSD managers may tap into customers' mental schemas. By sharing mutual suggestions, understanding about individual perspectives and sense making of the information provided can be improved (Boland, 1978). This implies a cognitive process within which both parties, customers and NSD teams, can extend their "frame of reference", i.e. what they have experienced in the past.

It has also been recognised that collaboration with customers helps to disseminate innovation rapidly. The interaction process educates customers about specifications, attributes, and use of novel service (e.g. Alam, 2006b; Damodaran, 1996). Thus, customers may act as early adopters and promote usage of service. This behaviour is seen as an indication of their loyalty to the service firm. Customers may feel appreciated when firms listen to what they have to say (Alam, 2006b).

Despite these cogent benefits of customer involvement, service firms need to be aware of numerous challenges. When involving customers in the development process, knowledge is exchanged between firm and customers (Nambisan, 2002). Since both parties contribute to knowledge production, each party may claim the ownership of the resulting service (Hipp and Herstatt, 2006). Furthermore, when "over-listening to customers", the final service may be "too customised". Thus, the novel service may serve only a niche market (Enkel et al., 2005) resulting in unfavourable cost-and-benefit relations (Campbell and Cooper, 1999). Further arguments raised against customer involvement are based on the notion about customers not having sufficient technical knowledge to produce innovations (Christensen and Bower, 1996) and not being able to articulate latent needs (Leonard and Rayport, 1997). In addition, buyers may not detach themselves from what they know, i.e. customers are unable to imagine alternatives or future functions of utilised services (Campbell and Cooper, 1999; Enkel et al, 2005; Ettlie, 1986; Gales and Mansour-Cole, 1991).

The review on benefits and challenges illustrates that customer involvement in NSD is discussed controversially. Kujala (2003) asserts that methods and level of customer involvement need to be carefully managed during NSD in order to develop successful new services. The following examples illustrate how customer involvement could be organised successfully, and how the concept is incorporated in the firm's orientation towards customer value creation.

1.2.3 Examples

In October 2005, Bank of America reshaped consumer banking in the United States when developing its "Keep the Change" service. The bank rounds the amount of each purchase a customer makes with their Visa debit card to the next dollar, and automatically transfers the difference to the customer's savings account. The insight for Keep the Change began as the bank conducted observations of families at their homes. The bank witnessed that many people already rounded their checkbook entries to the nearest dollar for convenience reasons. Besides, they became aware that the particular customer segments could not save, either because they could not afford it or because they had difficulties controlling their impulse buying. The concept has been developed and tested with larger numbers of individuals through surveys. The name of the novel service was actually suggested by a customer focus group participant. It was also a member of the focus group who had proposed getting people to dig for change in the cushions of a couch. Bank of America took the idea and created a custom-made, 20-foot-long red velvet couch guaranteed to attract attention upon service launch (Tekes, 2007).

Since autumn 2009, the Swiss Railway Corporation SBB has been transforming its way of integrating customers in product and service development decisions. Until then, the firm focused on customer surveys and feedback reports to improve its service offerings. The national transport service provider, which transports approx. 322 million passengers and 54 million net tons of freight per year, has decided to shift partial responsibility of creating and changing transport services to a customer advisory board. The board consists of twenty-nine customers representing the population of Switzerland. The board members meet three times a year and discuss topics of high interest to passengers. The dialogue with its customers often spawns ideas that the product and service management has never thought of. None of the board’s proposals is to be rejected by corporate representatives because of being “unrealistic”. Not only does the monopolist aim for improving and redesigning its service offerings, it attempts to revamp its customer focus. The customer advisory board is organisationally attached to the head of main line traffic, to place more weight on the board’s suggestions. As one of its first moves, the board decided to develop a new online platform to discuss problems from a customer standpoint in depth. Since the advisory board has worked for less than one year, recent results are sparse. However, the entity is expected to change the way new ideas are brought forward for adding more value to transport services (Interview, T. Ebinger, 2009).

In summary, the previously stated benefits, challenges and examples illustrate that customer involvement in NSD

- is associated with customer knowledge generation and a firm's pursuit of creating customer value;
- encompasses decisions on appropriate methods and level of involvement in different NSD phases to achieve pre-set objectives and to work with customers effectively;
- may either postively or negatively affect development of new services.

These points of departure set the framework of this thesis. We do attempt to provide a more detailed view on the intricate concept, which is described in the following section.

1.3 Research Aims and Theoretical Foundations of Research

1.3.1 Research Aims

Based upon the previous outline, the research objective is threefold. First, the research aims to develop a conceptualisation of customer involvement in new service development in the knowledge creation context. We contend that the existing concepts of customer involvement do not address the essence of the construct. Proponents of customer involvement in NSD agree that interacting with customers directly leads to successful new services. With its ability to explain the construct and its role in NSD this view is clearly limited and should be expanded. Knowledge about customers exists within firms before any interaction with customers (Blazevic and Lievens, 2008). By integrating customers in their NSD initiatives, firms update, review and increase their existing knowledge stock about current and potential buyers gained from information gathered in previous NSD projects and while they were delivering the service. We adapt this view and attempt to demonstrate that market intelligence generation - the use of customer research techniques, i.e. customer involvement in NSD, does not lead to successful outcomes of NSD initiatives as such, but is mediated by the increase of stock of customer knowledge (new knowledge). Based on this assumption, we expect the following possible results:

(1) $CK_t \leq CK_0$ => Δ CK = 0 or negative; no effect of customer involvement

(2) $CK_t > CK_0$ => Δ CK = positive; positive effect of customer involvement

Where CK_0 is the stock of customer knowledge prior to project and CK_t is defined as the stock of customer knowledge at the end of the project. The difference between the two knowledge stocks determines the increase in customer knowledge (Δ CK).

Since knowledge is considered as an important resource that helps to achieve competitive advantage in conjunction with other resources, we examine the interplay of internal resource-based factors affecting customer involvement. These antecedents may intensify or inhibit customer collaboration. Examining and discussing their impact on facets of customer involvement sheds light on the relative importance of factors that influence a firm's pursuit of collaborative customer value creation.

Our research on the relationships associated with antecedents to customer involvement and customer knowledge creation is explorative and predictive by nature. We attempt to gain insights on the existence of causes and effects related to the constructs instead of confirming them. We further address this aspect in section 6.1.4.

Second, existing literature on customer involvement in NSD focuses on one or two aspects of the construct, e.g. beneficial methods of involvement. Even though there is some literature on the specific facets on how, when, why and to what degree customers are integrated in NSD, there is silence on how these crucial questions are interrelated to create successful new services. These questions determine key decisions of NSD executives to manage customer involvement in NSD. In this context, we attempt to enhance understanding of alternative customer-involvement management approaches. Contrary to existing research, we contend that there is more than one strategy-related option leading to positive results. Hence, the study focuses on exploring similarities and differences of approaches, and their beneficial outcomes.

Third, we measure customer involvement and customer knowledge creation in the context of three different new service outcomes. It has been argued in the literature that success of NSD and rationales of customer collaboration in innovation are manifold. To be in the position to govern customer integration, NSD decision makers need to have valid marketing metrics available (Matthing et al., 2004) that are related to the outcomes of customer interactions. The study therefore attempts to enrich the debate on effective work with customers.

The research questions distilled from the discussion are the following:

- *"How do the level, stages and method of customer involvement contribute to a firm's knowledge about customers and affect the success of new service development projects?"*
- *"What are important resource-based antecedents that influence learning with/from customers in NSD projects?"*

- *“What are differences and similarities of existing customer-involvement management practices?”*

Based upon these research questions, our study contributes to the concept on market orientation (Narver et al., 2004) and organisational knowledge creation in the innovation performance context (Moorman and Miner, 1997) by developing valid metrics of customer involvement in NSD (Martin and Horne, 1995) and exploring intangible resources that affect customer value co-creation (Vargo and Lusch, 2004). Detailed contributions of this study are described in chapter 7.

Some of this research will confirm existing results from new service and product development and service marketing literature, but this is the first time that the facets of customer involvement are measured from a knowledge-creation perspective and the distinct effects of internal antecedents on customer involvement are examined.

The unit of analysis of our work are NSD projects, since project teams are an important potential site for organisational learning (Keegan and Turner, 2001). By institutionalising new routines, information and processes, they benefit from experience and insights they gained in the past (Nonaka and Takeuchi, 1995).

Associated with previously stated contributions we subsequently describe the theoretical framework of this thesis. The framework contains the approach of viewing the concept of customer involvement in NSD from a learning and knowledge creation perspective. This perspective expands the view of market orientation, which emphasizes the behaviour of acquiring, disseminating and responding to market information. On the one hand, behaving consistently in a market-oriented fashion reflects the firm’s culture of market-based learning. On the other hand, it guides decisions on how to innovate with customers.

1.3.2 Theoretical and Conceptual Foundations of Research

Our research arises from the imperative that market-oriented firms need to generate and act on market intelligence. Researchers consider this as the *act of using traditional market research tools and market databases, employing high-touch techniques such as working closely with lead users, visiting customers and benchmarking of customer value creation processes* (Kohli and Jaworski, 1990; Slater and Narver, 2000). The definition accrues from the notion that organisations need to (1) develop knowledge about current and future needs of customers, (2) disseminate it within the organisation, and (3) act on it to compete successfully in the market (Kohli et al., 1993; Kohli and Jaworski, 1990). The authors stress that the three behavioural constructs allows one to assess the degree to which an organisation is market-oriented and echoes the implementation of the marketing concept. Narver and Slater complement the view of Kohli and Jaworski by proposing that market orientation is a form of corporate culture that provides norms for behaviour regarding customer and competitor orientations and interfunctional coordination. They define market orientation as *the firm's culture and commitment to the continuous creation of superior customer value* (Narver and Slater, 1990; Slater and Narver, 1994). "*Specifically this entails collecting and coordinating information on customers, competitors, and other significant market influences (such as regulators and suppliers) to use in building superior customer value*" (Slater and Narver, 1994).

Both definitions share the idea of acquiring and acting on relevant information and knowledge about markets in order to direct marketing efforts. This view has been expanded in the work of Narver et al. (2004) and Baker and Sinkula (2007) who investigate the effect of market orientation on product innovation. Both studies address the controversial debate on whether market orientation leads solely to incremental innovation. This relationship has been constituted in the literature due to the prevalent notion that customer orientation lies at the heart of market orientation and is concerned with achieving high customer satisfaction. Christensen and Bower (1996) state that constantly focussing on customers and satisfying them with appropriate products - that is, being customer-led - may restrain firms from developing radical new products and services because they fail to anticipate needs of future markets. Slater and Narver (1998) emphasize that being customer-led is part of customer orientation and as such, it is an important element of market orientation. However, according to the authors, the philosophy of market orientation goes beyond satisfying expressed needs to understanding and satisfying customers' latent needs, and thus, is longer term in focus. Narver et al. (2004) have developed this distinction further. They introduce two terms: (1) proactive market orientation which is based on the philosophy of leading customers by anticipating and acting on their latent needs, i.e. developing products new to the market, and (2) responsive market orientation which refers to a firm's propensity to be market-driven, i.e. developing products aiming to satisfy expressed existing needs of customers. However, although related to new product and service development, the identification of latent and expressed customer needs should be distinguished from innovation, the successful implementation of new services and products (Hurley and Hull, 1998). Innovation is a business function that coexists with market orientation (Han et al., 1998) based upon organisational learning (Baker and Sinkula, 2007) and refers to the appropriate transformation of customer need information into new products and services.

Researchers argue that innovation stems from an innovative strategy (Han et al., 1998; Li and Atuahene-Gima, 2001) and a culture that implies special capabilities of implementing new ideas associated with insights gained from the environment (Hurley and Hull, 1998), e.g. market opportunities.

It is worth noting that innovation literature emphasizes the synergistic effect of market orientation and organisational learning. This effect has been addressed in the previous works of marketing researchers (Sinkula, 1994; Slater and Narver, 1995). The authors note that the behavioural elements of the market orientation are compatible with gaining external knowledge (Day, 1994a). Furthermore, market-oriented organisations provide the cultural framework from which a learning orientation can develop (Slater and Narver, 1995), and hence can be described as learning-oriented organisations. Researchers define the inherent pursuit of learning about markets as *market-based organisational learning* (e.g. Hoe, 2008; Morgan, 2004). The concept contains "*the learning values, capabilities, processes and behaviours that facilitate the dynamic fit between organisations and their marketplace environments*" (Morgan, 2004). It captures important elements of organisational learning required to respond to a marketplace appropriately:

(1) Learning values reflect the understanding that market information is a critical input for firms' development process. These values support organisational cognition by directing the content and interpretation of knowledge in the dimensions of market orientation (Kok et al, 2003). (2) Capabilities refer to competencies gained from engaging in mechanisms and processes for planned learning (Slater and Narver, 1994). These capabilities encapsulate knowledge and skills as well as technical and managerial knowledge systems, which enable learning about markets through information processing behaviour in new product and service development (Kok et al., 2003). (3) Processes pertain to

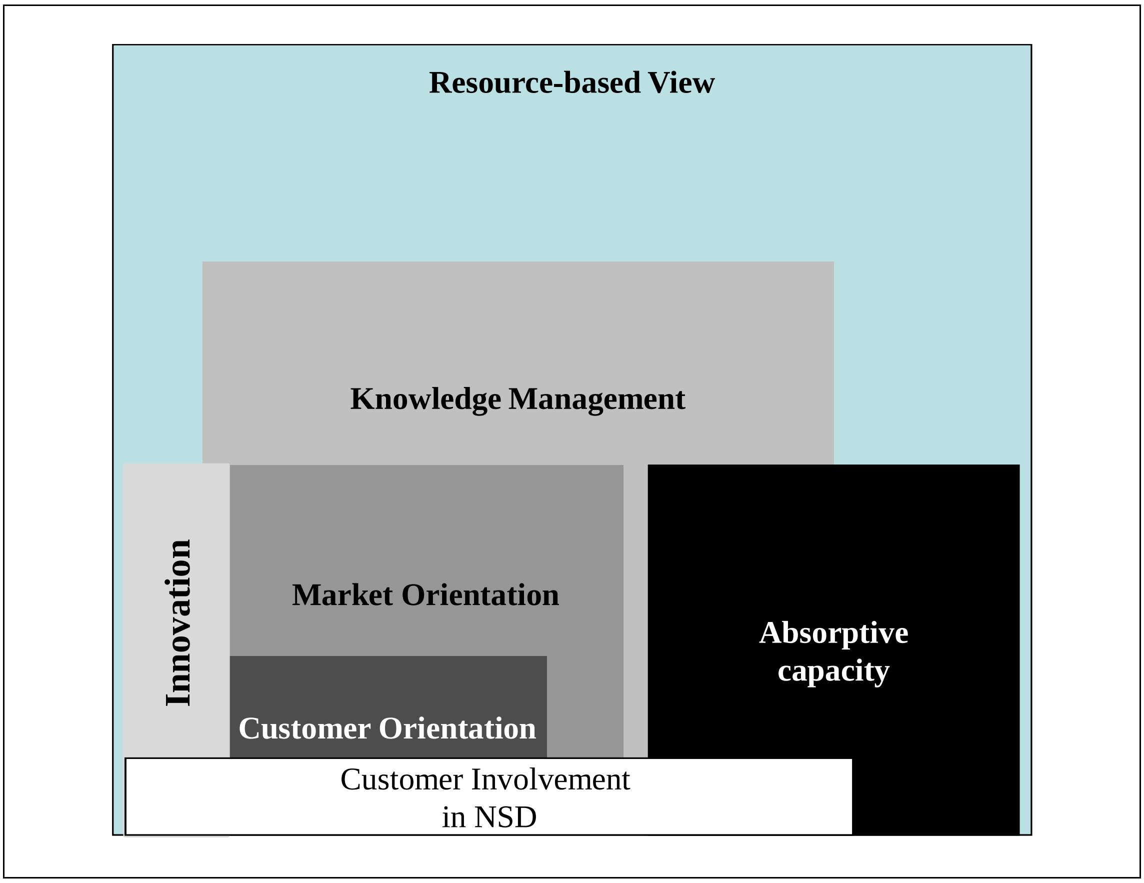
organised systems based on marketing behaviour and are founded upon a pattern or stream of decisions (Morgan, 2004). (4) Behaviour refers to the activities that underlie the generation and dissemination of market intelligence and the associated response by all parties within the firm (e.g. Jaworski and Kohli, 1993; Kohli and Jaworski, 1990; Morgan, 2004). These activities are frequently summarised by the term “market-sensing” (e.g. Day, 1994b). The evaluation of these activities leads to enhanced knowledge and skills in a firm and determines the search for missing knowledge (Kok et al., 2003).

Related activities can be found in the theory of knowledge management, namely acquisition, creation, storage, transfer and application of knowledge (e.g. Alavi and Leidner, 2001; Davenport and Prusak, 1998). Knowledge management (KM) refers to “*identifying and leveraging the collective knowledge in an organisation to help the organisation compete”* (Alavi and Leidner, 2001 referring to Von Krogh, 1998). KM enables organisations to gain access to the knowledge held by individuals and groups. It also involves the discovery and resolution of opportunities or problems, and the generation of innovations (e.g. Matusik and Hill, 1998) within the context of NPD/NSD (Nonaka and Takeuchi, 1995). Learning to be able to exploit opportunities is based on coordinated search procedures (knowledge acquisition) and is encapsulated in a firm’s dynamic capabilities (Zahra and George, 2002; Zott, 2001) of which absorptive capacity is an important part of (Cohen and Levinthal, 1990). These capabilities are a prerequisite of gaining competitive advantage.

Absorptive capacity, “*the ability to recognize the value of new information, assimilate it, and apply it to commercial ends*”, stems from the stock of knowledge within firms (Cohen and Levinthal, 1990). According to the resource-based view, a firm’s existing knowledge stock strengthens the ability to learn (Barney, 1991; Teece and Pisano, 2004). By doing so, the stock of knowledge becomes a unique resource that complements another valuable organisational resource, namely market orientation (Hurley and Hult, 1998).

As previously noted, researchers argue that customer involvement in NSD is associated with learning about buyers, their stated and latent needs, preferences, wishes, and values (Edvardsson et al., Matthing et al, 2004) and the act of knowledge co-creation to develop new services (Blazevic and Lievens, 2004). We conclude from this that the concept of this study is concerned with the research streams of market orientation, organisational learning, knowledge management and innovation (Figure 1).

Figure 1 Conceptual and Theoretical Foundations of Research



All concepts are based on the assumption that internal resources and capabilities, such as absorptive capacity, determine the internal environment facilitating the achievement of competitive advantages. Hence, the research models of this thesis build on these theoretical concepts and refer to them respectively.

In the next section, we describe the structure of the dissertation and the content of the chapters.

1.4 Dissertation Outline

After the introductory chapter, this dissertation outlines the general understanding of the constructs within which customer involvement in NSD is embedded: (1) new services and (2) new service development. Chapter 2 describes different perspectives elaborating the foundations of the concept we study. First, we provide a definition of new services referring to the degree of newness manifested in a firm's new service strategy. Second, we describe three distinct perspectives of new service development: NSD as a (1) sequence of tasks, (2) network of individuals and (3) learning process. The chapter attempts to shed light on the organisation and the core elements of NSD.

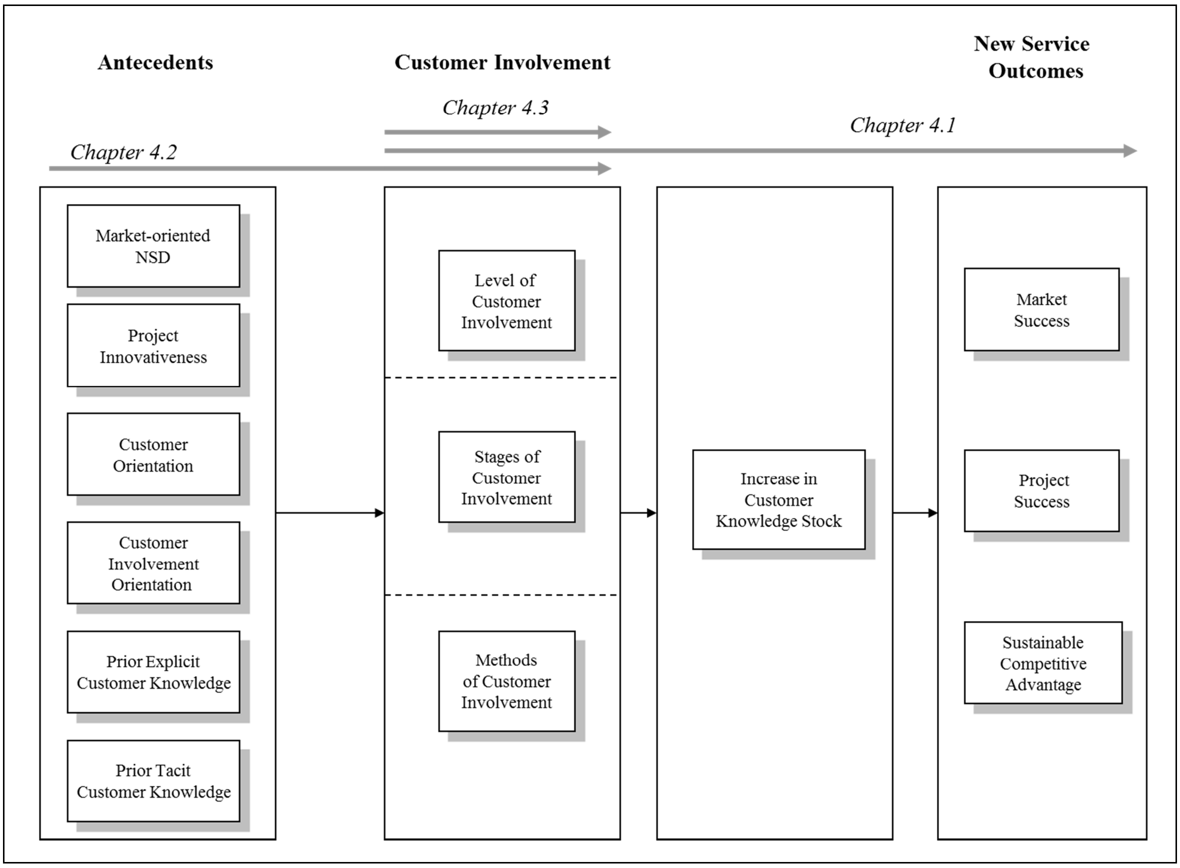
In chapter 3, existing research on customer involvement in new service development is summarized. Furthermore, we address current research gaps stressing the need of this research.

Chapter 4 outlines the concepts of customer involvement in three research models or parts. The parts are interrelated, but may also be viewed as separate studies. We first conceptualize the relationships of customer involvement, stock of customer knowledge and new service outcomes. Then, we hypothesize the relationships between internal determinants and customer involvement in NSD stages. Finally, we explore distinct customer involvement management approaches pertaining to the methods and stages of customer involvement in NSD. Figure 2 illustrates the content of the three sections and their relationship.

In chapter 5, we report on the development of our constructs and research methodology. This empirical research is based on expert interviews, an expert survey and a main survey incorporating key informants in marketing departments of service firms.

The subsequent chapter summarizes the findings of the three studies. Chapter 7 discusses our results in detail and outlines theoretical and managerial implications. In chapter 8, we point to limitations of our study and suggest approaches for future research. We close with a synopsis of the main findings about customer involvement in NSD in chapter 9.

Figure 2: Research Concepts



2 New Services and New Services Development – A Review

2.1 Introduction

Looking into "*new services*" and "*new service development*" is central to this research. We therefore account for this by introducing viewpoints and approaches towards these two important services marketing realms.

2.2 New Services

In recent years, service competition and development of new services that create customer value have become a major challenge in almost every industry. Firms must offer services to differentiate themselves and adapt to the requirements of prospering service economies. Services, chiefly associated with service industries and companies whose core product is a service such as financial services, health care, telecommunication services and information technology, refer to "*deeds, processes, and performances*" (Zeithaml et al, 2006). Services include "*all economic activities whose output is not a physical product or construction, is generally consumed at the time it is produced, and provides added value in forms (such as convenience, amusement, timeliness, comfort or health) that are essentially intangible concerns of its first purchaser*" (Quinn et al, 1987). A service is more than its core functions, i.e. the service product or offering, which is purchased (Johne and Storey, 1998). It also refers to customer service, a service or augmented offer that supports a company's core products (Zeithaml et al., 2006) and derived services that are provided by any physical good or service offer (Lusch and Vargo, 2006). The broad perspective on what a service is reflects the wide area of service innovation opportunities to be exploited by service providers. Storey and Easingwood (1998) stress that expanding the standpoint on services and understanding the total offering from the viewpoint of a customer are crucial for success of novel services. By seeing services from the customers' perspective, service managers may identify the utility or value customers receive by using the service, which is the basis for service competition (Grönroos, 1990).

Within the past decades, service industries have extended their R&D spending continually. Although most service firms do not have a formal R&D department, they do undertake this kind of activity to deliver a stream of new services (Commission of the European Communities, 2007). The growth in R&D investments could be explained by the circumstance that services can be easily copied resulting in recurrent new service development activities to strengthen a firm's competitive advantage (Easingwood, 1986). Upon new service strategy definition, firms lay the groundwork for innovations. They will be in a better position to plan both its development activities and growth on new services. New service strategies distinguish novel services by their degree of newness (Zeithaml et al., 2006). Service innovativeness or newness refers "*to the degree of familiarity organizations or users have with a service*" incorporating totally new, or discontinuous, product/service innovation and simple line extensions or minor adaptations/adjustments that are of an evolutionary, or incremental, nature (e.g. Griffin, 1997). Distinguishing novel services by newness is vital, since it accounts for the potential levels of risk and uncertainty associated with new service development (De Brentani, 2001).

2.3 New Service Development

2.3.1 Introduction

In the literature on Services Marketing, the words "*service innovation*" and "*new service development*" (NSD) are often used interchangeably, referring to the act of successfully inventing and commercialising service products, which are new to the supplier (Johne and Storey, 1998).

New service development (NSD) is a crucial element within services marketing and a firm's new service strategy. The concept is intricate since it incorporates complex interaction processes. Key to understanding the interplay of its elements – tasks, actors, resources and knowledge, determinants of successful NSD initiatives, are three different research approaches prevalent in existing service marketing literature: (1) task and decision orientation, (2) network concept orientation, and (3) learning process orientation.

2.3.2 New Service Development – A Chronology of Tasks

Much of the research into the NSD has focused on the sequence of different stages in the development process to account for the necessity of proficiency in successful NSD (e.g. De Brentani, 1995). Within this formal procedure, series of tasks are executed during consecutive and separated or concurrent phases (e.g. Davis, 1993). The NSD process is similar to its generic equivalent – new product development - although the importance of the stages may vary due to unique characteristics of services (Johne and Storey, 1998). Many models have followed the stage-gate process of Booz et al. (1982) who distinguish five operational phases: (1) idea generation, (2) concept development and evaluation, (3) business analysis, (4) service development and testing and (5) market testing and launch. Each step in the process refers to a checkpoint specifying requirements that a new service must meet before it can proceed to the next stage of de-

velopment (Zeithaml et al., 2006). Thus, managers are in the position to allocate resources and manage people and efforts towards the expected results of each phase.
Much of the research has looked into the organisation of different stages in the development process (e.g. Scheuing and Johnson, 1989). The debate has revolved around what stages should be carried out sequentially or concurrently (Alam and Perry, 2002) to speed up the development process, an important internal performance measure for achieving “time to market” objectives (Storey and Kelly, 2001). As a corollary to this process-oriented view, research has started to examine how firms reconcile this process with their marketing concept to develop market-oriented products and services. This can be achieved by defining activities that could be performed by customers at each NSD phase (Appendix 1). Consequently, the new service development process becomes customer-oriented (Alam and Perry, 2002).

In recent years, two new perspectives on the NSD process have emerged in the marketing literature: (1) the concept of a social network, and (2) the behavioural and cognitive view of organisational learning.

2.3.3 New Service Development – A Network of Actors

Creativity is a fundamental ingredient in NSD that can be boosted when people join forces (Beirne and Cormack, 2009). Throughout the NSD process, individuals, e.g. employees and customers, collaborate and have a share in creating the new service. Indisputably, people should be managed to exert their individual contribution to new ideas and concepts, and to achieve high NSD team performance. Since collaboration is predominantly characterized by social interaction, two aspects are crucial for successful outcomes: first, *who* needs to be involved in NSD and second, *how* should they interact to create successful new services.

The former concerns the determination of internal and, more important, external actors, and their roles in NSD, because interdependences within organisations as well as between organisations and their environment have a significant impact on the service innovation process. For example, companies depend on acceptance of their products and services by their target markets. On the other hand, customers desire products and services that satisfy their needs. The exchange of information - internal and external - is one key factor in this context. The ethos of services is interactivity and relationships. Services, by their very nature, are developed and consumed as a process with a multiplicity of actors (Syson and Perks, 2004): (1) employees, (2) (potential) customers, (3) suppliers/distributors and (4) boundary spanners – individuals within the organization who serve as mediators of communication between the NSD team and outside sources (Lievens and Moenaert, 2000). Actors are defined as those individuals, groups and organisations that have access to or are in control of resources, i.e. physical, intangible, financial and human assets. By interacting with each other, they become an integral part of a network (Syson and Perks, 2004).

The latter refers to the form of interaction that affects the facilitation of resource exchange between actors, e.g. obtaining access to specialized skills of customers involved in NSD. Kristensson et al. (2004, 7) illustrate this effect in their work on user creativity in NSD: "*A deepened interaction between a user and a company may increase the likelihood of making new combinations of previously disconnected and unrelated informational elements. This is because a user who interacts with a company will gain access to the possibilities and limitations of that company and its resources and will have the op-*

portunity of combining this information with the sticky information about the user's own needs and setting of use. If users are given information about need-related aspects of a certain product, then a user can incubate this knowledge and, if motivated, can combine it with personal needs in the environment". Thus, interactions are vital in the NSD process and a key element of networks (Syson and Perks, 2004).

In summary, the social network perspective illuminates the value of actors and their interactions in the service innovation process. Unlike the task-oriented view, the social network perspective is more dynamic and can be more valuable in identifying and nurturing appropriate relationships (Syson and Perks, 2004). Furthermore, this view is helpful for the design of the arena for networks (Gummesson, 2006); that is to say, determining how value is co-created by actors.

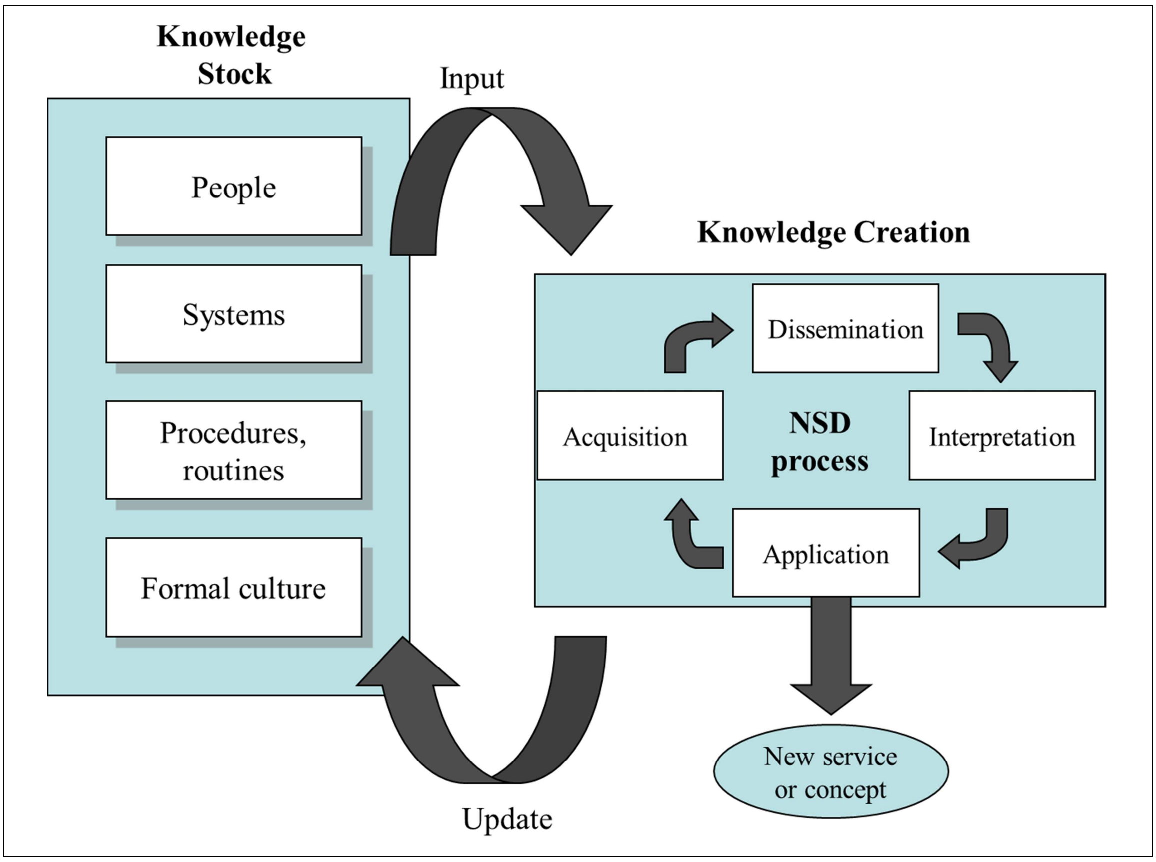
2.3.4 New Service Development - A Learning Process

Recent research has addressed the aspect of organisational learning in NSD literature (e.g. Matthing et al, 2004; Roberts et al., 2005; Stevens and Dimitriadis, 2004) stressing that knowledge creation needs to be coordinated effectively to achieve desired knowledge outcomes. While innovating, NSD team members share and improve ideas, interpret information, experiment and test, tell stories, apply intuitions and share experiences. By doing so, they build collective new knowledge that has the potential to affect behaviour (Slater and Narver, 1995 adapted from Huber, 1991), and produce new inferences (Nonaka and Takeuchi, 1995). This implies managing the tension between knowledge previously institutionalised and emerging new knowledge (March, 1991).

Since key characteristics of organisational learning are capabilities and knowledge processes, i.e. knowledge acquisition, knowledge dissemination, interpretation, and knowledge use (e.g. Demarest, 1997; Nonaka and Takeuchi, 1995), the knowledge creation perspective unleashes new ways of managing the NSD process. According to this view, NSD managers may focus on what type of knowledge is required and how it should be combined with capabilities to create customer value. For example, changes in the marketplace call for a review of existing procedures and the way firms deliver value to their customers. To respond to these changes effectively, NSD managers conceive the necessity of changing "routinized actions" and rules leading to cognitive conflicts at the individual level (Stevens and Dimitriadis, 2004).

By sharing and linking cognitive conflicts and individual perspectives, the NSD team achieves convergence of representations that lead to new inferences. This learning process is based on the diversity in capabilities and knowledge of employees and customers/suppliers that stimulates new ideas and helps to gain new insights through different perspectives (Blazevic and Lievens, 2004 adapted from Easterby-Smith, 1997; Garvin, 1993). The new service product and update of a firm's stock of knowledge are results of this knowledge-creation activity (Madhavan and Grover, 1998; Moorman and Miner, 1997). Using existing stock of knowledge and continuously generating new knowledge are fundamental elements of an organisational learning cycle (March, 1991). Figure 3 illustrates the relationship of knowledge stock and knowledge creation in the context of new service development. Nonaka and Takeuchi (1995, 3) emphasize the dynamic and asset-related aspects of knowledge creation: *"By organizational knowledge creation we mean the capability of a company as a whole to create new knowledge, disseminate it throughout the organization, and embody it in products, services, and systems"*.

Figure 3: NSD as Learning Process



To summarize, new services are defined by their degree of newness and reflect a firm's new service strategy, which influences its new service development initiatives. Three distinct approaches to expound new service development are prevalent in the literature. Viewed as a chronology of phases, the service innovation process emphasizes the coordination of tasks and decisions. The network perspective highlights the coordination of people and the importance of managing social interactions. The third view on new service development underlines the relationship of innovation and knowledge creation; i.e. learning.

We consider the network and the knowledge creation perspective as the centre of this thesis. The customer is viewed as a relevant actor that should be included in NSD (e.g. Alam, 2002) to act on the firm's knowledge resources that affects new service outcomes. As a pivotal component, we regard the form of customer interaction, defined as facets of customer involvement. Hence, an extensive literature review on methods, stages, level and objectives of customer involvement was conducted. It shows the state of research of managing forms of customer integration that imbues the entire study, and particularly the third model.

Customer involvement in innovation per se is not a new concept. What is new is the recognition that customers are knowledge co-creators (e.g. Blazevic and Lievens, 2008; Prandelli et al., 2008). Hence, our literature review contains a section on customer knowledge creation manifested in our first model. Finally, since knowledge is a resource that creates effects when combined with other firm resources (Kogut and Zander, 1992), e.g. market orientation, we investigate its relative impact on customer involvement. Hence, section 3.4 introduces the resource-based antecedents to customer involvement in NSD to set the agenda of the second part of our research.

3 Customer Involvement in New Service Development – A Review

3.1 Introduction

Although our definition indicates that customer involvement in NSD goes beyond traditional marketing research, the annual statistic of ESOMAR is the most comprehensive global source of indicating the significance and use of customer involvement practices. In 2007, firms spent approx. USD 28 billion on market research. The largest share of investments is accounted for new product and service development research (ESOMAR, 2008, 59).

The idea of integrating customers in commercial development activities has its foundation in the resource dependence theory (Gruner and Homburg, 2000; Kausch, 2007). The theory proposes that firms actively determine their own fate by attempting to gain control over environmental resources. Since customers are viewed as knowledge carriers, i.e. resource-owners, firms become dependent on them. Thus, they will seek to manage dependence and reduce the resulting uncertainty by purposely structuring their exchange relationships through (semi-)formal links (Pfeffer and Salancik, 1978; Ulrich and Barney, 1984).

In the past few decades, this view has become an important element of the concept of market orientation. The central point of this concept is the acquisition and dissemination of market knowledge, i.e. knowledge about competitors and customers (Marinova, 2004). By employing customer research techniques, firms may collect information to develop market-oriented products and services (Kok et al, 2003).

The imperative of involving customers in innovation activities has initially been addressed in the literature of new product development. Recognizing "the voice of the customer” and its integration in new products has been viewed as a central element in NPD, because of high failure rates of new products. Some companies claim a maximum failure rate of 10 per cent (Trott, 2005). However, because of the inherent characteristics of services, integrating customers in NSD becomes even more important than in NPD. Services are typically produced and consumed simultaneously. Thus, customer participation at some level is inevitable in service delivery and co-creation (Zeithaml et al., 2006). However since customer involvement is a multifaceted construct, managers face the challenge of determining the “ideal” way of working with customers.

Numerous studies, most of them qualitative in nature, have attempted to shed light on this issue by looking into how customers are involved in NSD (e.g. Alam, 2006a; Bamforth and Brookes, 2002; Durgee et al., 1998; Griffin and Hauser, 1993). Even though these studies clearly demonstrate the usefulness of particular methods, they have not brought up a conceptual framework within which the facets of this phenomenon are embedded. One of the most comprehensive studies has been conducted by Ian Alam. According to the author, four perspectives describe the concept: (1) modes or methods of involvement, (2) objectives of involvement, (3) intensity of involvement, and (4) NSD stages (Alam, 2002). These dimensions set the scope of management decisions on customer knowledge co-creation to develop successful new services.

3.2 Facets of Customer Involvement in New Service Development

3.2.1 Methods of Customer Involvement

Market-oriented organisations need to develop new intelligence about market requirements (Kohli and Jaworski, 1990; Narver and Slater, 1990). This will be achieved by employing methods of customer involvement, i.e. means through which input and information are obtained from customers (Alam, 2002). Numerous researchers have stressed that particular modes of customer interaction lead to useful service ideas and/or increase service performance (e.g. Martin and Horne, 1995; Kaulio, 1998; Sawhney et al., 2005; Ulwick, 2002). In this context, NSD managers should apply modes that capture more than just attitudes and intentions toward services existing in the marketplace Ogawa and Piller, 2005). They should employ new and proactive techniques of customer involvement that go beyond the focus of traditional market research; aiming for using customers as innovators (Edvardsson et al., 2006). Blazevic and Lievens (2008) refer these methods to the act of knowledge co-creation.

Within recent years, the phenomenon of knowledge co-creation has been intensively studied in the context of *commercial virtual communities*. Sponsored by companies, they function as platforms for customers who collectively co-produce and consume content about a commercial activity related to their centre of interest (Wiertz, 2005). By monitoring and actively encouraging peer-to-peer conversations in virtual communities, firms are in the position to understand why ideas are exchanged and to gather new insights about wants, trends and customer problems. Simultaneously, firms overcome the limitations of conventional market research techniques. Commercial virtual communities are not constrained in frequency of interactions with customers and privacy concerns users may have; this may be considered an enrichment of information (Sawhney et al., 2005).

3.2.2 Objectives of Customer Involvement

The overall objective of user involvement is developing successful new services (Alam, 2002). Existing literature on customer involvement in NSD demonstrate that objectives of customer involvement are not new service success measures per se, but determine underlying rationales of working with customers in NSD. They are customer-based and thus, reflect solely one dimension of success. For example, Magnusson (2003) identified six major objectives of customer involvement: (1) new ideas and inventions, (2) testing ideas, concepts and prototypes, (3) enhanced understanding of user value, (4) mutual learning, (5) enhancing the customer's competence, and (6) reducing cycle time. Alam (2002) stress that objectives of customer integration in NSD are related to its benefits: (1) reduced cycle time, (2) user education, (3) rapid diffusion, (4) improved public relations and (5) building and sustaining long-term relationships. Anderson and Crocca (1993) add that user involvement in NSD is associated with faster and improved learning.

Although they clearly represent the value of the concept, these objectives are not specific and measurable, an important requirement to manage and plan business activities effectively (Armstrong, 1982). For example, measuring reduced cycle time requires similar projects of the past as benchmarks that may not exist because of changes in the market environment. Likewise, qualitative objectives such as improved public relations and user education are not precisely operationalized to be measurable.

According to Griffin and Page (1996), objectives that capture successful development activities should be aligned to the innovation strategy and clearly indicate the long- and/or short-term intentions of the firm. Hence, the effect of customer involvement in NSD should be measured by a broad spectrum of financial, customer and internal objectives (Storey and Kelly, 2001). Martin and Horne (1995) stress that achieving NSD success is related to the level of customer involvement.

3.2.3 Level of Customer Involvement

Firms need to decide on the extent to which customers should support NSD managers in developing commonly understood (shared) meanings related to the new service. The degree to which customers and/or information about customers conveyed through research means are integrated in this learning process can be described as intensity or level of customer involvement, a facet that management needs to control to avoid overload of external and internal resources (Datar et al., 1996; Sandén et al., 2006).

This part of the construct is concerned with the customers' roles in NSD. Since information about "needs" or ideas of novel services resides within customers (e.g. Alam, 2002; Kristensson et al, 2004; Kristensson et al., 2002, Matthing et al., 2006) firms engage them more or less intensively; i.e. as informants, consultants or participants (Damodaran, 1996). Setting the degree of customer involvement prior to service development projects helps managers to define how dialogues with buyers need to be designed in order to develop a shared language and understanding, one fundamental element of the knowledge co-creation process (Lundkvist and Yakhlef, 2004).

Even though there is a common understanding that level of involvement is linked to the role of customers, a clear definition is absent in the literature. Alam (2002) defines level of customer involvement in NSD as a "*continuum, where passive user participation is at the least intense end of the continuum and representation, i.e. participative decision making, is at the extreme intense end of the continuum*". The author has analysed four levels of involvement ranging from low to high involvement: (1) passive acquisition of input, (2) information and feedback on specific issues, (3) extensive consultation with users, and (4) representation. The author has found that extensive consultation and information/feedback are the most preferred levels of customer involvement since they were easier to manage, less expensive and less time-consuming than a high degree of integration.

The idea of categorising level of customer involvement based on methods of involvement or roles of customers has already been addressed by the previous research of Damodaran (1996) and Martin and Horne (1995). However, numerous researchers censure those activities being performed in innovation management measures as neither "level of proficiency" (Cooper and Kleinschmidt, 1986) nor intensity of customer involvement (Skiba and Herstatt, 2008). For example, in ethnographic methods, customers do not actively take part in NSD, but act as remote sources of information. By doing so, they increase firms' understanding of how customers use their services. Thus, measuring level of customer involvement based on participation methods does not clearly reflect the inherent characteristics of customer involvement (Edvardsson and Olsson, 1996; Kaulio, 1998), that is to say, the degree of learning about customers.

Rather than being implied in methods of integration, level of customer involvement should be measured by the "richness of integration" and the "size or scope of customer groups". This distinct approach considers that tapping into social knowledge and experiential contexts of customer consumption can only be achieved when firms richly interact with their buyers; whereas firms in need of gaining insights from a broad customer base can manage customer integration in terms of size and scope of customer groups (Sawhney et al., 2005).

Often customers are integrated in several phases of NSD (Alam and Perry, 2002; Kaulio, 1998) which led to the idea of measuring intensity of customer involvement by summing up customers' input during the entire development process (Fang et al., 2008;

Gruner and Homburg, 2000). It is an approach of quantifying verbal information of customers in NSD, which does not account for the level of quality of customer integration.

Despite the previously described debate, there is a common agreement in the literature that high and low involvement is associated with the usefulness of customers as a resource and can play a key role in the phases of the innovation process (Fang et al., 2008).

3.2.4 Stages of Customer Involvement

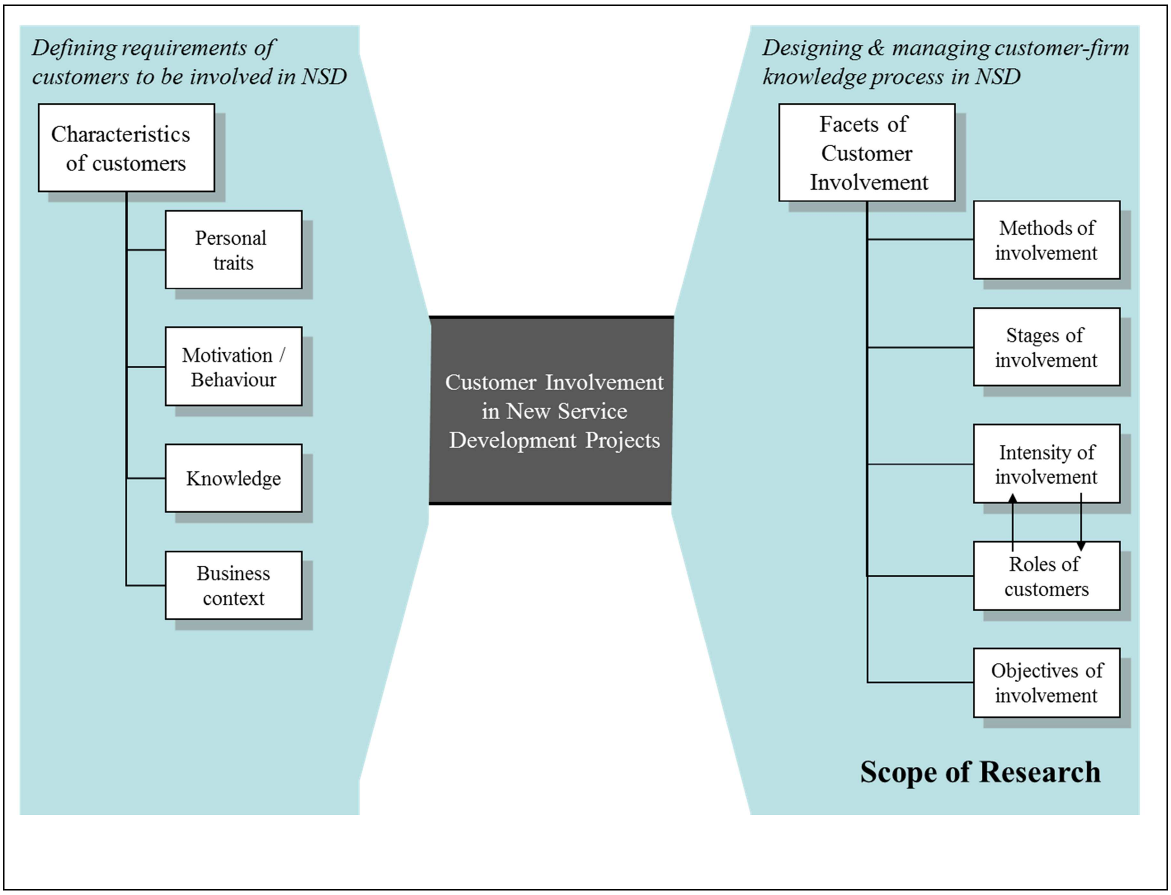
As discussed in chapter 2.3.2, the NSD process incorporates several phases. Since collecting, sharing and processing information about customers is a key element in every phase of firm's market-oriented new service development process (Alam and Perry, 2002), these stages are tied to customer involvement. Customers are integrated to ensure that customer-orientation is pursued from idea generation to launch of the novel service. Alam (2006b) presents an exhaustive list of activities customers may perform throughout the process (Appendix 1). The author suggests ten phases of customer involvement, but adds that the number of phases can vary, because firms – especially small organizations – tend to conduct some steps in a parallel fashion. Thus, the number of stages of customer involvement ranges from five to ten.

Consensus on the optimal moment and duration of involving customers in the innovation process to create successful new services has not been reached. For example, it is beneficial in the idea generation phase (Alam, 2006a), evaluation phase (Feldman and Page, 1984), concept development and testing phase (Von Hippel, 1984) and throughout the development process (Maidique and Zirger, 1984). The discussion about the timing of customer involvement is associated with the risk and uncertainty that the firm intends to reduce. By involving customers in the “fuzzy front-end”, i.e. idea generation and screening phase, only concepts will be developed that fit to customers’ needs. However high costs of providing mechanisms to structure and channel customers’ inputs (Sandén et al., 2006) and unwanted knowledge spill over or users’ claim of idea ownership (Hipp and Herstatt, 2006) may impede the work with customers at earlier development phases. Findings on successful customer integration in late NSD phase, i.e. back-end, are absent in the literature.

3.2.5 Characteristics of Customers

Numerous researchers stress that characteristics of buyers need to be taken into account when “typecasting” customers for collaborative NSD. According to multiple researchers, zooming in characteristics of customers and selecting them based on (1) personal traits (Gruner and Homburg, 2000; Von Hippel, 1986), (2) inherent motivation/behaviour (Alam, 2003; Berthon et al., 2007; Jeppesen and Frederiksen, 2006), (3) knowledge (Christensen and Bower, 1996; Sim et al., 2007), (4) their status in firms’ business context, e.g. strategic fit of customers and firm (Alam, 2006a), or (5) duration of relationship (Littler et al., 1995), help firms to overcome inherent risks of customer involvement (Enkel et al., 2005; Sim et al., 2007). Like seeking the best employee for a job, firms choose customers based on their competences, attitudes and their relevance to the firm prior to any collaboration (Desouza et al, 2008). In contrast to the previously discussed components of customer involvement, this facet is not part of the learning cycle in NSD and thus, is not incorporated in our research (Figure 4).

Figure 4: Facets of Customer Involvement in NSD



This dissertation focuses on the managerial facets of customer involvement incorporated in the process of designing and managing customer-firm knowledge creation in NSD: (1) methods of involvement, (2) stages of involvement, (3) level of involvement, and (4) objectives of involvement.

We conclude from the literature review on the facets of customer involvement that certain research gaps exist, which refer to our research questions. First, the managerial facets of customer involvement contain methods, level, objectives and stages of customer involvement in NSD. Existing research lacks insights on how these dimensions are interrelated and combined in NSD. Prevalent literature on methods of customer involvement emphasizes the application of particular methods to generate successful new service outcomes. It could be assumed that because of inherent risks of service development, firms employ more than one method within their development process. We believe that a combinative effect exists when multiple methods are applied in NSD.

Furthermore, in learning environments, selected methods should be consistent with objectives. By reconciling them, the process of learning can be managed towards desired outcomes (Bloom et al., 1956). There are, however, multiple objectives that could be considered when working with customers. Existing literature lacks insights about the effects of customer involvement on distinct new service outcomes, e.g. financial, customer and internal success metrics.

In addition, it has been described that level of customer involvement could be measured by roles of customers, methods and phases of involvement. However, researchers argue that these constructs do not reflect the inherent characteristics of customer involvement. The existing concept of Sawhney et al. (2005) implying the linkage of customer involvement management and customer knowledge creation appears a reasonable alternative. However, metrics on the concept to explore meaningful relationships with the construct are absent.

Another research gap accrues from studies on stages of customer involvement. Prior research stresses that the integration of customer is beneficial in early phases of innovation or throughout NSD. Analyses including all phases of customer integration may compare and contrast their distinct relationships with relevant outcome variables. Insights on this issue are absent from the literature.

In the next chapter, we adopt the perspective of customer knowledge creation related to customer involvement in NSD. It incorporates the theoretical rationales for integrating the process of customer knowledge creation when innovating with customers. The chapter defines relevant terms in this context.

3.3 Customer Knowledge Creation in NSD

Information about market environment, particularly about customers, is the source of stimulating firm's knowledge (Day, 1994b; Nonaka and Takeuchi, 1995) and the driver of organisations' market-oriented strategy (Narver and Slater, 1990). Researchers in the field of customer involvement in service innovation therefore consider the input of customers as a crucial success factor of new service development (e.g. Callahan and Lasry, 2004; Damodaran, 1996; Kristensson et al, 2002; Martin and Horne, 1995). It has been argued that new service success is a direct consequence of the degree to which service firms collaborate with customers by deploying particular involvement methods. By doing so, firms are in the position to harness important new service ideas from customers. Blazevic and Lievens (2008) emphasize that this view is valuable since it sheds light on the usefulness of information acquisition techniques, e.g. face-to-face meetings, personal interviews. However, it does not account for the worth of knowledge within NSD and hence, its ability to explain successful new service development outcomes is limited. Market information provides a new view for interpreting events or objects of the firm's external environment, which makes visible previously invisible meanings or unveils on unexpected connections. Thus, market information is a necessary medium or material for eliciting and forming organisational knowledge (Bateson, 1979). It affects knowledge by adding something to it or restructuring it (Nonaka and Takeuchi, 1995). When processing information, that is, acquiring, distributing and interpreting information, organisations give meaning to it (Daft and Weick, 1984, 294; Sinkula, 1994).

However, information processing is insensitive to the creation of *new* meaning out of the information. This is the role of knowledge creation. Furthermore, it is the knowledge co-creation itself that is seen as the focal act to create value while innovating with customers (e.g. Blazevic and Lievens, 2008; Vargo and Lusch, 2004).

Knowledge is *justified true belief anchored in personal commitment concerned with meaning and action*. Belief and commitment are deeply rooted in individuals' value system, which affects human actions (Nonaka and Takeuchi, 1995), and which in turn leads to organisational interactions with the environment (Sinkula, 1994). With regard to innovation, Nonaka (1994) stresses that "*innovation, which is a key form of organizational knowledge creation, cannot be explained sufficiently in terms of information processing or problem solving. Innovation can be better understood as a process in which the organization creates and defines problems and then actively develops new knowledge to solve them. Also, innovation produced by one part of the organization in turn creates a stream of related information and knowledge, which might then trigger changes in the organization's wider knowledge systems. Such a sequence of innovation suggests that the organization should be studied from the viewpoint of how it creates information and knowledge, rather than with regard to how it processes these entities*". When innovating, firms must create knowledge about customers and their needs. New knowledge about customers is the result of having analysed customer input and customers' responses to probes of ideas (Joshi and Sharma, 2004). By means of effective communication, cross-functional NSD teams add meaning to the information acquired (Lievens and Moenaert, 2000) and transform it into a shared stock of customer knowledge. It is this accumulated stock of customer knowledge that can be exploited for innovation (Kyriakopoulos and De Ruyter, 2004; Spender, 1996).

A firm's stock of customer knowledge incorporates knowledge about customers' current and potential (future) needs for new services (Li and Calantone, 1998), exogenous market factors (e.g. regulations, trends) that affect customer needs and preferences (Kohli and Jaworski, 1990, 3; Mcdonald and Madhavaram, 2007), customers' buying behaviour and customer characteristics (Garcia-Murillo and Annabi, 2002), sales history, seasonal and cyclical trends, and promotional experience (Mcdonald and Madhavaram, 2007). Firms can make use of it by developing an in-depth understanding on what creates customer value.

Knowledge about customers exists in various forms. On the one hand, customer information collected by multiple touch points within the company or sales channels could be stored in corporate databases. Information technology tools provide reports on customer behaviour by analysing meaningful relationships of data (Garcia-Murillo and Annabi, 2002). On the other hand, much of the crucial expertise on customers resides only in the minds of the organisation's members, such as sales representatives. They learn from intensive customer interactions during the sales process (Madhavan and Grover, 1998). The first example refers to the explicit dimension of knowledge, whereas the latter alludes to tacit knowledge.

Explicit or codified knowledge is transmittable in formal, systematic language. It consists of facts, rules, relationships and policies that can be codified in paper or electronic form. It is concerned with past events or objects and oriented toward a context-free theory. Fact knowledge is discrete or "digital" and captured in records such as libraries, archives, and databases (Nonaka, 1994; Nonaka and Takeuchi, 1995).

On the contrary, tacit or implicit knowledge is tied to personal relations, shared habits, and intuition, not all of which are easily documented (Von Krogh et al., 2000). It contains cognitive and technical elements. The cognitive elements centre on “mental models”, “*in which human beings create working models of the world by making and manipulating analogies in their minds. Mental models, such as schemata, paradigms, perspectives, beliefs, and viewpoints, help individuals to perceive and define their world. The technical element of tacit knowledge includes concrete know-how, crafts, and skills*” (Nonaka and Takeuchi, 1995).

Because of its intangible characteristics, tacit knowledge is less accessible and has a different function in innovation activities (Leonard and Sensiper, 2000; Nonaka, 1994). It is the tacit knowledge that makes individuals combine what they have learned and experienced enabling them to adapt it to new situations. Moreover, it is the basis for individuals to develop holistic concept solutions and guiding visions (Mascitelli, 2000). For example, NSD teams who observe customers in their environment may return with very different perspectives. However, their observations overlap to create some tacit understanding of the environment for which they are designing. Simple phrases associated with the observations call up specific mental images summarizing the user and his/her environment (Leonard and Sensiper, 2000) which eventually guide decision-making and action planning (Kakabadse et al., 2001).

In contrast, explicit knowledge will improve the probability of detecting new insights. Without reports, manuals or a database, new routines are less likely to be identified by another area of competence than one that is not documented (Galunic and Rodan, 1998).

Organisational knowledge in innovation also has a social component. Madhavan and Grover (1998) state that new product or service development teams are engaged in knowledge accumulation activities, such as project meetings, which imply social processes. Each individual brings to the situation his or her repertoire of skills, knowledge, strategies, and facts which affect and are affected by the situation. This dynamic interaction of individuals leads to cognitive performance of the group (Madhavan and Grover, 1998; Patel, Kaufman and Madger, 1996, 140). "*The distributed notion implies that teams should function more as a single unit engaged in a single process of expertise, rather than purely as a well-coordinated group of discrete, individual contributors*" (Madhavan and Grover, 1998). This form of interaction helps the group to develop a body of knowledge, based upon the information passively or actively provided by customers, e.g. through observations or virtual communities. Latter refers to a two-way learning relationship (Prandelli et al., 2008) and a customer-firm knowledge co-production (Blazevic and Lievens, 2008). This relationship can be fruitful when firms use their prior knowledge to value the new insights (Cohen and Levinthal, 1990).

In summary, customer knowledge creation can be viewed as an essential act in NSD. Both process of knowledge creation and knowledge stock are fundamental in service innovation. The process consists of acquiring, sharing, interpreting and finally applying customer knowledge in the novel service and the firm's stock of knowledge.

A firm's stock of knowledge consists of two dimensions, the tacit and explicit knowledge. The functions of the two types of knowledge are different in the innovation process. While tacit knowledge is the basis to create visions about future services, explicit knowledge enables firms to detect new insights.

The subsequent chapter on antecedents of customer involvement in NSD describes the state of research regarding factors that enhance or inhibit the work with customers in NSD.

3.4 Antecedents to Customer Involvement in New Service Development

Marketing managers are being required to demonstrate that new services will achieve high level of customer acceptance prior to new service launch. By collaborating with customers firms may "control" for the inherent risk of market failure (Pfeffer and Salancik, 1978) and create more value for the customer than does a competitor (Michel et al., 2008; Slater and Narver, 2000). Thus, the integration of customers in NSD is a consequence of a firm's market-oriented behaviour (Deshpandé et al., 1993; Jayachandran et al., 2004).

Despite the concept of market orientation little is known about antecedents to customer involvement in NSD. Carbonell et al. (2009) demonstrate that customer involvement is linked to technological uncertainty, emphasizing customers' role in reducing uncertainty of new service development. The researchers focus on the isolated effect of technology uncertainty on customer involvement in NSD, an external factor that affects firms when innovating. However, the study does not account for internal business elements that may trigger customer integration in innovation activities. Lin and Germain's study (2004) in the field of NPD demonstrates that internal factors in lieu of external ones affect conjoint NPD. They indicate that firms involve customers to a higher degree when products are complex and the organisation is centrally structured.

Based on the resource-based view, multiple resources could be considered as antecedents to customer involvement in NSD. However, existing research is confined to the behavioural perspective of collaborative market learning, since customer involvement in NSD is viewed as the act of market information acquisition (e.g. Slater and Narver, 1995). Morgan (2004) maintains that market-based learning also includes a cognitive perspective.

The cognitive perspective related to market orientation allows gaining richer insights into what beliefs are shared and not shared across a business known to be market-oriented. Cognition serves to focus everyone towards the same goals or ends, and supports the contention that managers need not share cognitive understandings of the means to those ends (Tyler and Gnyawali, 2009). It forms mental models or “thought worlds” of a group of managers, cause-effect relationships, and is the foundation for the group’s action (Mohammed and Dumville, 2001; Moorman, 1995; Tyler and Gnyawali, 2009).

Culture and orientation, assets, capabilities and beliefs are described as resources that influence cognition of organisations, particularly related to markets (Hooley et al., 2001; Williams, 2001). Deshpandé and Webster (1989) define culture as the “*pattern of shared values and beliefs that help individuals understand organizational functioning and thus provide norms for behaviour in the organization*”. They emphasize that organisational culture is related to causality that members impute to the marketing functioning. From a cognitive perspective, culture sets the "frames of reference", managers use to assess acceptability of new information. Managerial assumptions inherent in the frame of reference determine managers’ interaction with environmental parameters, e.g. customers, and the use of information (Shrivastava and Schneider, 1984). Cultural-based assumptions about the work with customer could therefore be interpreted as an antecedent to customer involvement in NSD. Deshpandé et al. (1993) demonstrate this relationship in their studies on customer orientation. They see customer orientation as being as a part of an overall, but much more fundamental, corporate culture and define it as "*the set of beliefs that puts the customer's interest first, while not excluding those of all other stakeholders such as owners, managers, and employees, in order to develop a long-term profitable enterprise*". The researchers emphasize in this context that acquisition of customer information goes beyond a process or routine. It is related to the more deeply rooted set of values and beliefs that are likely to reinforce such a customer focus and pervade the organisation. Moorman and Miner (1997) add that cognitive resources, i.e. beliefs, knowledge, frame of reference, models, values and norms, determine the memory of organisation that influences acquisition of outside information (referring to Day, 1994a; Leonard-Barton, 1992; Moorman, 1995). Organisational memory is the stored knowledge, a firm can exploit for innovation (Cohen and Levinthal, 1990). It is one of the soft assets that accrues from the accumulation of previous experiences and information acquired. Kyriakopoulos and De Ruyter (2004) refer organisational memory to the organisational knowledge stock that is instrumental to innovative activities (referring to Cohen and Levinthal, 1990; March, 1991; Moorman and Miner, 1997) and consists of two dimensions: tacit and explicit knowledge. Mcdonald and Madhavaram (2007) assert that prior accumulated knowledge is essential to extract the value of knowledge inflow through customer involvement. Hence, it determines the quality of a firm's capability to absorb external information that is used to restructure its knowledge system (Cohen and Levinthal, 1990).

As previously noted, customer involvement in NSD is seen as a means to reduce uncertainty on market success of the novel service. De Brentani's work on new service scenarios (1995) indicates that the type of new service situations that managers face is linked to the factors affecting the likelihood of success. One important determinant of NSD decisions is the degree of service newness, which is manifested in a firm's new service strategy. Song and Montoya-Weiss (1998) state that the risk of developing very new services is considerable higher compared to projects focussing on incremental service changes. Radical new service projects typically involves targeting emerging markets in which consumer demand is latent and service requirements are unarticulated. The development process is difficult in these conditions because there is less synergy between the needs of the project and the firm's existing skill and resource base. To avoid costly new product and service failure associated with these conditions, companies integrate customers in the innovation process and ask for their commitment to purchase early on (Ogawa and Piller, 2006).

We conclude from the literature review on market-based organisational learning and innovation that existing research lacks insights on internal antecedents that facilitate learning with customers in NSD. Further research is necessary to understand how cognitive and behavioural elements of a firm and its innovation strategy affect the work with customers in service innovation. It sheds light on how service firms allocate their resources in NSD and shift development activities to customers.

The next section summarizes existing research on customer involvement in NSD and outlines research gaps pertaining to the facets of the concept.

3.5 Existing Empirical Research on Customer Involvement in NSD

Empirical research on customer involvement varies in context, focus and findings. A synopsis of authors, research focus, research methods, sampling unit, research context, findings and limitations of research is provided in Appendix 2.

The current state of empirical research shows that customer involvement in service innovation can be characterized as truly interdisciplinary, involving human-computer interaction, engineering design, organisational knowledge creation theory, marketing and quality management. Consequently, reviewing previous research is difficult. We started with marketing-centred studies and then investigated other disciplines. Previous marketing research about customer involvement in new service development is limited; therefore, the number of references in this research realm to build from as well as the conceptual variety is reduced. Studies on customer involvement in new product development are not included, since our study should account for the complexity of services related to the fact that many services are interactive, technology intensive, and embedded in relationships (Matthing et al., 2004).

Articles were selected based on two criteria: the focus of the article should be related to the four facets of customer involvement as outlined in chapter 3.2 and the techniques that support learning from and with customers. Appendix 2 supports our statement that empirical research is interdisciplinary and varies in context.

The literature states a number of strong allied concepts of customer involvement, e.g. lead user method (Jeppesen and Laursen, 2009; Olson and Bakke, 2001; Urban and Von Hippel, 1988), user involvement (Alam, 2002; Jeppesen, 2005; Kristensson et al., 2004; Kristensson et al., 2007; Magnusson et al., 2003; Sandström et al., 2009; Voss, 1985), customer input (Alam and Perry, 2002; Callahan and Lasry, 2004; Martin and Horne, 1995), and customer participation (Cermak and File, 1994; Martin and Horne, 1995; Voss, 1985). Surprisingly, comparisons and contrasts of definitions in previous studies are often absent. Thus, interrelations of the concepts remain vague. Several different parameters are used to grasp and describe the concepts, e.g. degree of customer involvement (Alam, 2002; Martin and Horne, 1995; Voss, 1985), behavioural and personal characteristics of users (Jeppesen and Laursen, 2009; Jeppesen and Frederiksen, 2006; Jeppesen and Molin, 2003; Morrison et al., 2000), objectives of customer involvement (Alam, 2002), phases of NSD (Alam, 2002; Alam and Perry, 2002; Carbonell et al., 2009; Martin and Horne, 1995), the role of customers in the service innovation process (Blazevic and Lievens, 2008; Wikström, 1996), modes and methods of customer involvement (Alam, 2002; Alam, 2006a; Bamforth and Brokes, 2002; Griffin and Hauser, 1993; Gustafsson et al., 1999; Jeppesen, 2005; Jeppesen and Laursen, 2009; Martin and Horne, 1995; Olson and Bakke, 2001; Thomke, 2003), users as source of innovative ideas (Jeppesen and Laursen, 2009; Kristensson et al., 2004; Kristensson et al., 2007; Magnusson et al., 2003; Matthing et al., 2006; Matthing et al., 2004; Olson and Bakke, 2001; Sandström et al., 2009), inhibiting factors of customer involvement (Olson and Bakke, 2001), antecedents to customer involvement (Carbonell et al., 2009), and customer involvement and new service success measures (Callahan and Lasry, 2004; Carbonell et al., 2009; Cermak and File, 1994; Martin and Horne, 1995).

The review of literature reveals a limited number of quantitative studies on the constructs central to our research. Most of these studies are qualitative in nature. Furthermore, despite the prevalent call of studying customers in the context of organisational learning (e.g. Matthing et al., 2004), only one work exists that clarifies the process of customer knowledge co-creation. Blazevic and Lievens' (2008) study imparts how virtual customer communities co-produce knowledge valuable for creating new electronic services.

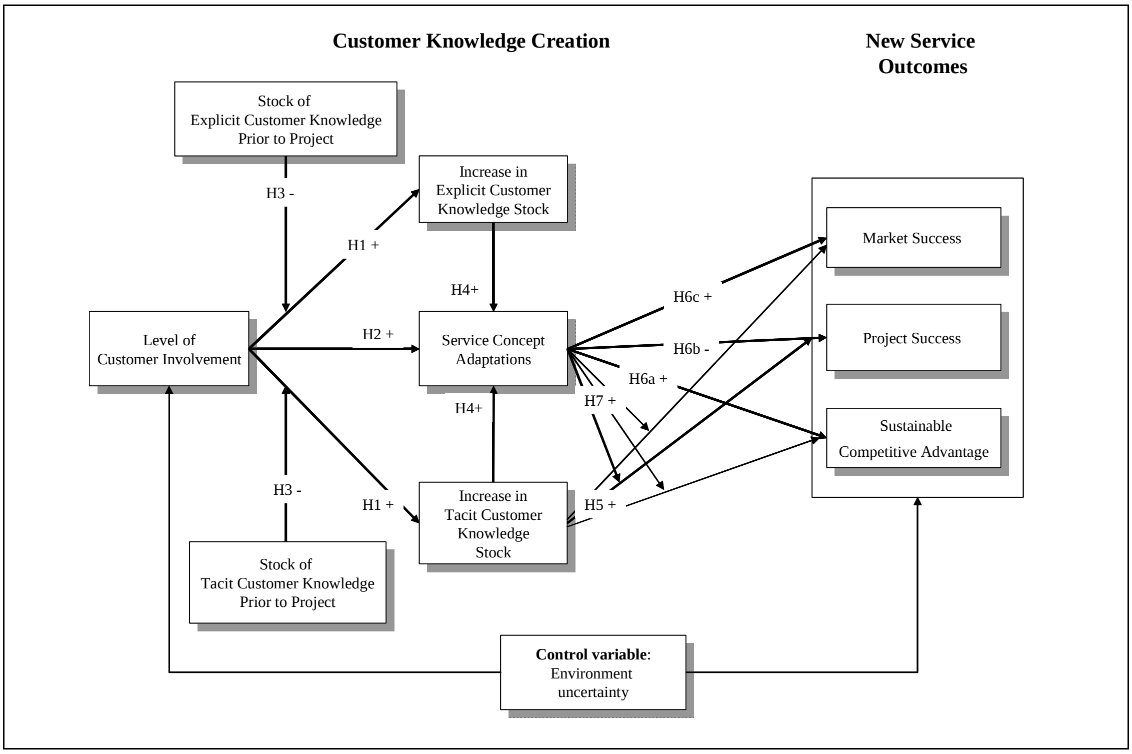
4 Measuring Customer Involvement in New Service Development

Based on the outlined literature, we investigate three conceptual models. In chapter 4.1 we conceptualise the cause-effect relationship of level of customer involvement, customer knowledge generation and new service success. In the next chapter, we outline our concept of antecedents to customer involvement and finally, in chapter 4.3 we describe our research on customer involvement practices.

4.1 Customer Knowledge Creation in New Service Development

Considering customer knowledge creation as the main act when working with customers in service innovation, we conceptualized a model in which the increase of customer knowledge mediates the relationship of customer involvement and new service outcomes. Figure 5 depicts the model we embark on developing hypotheses in this context.

Figure 5: Model of Customer Knowledge Creation



4.1.1 Effect of Level of Customer Involvement on Increase in Customer Knowledge Stock and Service Concept Adaptations

Increase in Stock of Customer Knowledge. Researchers propose that the degree of customer integration affects commercial innovation processes since it augments a firm's level of information (Fang et al., 2008) and contributes to the generation of new customer knowledge (Fey and Birkinshaw, 2005). High level of knowledge can be a result of rich customer involvement, e.g. through social interactions between customers and developers (co-development) (Fang, 2008) and cognitive conflicts (Nonaka and Takeuchi, 1995) arising from using a range of involvement methods (Sawhney et al, 2005). Cognitive conflicts refer to task-oriented disagreements arising from differences in perspectives and are fundamental for interpreting assertions and presentations of individuals and antecedents to the evolution of alternative solutions (Amason and Sapienza, 1997; Stevens and Dimitriadis, 2004). Both social processes and cognitive conflicts may change groups' view on the world, since each member has to make sense out of new mental contributions, which in turn shapes the collective assumptions about markets (Day, 1994b). The outcome of this process can lead to new applications and extensions of existing knowledge, and new connections that create a strategic path for the future (Daft and Weick, 1984; Dougherty et al., 2000).

On the other hand, firms can involve customers intensively in terms of reach by enlarging the size and scope of customer groups. By engaging customers on a broad base, firms can develop a wide knowledge about their markets. For example, they can integrate a significant number of individuals to achieve a higher degree of accuracy of knowledge provided (Sawhney et al, 2005). We infer from this debate that level of customer involvement determines the level of learning, i.e. the increase in a firm's customer knowledge base (Blazevic and Lievens, 2008).

Hypothesis 4.1-1:[1]
The greater the level of customer involvement, the greater is the increase in stock of explicit and tacit customer knowledge.

Service Concept Adaptations. New service development plans are developed in the early phases of innovation projects (Stockstrom and Herstatt, 2008). By integrating customers in their NSD learning process, managers must attune to the fact that fresh perspectives and recent knowledge are provided by customers (e.g. Anderson and Crocca, 1993; Magnusson, 2003) may lead to new insights about opportunities or problems (Dahlsten, 2006; Slater and Narver, 1995) that affect plans made at the outset of the project. The changes are mostly the result of a common agreement between the customer and the project manager (Dvir and Lechler, 2004) while they intensively work together. For example, research at 3M has demonstrated that intensive interaction with lead users has changed the firm's initial plans and pushed the NSD team into a new direction of solutions. Something similar has been reported about a service company that offers credit-reporting services (Von Hippel et al., 1999).

When accepting and valuing the new practices, NSD managers are likely to modify their plans (Cohen and Levinthal, 1990; Moorman and Miner, 1998). Based on this reaction of managers, we refer service concept adaptations *to the degree to which a new service concept has been modified because of new insights and information provided by customers* and hypothesize that intensive customer involvement in NSD positively affects service concept adaptations.

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[1] Number of hypotheses contains: number of chapter – consecutive number of hypothesis

Hypothesis4.1- 2:

The greater the level of customer involvement, the greater are service concept adaptations.

4.1.2 Moderating Effect of Prior Stock Customer Knowledge

Prior stock of knowledge is viewed as an important knowledge resource and input to innovative activities (Kyriakopoulos and de Ruyter, 2004). It incorporates basic skills or even shared language and hence confers an ability to recognize the value of new information, assimilate it, and apply it to commercial ends. These abilities collectively constitute what Cohen and Levinthal (1990) call absorptive capacity and are embedded in organisational processes that enable to coordinate typical business activities, e.g. new service development (Day, 1994a), and to exploit a firm's assets, such as prior customer knowledge stock. We conclude from this that the entire process of knowledge creation and utilization in the NSD context is this dynamic capability, researchers refer to absorptive capacity (Cohen and Levinthal, 1990; Zahra and George, 2002). Instead of measuring absorptive capacity as an independent variable in the model, we consider it as incorporated in the new service development process that can be observed by the degree of reconfiguration of a firm's resource or knowledge base (Zahra and George, 2002); the increase in customer knowledge stock through customer integration in NSD.

Based on its prior knowledge, a firm is subsequently able to evaluate effectively the amount of outside knowledge to be acquired. "*The type (in terms of amount) of knowledge that the firm believes it may have to exploit will affect the sort of research the firm conducts*" (Cohen and Levinthal, 1990, 148). We conclude from this that a firm with high stock of customer knowledge merely involve customers to a low level, since great understanding already exists in routines, procedures, teams and systems.

Drawing on the interactive fit argument or “fit-as-moderation” view of contingency theory (Venkatraman, 1989) and marketing strategy research, the NSD teams’ ability to develop commonly shared new insights from customer collaboration pertains to internal environment conditions (Atuahene-Gima and Murray, 2004; De Luca and Atuahene-Gima, 2007), such as the prior stock of customer knowledge. We synthesize the preceding arguments to propose that the prior level of customer knowledge moderates the relationship between the level of customer involvement and the increase of stock of customer knowledge.

Hypothesis 4.1-3:
The existing explicit and tacit customer knowledge stock has a negative impact on the relationship between level of customer involvement and increase in stock of customer knowledge.

4.1.3 Effect of Increase in Stock of Customer Knowledge on Service Concept Adaptations

It has been argued that knowledge cannot be considered as static. Particularly in social settings, knowledge has a dynamic facet that is related to “*the competence of individuals and of the organizing principles by which relationships among individuals, groups and members of an industrial network are structured and coordinated*” (Zander and Kogut, 1995, 77). Thus, besides being regarded as output (knowledge as variable stock), knowledge could also be understood as a process for interpreting data and information to endowing it with meaning and acting on it. This, in itself, conditions the processes of learning, and thus affects behaviour and actions (Morenó-Luzon and Lloria, 2007). In new service development projects, knowing how to organise and structure knowledge and information sources within a firm-customer network is crucial in order to gain insights and add meaning to them. For example, Magnusson (2006) reports in his study on developing telecommunication services that the users generated 374 new service concepts, which were not anticipated by the designers prior to the involvement of customers. Most of the ideas, however, needed to be fine-tuned by professional developers before becoming commercially viable.

Open-minded and knowledgeable teams reflect new ideas from customers, and transform them into new service modifications when they consider them as meaningful. It is a process incorporating determination of what has been learnt, evaluation of the importance of new information, understanding of what has been learnt and use of this knowledge competitively. Learning organisations often exhibit flexibility, which means that rapid organisational actions, such as service concept adaptations, can be implemented to exploit emerging opportunities. Within this context, firms are taking advantage of both types of learning models. They learn for the sake of broadening their knowledge stock (cognitive learning) and demonstrate a specific form of response behaviour (behavioural learning) (Morgan, 2004). The author states, "*This distinction can be recognised in conceptual and instrumental forms of information use respectively. Conceptual use describes the situation where the indirect application of information serves to broaden the knowledge base of decision makers without specifically providing an input to a decision or future strategy. Instrumental use, however, is characterised by the information being used directly to guide a specific decision scenario or identified management problem. Thus, where conceptual use of information is made there is an expectation that no immediate behaviour modification will take place (cognitive perspective), while the corresponding form of instrumental use suggests that managers will consciously decide to modify behaviour by developing a tactical response or considering a contingency strategy, for instance*" (referring to Caplan et al., 1975). According to this perspective, NSD teams use customers to enhance their knowledge base, and hence learn cognitively. However, whether they accept or reject service concept adaptations is contingent to their reflections on what they have learnt and the opportunities they recognize arising from service concept adaptations. This behaviour is based on the new tacit and explicit customer knowledge. For one, the act of reflecting new customer ideas and projecting the exploitation of opportunities is embedded in the tacit dimension of knowledge (Morgan, 2004). For another, the magnitude of available written facts changes the attitude of service product designers and helps getting the message across, e.g. changing predetermined design decisions (Antioco et al., 2008). Furthermore, designers value written information as a medium to reduce their decision making bias (Antioco et al., 2008) and their doubts about customer needs (Lievens and Moenaert, 1999). For example, Blazevic and Lievens (2008) report in their study about electronic service innovations that NSD teams receiving ideas from a limited number of customers seek for additional information that would confirm that they are developing services many customers want.

We conclude from this that new insights resulting from the increase in a firm's customer explicit and tacit knowledge stock induce NSD teams to change the initial service concept.

Hypothesis 4.1-4:
The increase in explicit and tacit customer knowledge stock has a positive impact on service concept adaptations.

4.1.4 Mediating Effect of Increase in Stock of Customer Knowledge and Service Concept Adaptations on New Service Outcomes

Previous research has demonstrated that knowledge stocks have a direct, but distinct effect on NPD and NSD success (Kyriakopoulos and De Ruyter, 2004; Moorman and

Miner, 1997). For example, Moorman and Miner (1997) have found out that increase in organisational knowledge enhances short-term financial performance, but not creativity; the degree to which a new product is novel and has generative capacity (i.e. the potential to change thinking and practice). Their study results support the importance of considering multiple dimensions of innovation outcomes in research and the distinction of short-term and long-term consequences of knowledge creation which is also proposed by other researchers (Cooper and Kleinschmidt, 1987; Griffin and Page, 1993; Johne and Storey, 1998; Kaplan and Norton, 1992). Storey and Kelly (2001) demonstrate in their study that service firms evaluate new service performance by a limited number of metrics on project as well as on firm level. On average, four measures, most of them related to financial performance and customer acceptance, are used to evaluate innovation outcomes. Financial and customer-related measures often attempt to quantify how well a service meets the needs of the customer (Griffin and Page, 1993) and are related to the reasons of customer involvement in NSD (Sandén et al., 2006). These metrics are associated with short-term new service success since they measure a service firm's immediate market and financial growth induced by the introduction of the novel service (Griffin and Page, 1996).

Furthermore, on the project level, working with customers has often referred to the benefits of (1) shortening development cycle time due to integration of most up-to-date customer knowledge in the new service (Alam, 2006b) and (2) achieving NSD project cost advantages because of "getting it right the first time" (Sandén et al., 2006). It could be assumed that project success is an adequate performance indicator to measure these benefits.

Moreover, learning organisation theory suggests that understanding and explaining the processes and procedures through which knowledge is created, shared and applied (that is, learned) in NSD teams is critical for understanding new service success (Akgün et al., 2006b). Learning is one of a host of complex resources that can yield marketplace positions and sustainable competitive advantage (Baker and Sinkula, 1999), and therefore relates to the firm's long-term future growth (Griffin and Page, 1996). Following these recommendations, we include three metrics to measure new service outcomes: (1) sustainable competitive advantage, (2) project success and (3) market success.

Based on the theory of organisational knowledge creation stressing the importance of tacit knowledge in innovation activities (e.g. Mascitelli, 2000; Nonaka and Von Krogh, 2009; Nonaka and Takeuchi, 1995; Von Krogh et al., 2000), we assume that the role of explicit customer knowledge differs from tacit customer knowledge and does not affect new service outcomes. Explicit customer knowledge incorporates knowledge about past events or objects (Mascitelli, 2000). It could be described as know-that. It is the knowledge that can be readily identified (Goffin et al., 2010). This implies for example that NSD teams can derive from reports that customers' needs have changed. In contrast, new tacit customer knowledge refers to know-how and know-why (Alavi and Leidner, 2001; Galunic and Rodan, 1998) which enables NSD teams to enhance a firm's way of creating customer value. Fahey and Prusak (1998) argue that "*tacit knowledge entails a body of perspectives (e.g. our view of customers is framed by our firm's experience in North America), perceptions (e.g. customers seem disinclined to try our new product), beliefs (e.g. investment in new technology will lead to breakthrough new products that will create new customer needs), and values (do what is right for the cus-*

tomer)". Knowing how and why customer needs have changed imply conclusions what type of new service will create customer value. Due to its inherent power, we assume that the increase in the firm's tacit customer knowledge stock positively affects all three new service development outcomes.

Sustainable Competitive Advantage represents the degree to which new yielded customer knowledge positively affects the firm's service portfolio and generates future market opportunities (Storey and Easingwood, 1998; Storey and Kelly, 2001). In contrast to creativity, sustainable competitive advantage does not incorporate novelty of service. The degree of newness is strongly associated with the firm's new service development strategy. In reality, not all firms operate under the same strategy and hence, do not measure novelty of service as a success indicator. Measuring new service success by degree of newness implies the firm's pursuit of developing radical new services. As the generic success indicator of all innovation strategies, the degree to which the project provides sustainable competitive advantage is generally the most useful indicator of long-term new service development consequences (Griffin and Page, 1996).

Sustainable competitive advantage is the ultimate outcome of using knowledge assets (Bharadwaj et al., 1993; Grant, 1996a; Song et al., 2005). Achieving and maintaining long-term advantage in the marketplace requires resources which are idiosyncratic (and therefore scarce) and not easily transferable or replicable. These criteria point to tacit knowledge as the most strategically important resource which firms possess (Grant, 1996b). The tacit dimension of a firm's knowledge is partially embedded in the NSD team in to form of guiding visions (Leonard and Sensiper, 1998; Madhavan and Grover, 1998). Visionary images about customers that go beyond explicitly stated goals helps to coordinate design decisions guiding the NSD team in developing holistic, customer-oriented future service concepts. In the NPD literature, for example, Nonaka and Takeuchi recount how Honda project team leader Hiroo Watanabe coined the phrase "Automobile Evolution" to inspire his designers, and the team continued the metaphorical conceptualization with the product concept "Tall Boy". The process resulted in the revolutionary Honda City, a car that was both "tall" in height and "short" in length (Leonard and Sensiper, 1998; Nonaka and Takeuchi, 1995).

Project Success measures the extent to which new service development conforms to project requirements in terms of budget and timeline. The stock of knowledge involves an understanding of how to interact with others (Insch et al, 2008) being anchored in skills and routines. These skills and routines are tied to the particular domain in which they are exercised (Moorman and Miner, 1998). For instance, in the context of new service development, it includes routines for team cooperation, project milestones (Kyriakopoulos and De Ruyter, 2004; Moorman and Miner, 1997) and the most common application of tacit knowledge, that is to say, problem solving (Leonard and Sensiper, 1998). The increase in knowledge makes the expert recognizing not only the situation in which he/she finds him-/herself, but also what action might be appropriate for dealing with it (Simon, 1981, 106). By applying these skills, the NSD team could work more efficiently towards expected project outcomes. For example, Dahlsten (2006) report about Volvo's XC90 project team who recognised in the early development phases that its target customers, women, were driving SUVs in increasing numbers in the US. However, since the team did not have an understanding of this market, the team decided to meet female customers in California. The team developed actionable knowledge about the group of potential buyers, for example that women in the U. S. value flexibility and storage, which guided the entire development process.

Market Success refers to the degree financial, sales, market growth rates and customer satisfaction objectives have been met. Such metrics are commonly used for measuring new service performance in the marketplace (Deshpandé, Farley, and Webster, 1993; Li and Calatone, 1998; Moorman, 1995) since they are important indicators of firms' growth on customer value generation and return of innovation investments (De Brentani, 1995; Storey and Easingwood, 1999; Storey and Kelly, 2001). Market success can be achieved when knowledge about customer preferences is accurately applied or embodied in the novel service (Joshi and Sharma, 2004) representing a new solution for the customer (Eisingerich et al., 2009; Madhavan and Grover, 1998).

Successful market introduction requires in-depth understanding of markets, such as differences in needs of customer groups. Some of these insights may exist in explicit form (e.g. customer satisfaction reports); however, most of the knowledge is subtle and unspoken, for example knowledge about differences in tastes and habits of customers (Subramaniam and Venkatraman, 2001). Tacit or implicit knowledge also encompasses differential logics ensuring thoughtful deliberations and the generation of new perspectives, novel strategic alternatives, analyses, and interpretations (De Luca and Atuahene-Gima, 2007; Galunic and Rodan, 1998; Prahalad and Bettis, 1986). For example, Alam (2006) reports in his study about one financial service firm that developed a new working capital product for all the firms in need of funds due to the cyclical changes or market down turns, e.g. construction service firms. The new, successful service product was a result of the NSD team’s new perspectives on the customers’ problems with existing financial products. The NSD team moved away from asking customers about their wants, and instead focused on their financial problems in their own business and concluded that financial institutions need to offer the loans without much restriction and approve them fast during the peak demand period. The change of perspective on what creates customer value is clearly associated with the enhanced tacit stock of customer knowledge triggering the development of the new service.

Hypothesis 4.1-5:
The greater the increase in stock of tacit customer knowledge, the greater are new service outcomes.

Research in project management proposes that change of plans affects success. Stockstrom and Herstatt (2008) have found out that modification of plans negatively influences project success, but positively affects market success. The authors assert that the occurrence of changes during the project stages hinders meeting the project schedule and budget goals (referring to Dvir et al., 2003). A positive effect of concept adaptations on market success can be achieved when the NSD team discloses emerging customer demands not being preconceived and modifies the new concept accordingly to achieve a better market fit of the new service (Li and Calantone, 1998).

Furthermore, Shentar et al. (2002) posit that projects are subsystems of the entire organization and should contribute to the long-term goals of firms. The modification of service concepts provides a platform for future learning, since involved staff with experience will be integrated in later projects (Stockstrom and Herstatt, 2008). Thus, we conclude:

Hypothesis 4.1-6a:

Service concept adaptations positively influence sustainable advantage.

Hypothesis 4.1-6b:

Service concept adaptations negatively influence project success.

Hypothesis 4.1-6c:

Service concept adaptations positively influence market success.

4.1.5 Moderating Effect of Service Concept Adaptations

Kogut and Zander (1992) emphasize the need to learn from internal and external sources and to combine both if a company wishes to exploit future opportunities. NSD teams often develop distinct scenarios through mental maps of possible complex future realities. Such mental maps assist in using new data and information from the market and help chart courses of action; a fundamental component of a firm's tacit knowledge (Teece and Pisano 2004). For example, researchers assert that customer feedback in form of new ideas calibrates the team's predictions (Hutchinson and Alba, 2001) and their assumptions about how the market will respond to actions taken based on this knowledge (Day, 1994a). Kristensson et al. (2004) find in their study that the integration of ideas from users without technological knowledge enhances the plans of professional developers in the telecommunication industry. Ordinary users are not constrained in their thinking on the realisability of new services and thus, ideas are more need-related. By merging divergent thinking of users - remote to technical know-how - and convergent thinking of developers – the ability to sort out the most logical or rational solution among various possibilities - unique new service ideas can be developed. In this vein, business success can be attributed not only to the ownership of knowledge and other complementary assets, but also to the dynamic utilization of mutually fertilizing knowledge resources to create value (Teece and Pisano, 2004).

We infer from this that service concept adaptations are integrated in the decisions on new service development, and propose that the relationship between the increase in tacit customer knowledge stock and new service outcomes is moderated by service concept adaptations. Due to lack of previous research, we hypothesize that service concept adaptations positively affect all three relationships. However, we explore each relationship individually to obtain insights on diverse consequences of the moderating variable.

Hypothesis 4.1-7:
The greater service concept adaptations, the greater the effect of increase in tacit customer knowledge on new service outcomes.

4.1.6 Control Variable

Control variables are used with independent variables to predict the dependent variable. However, they are not of interest of research, and thus, must be controlled (Punch, 2003, 106).

In testing our hypotheses, we controlled for environmental uncertainty because in unstable and dynamic environments, organizational knowledge and skills are increasingly important to deliver customer value (Grant, 1996a).

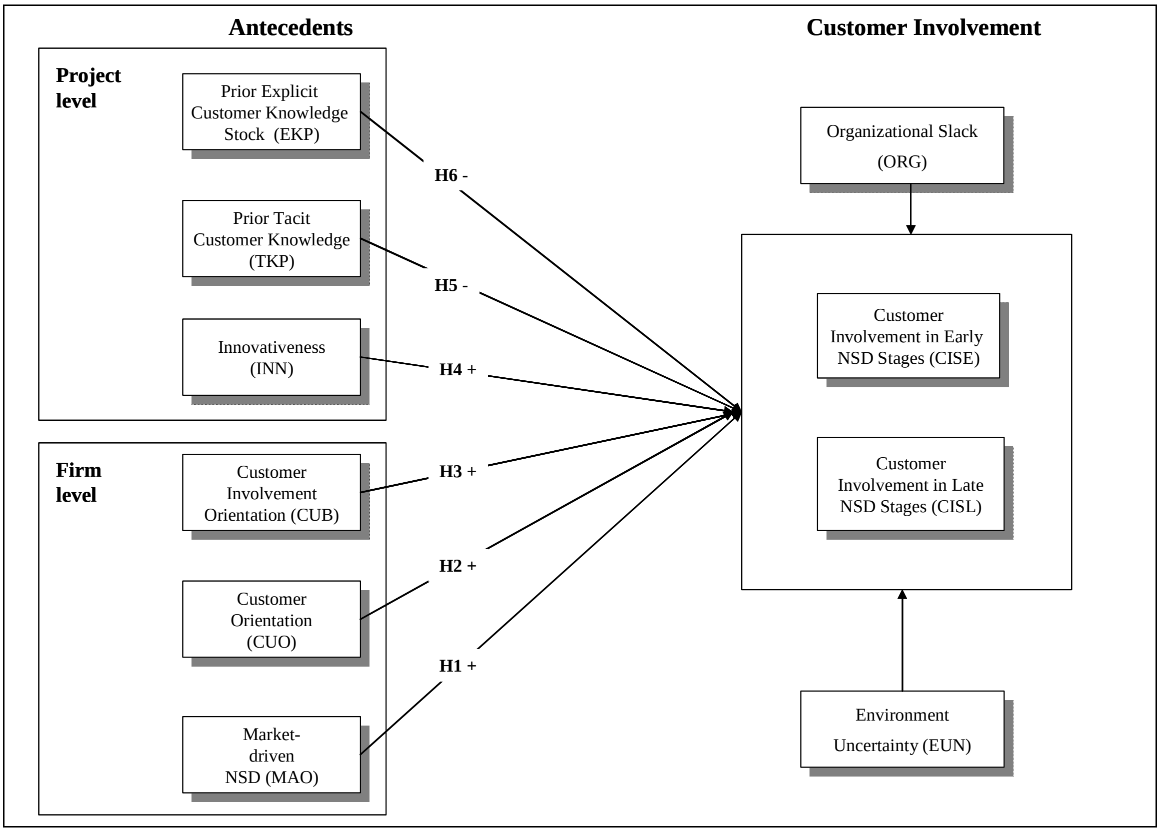
The first model gives a lens with which to link successful customer involvement in NSD to the act of customer knowledge creation. Customers can be viewed as a resource contributing to a firm's market knowledge development.

The next section focuses on the conceptualisation of relationships between predicting antecedent constructs and customer involvement. This research sheds light on the relative importance of several internal factors that are posited to help or hinder customer involvement in NSD. Remarkably, this fundamental issue has been addressed solely in the empirical study of Carbonell et al. (2009).

4.2 Antecedents to Customer Involvement in New Services Development Stages

While internal organisational (Lin and Germain, 2004) and external factors e.g. technology uncertainty (Carbonell et al., 2009) can be argued to be antecedents of customer involvement in innovation activities, the present research focuses on internal factors. This perspective embodies a more applied resource-based and market orientation. Moreover, this view accounts for the fact that managers have more control over internal antecedents compared to external ones. We distinguish between antecedents on firm level and project level and incorporate six independent variables as depicted in Figure 6.

Figure 6: Model of Antecedents to Customer Involvement in NSD



Customer involvement in NSD. Since there is an on-going debate in the literature about which NSD stages customer should be involved in (e.g. Alam, 2006a; Matthing et al., 2004), we measure customer involvement in the early and late phases of new service development. This perspective is based on the benefits managers expect from customer involvement in the various phases (see chapter 3.2.4), and is anchored in the firm's culture and existing knowledge about customers. Thus, the question attempted to be answered is, "What factors influence managers' decision on integrating customer throughout NSD or in selected phases?"

4.2.1 Antecedents on the Firm Level

Business culture forms the behaviour within organisations, giving rise to specific organisational structures and processes, which in turn affects the nature and effectiveness of innovation activities (Moorman, 1995; Slater and Narver, 1994). Departing from this viewpoint, we consider market-driven NSD, customer orientation and customer involvement orientation as important antecedents to customer involvement in NSD. Their interrelations to the construct are conceptualised in the following sub-sections.

4.2.1.1 Direct Effect of Market-driven NSD on Customer Involvement

Marketing orientation is viewed as a form of corporate culture - i.e. shared values and beliefs - that most effectively and efficiently drives the necessary behaviour for creating superior value for buyers (Day, 1994a; Homburg and Pflesser, 2000; Narver and Slater, 1990). The concept represents the degree to which firms acquire, distribute, use and ultimately depend on market information. The conventional wisdom among marketers is that customers should be the driving force behind product and service innovation (Baker and Sinkula, 1999) since sales result from buyers who value the new service offering.

When developing new products or services, firms collect information about customers through customer research techniques (Kok et al., 2003). Thus, the concept of customer involvement in NSD is tied to the firm's market-oriented behaviour (Jaworski and Kohli, 1993). Narver, Slater and MacLachlan (2004) assert that the concept of market orientation implies both customer-led and lead-the-customer innovation. However, according to the authors the current operationalizations measure behaviours associated with customer-led processes only. Being customer-led or market-driven in terms of new service and product development induces different organisational behaviour compared to innovativeness. The latter is often measured by a separate construct, since it accrues from a culture of entrepreneurship (Baker and Sinkula, 1999; De Brentani, 2001). Despite this debate, researchers acquiesce that both market-oriented, more specifically market-driven, behaviour and innovation [2], should be considered when studying new service/product development, because firms are challenged to satisfy customer needs and manage risks in equal measure (e.g. Baker and Sinkula, 2007; Narver, Slater and MacLachlan, 2004; Slater and Narver, 1998).

In reference to Slater and Narver (1998), we define market-driven NSD as the identification of current customer needs that are not fully satisfied which the company then endeavours to meet through an appropriate offering. The act of identifying customer needs is related to the market-sensing capabilities of a firm. Capabilities and organizational processes are closely entwined, because it is the capability that enables the activities in a business process to be carried out. Market-driven organisations have superior market sensing capabilities (Day, 1994a) which they apply to develop incremental new services (Narver et al., 2004; Slater and Narver, 1999) such as service adaptations and line extensions (De Brentani, 2001).

Customers play a major role in providing input for incremental new products and services. They are sensitized to dissatisfaction with current offerings enabling them to de-

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[2] We accounted for this by including the variable "innovativeness of the NSD project“ which measures the degree of service newness.

scribe the improvements they need in the product or service (O'Connor, 1998). Market-driven firms often view customer research as decision insurance: a premium that is paid to widen and deepen the understanding of customers (Day, 1994b). According to Martin and Horne (1995), in-depth understanding of customer needs and responding to them is the natural product of the intensive work with customers throughout NSD.

We synthesize from preceding arguments that market-driven NSD affects customer involvement throughout the NSD process and hypothesize that

Hypothesis 4.2-1:
Market-driven NSD is positively related to customer involvement.

4.2.1.2 Direct Effect of Customer Orientation on Customer Involvement

Customer orientation is *the set of beliefs that puts the customer's interest first, while not excluding those of all other stakeholders such as owners, managers, and employees, in order to develop a long-term profitability*. As part of the overall market-oriented corporate culture, customer orientation captures the more deeply rooted set of values and beliefs that are likely to reinforce such a customer focus and pervade the organisation (Deshpandé et al., 1993). Values and beliefs are important cognitive elements of the concept of market orientation that lead to a certain view of reality, form organisational characteristics such as goals, strategies, systems and activities (Cadogan and Diamantopoulos (1995), and help to formulate actionable guidelines for creating customer value. These guidelines should gear the NSD team in every single development stage and the new service development process as a whole (Kok et al, 2003).

The belief in customers as the major stakeholder is necessary to build and maintain capabilities that continuously create superior customer value in key strategic activities

(Slater and Narver, 1994). The customer-linking capability – creating and managing close customer relationships – is one of the most important capabilities in this context. Particularly, in business-to-business markets, close relationships between suppliers and customers (or major channel members e.g. IKEA and Wal-Mart) have been established to reduce cost of transactions. Collaborative relationships incorporate close communication and joint-problem solving in mutual business processes (Day, 1994a). Hence, a service firm's degree of customer orientation determines the extent to which value creation is achieved through customer participation in business activities (Chan et al., 2010). Moreover, it influences the extent to which the firm masters its cognitive capacities (Williams, 2001). Nägele (2006) conceptualizes a capability maturity model of customer-oriented service development. According to the author, service firms in a matured stage of customer orientation can resort to long-term and intensive development partnerships with customers. As a result of this high level of proximity to the customer, joint activities are organized to reinforce the relationship and substantiate knowledge exchange. In contrast, companies at lower levels of customer orientation regard customers as passive users of their products and therefore rely on their knowledge they assume to have instead of asking customers for their needs and ideas for new services. Customer involvement in NSD is therefore kept to a minimum.

We conclude from the preceding arguments that a firm's degree of customer orientation directs the strength of its relationships and the work with customers throughout NSD.

Hypothesis 4.2-2:
Customer orientation is positively related to customer involvement in NSD.

4.2.1.3 Direct Effect of Customer Involvement Orientation on Customer Involvement

Customer involvement orientation reflects *a firm's belief in customers as knowledge and information providers and the advantages of learning about and with customers in service innovation*. Beliefs hosted in a firms' culture affect behaviour and norms (Hurley and Hult, 1998). More specifically, they are essential ingredients in strategic decision making, particular those beliefs towards stakeholders who are instrumental in achieving an organisation's mission and strategic goals (Williams, 2001) and those associated with learning (Singuaw et al., 2006). The means of achieving learning objectives are incorporated in the mental model of managers, which has been developed through induction, problem solving, and reasoning. These models consist minimally of two types of beliefs; beliefs about the identity of the firm, its competitors, suppliers and customers, and causal beliefs about what it takes to compete successfully within the environment (Porac et al., 1989). Beliefs about the causes and effects directly influence actions (i.e. motivation orientation). Haberstroh and Gerwin (1972), in their model of strategic decision-making, indicate that beliefs are pervasive in the decision-making process, influencing perceptions as well as strategic choices. In the literature on innovation, beliefs about learning and knowledge pervade and guide all functional areas toward innovation. Furthermore, in the form of strategic directions, managers' beliefs toward innovation affect resource allocations, such as capital, talent and tools (Singuaw et al., 2006). Customers are one of the firm's operant resources that create effects on other resources and actively contribute to the value creation process (Vargo and Lusch, 2004). They provide knowledge about their needs, which in turn affects innovation creation throughout the development process (Alam and Perry, 2002).

We synthesize the preceding arguments and conclude that customers are integrated in new service development projects when decision makers believe in the positive contribution of customers. It could be assumed that the stronger this belief is the more managers intensify market and customer research. This relationship has been studied by Tyler and Gnyawali (2009) who cite one manager believing that one of the key challenges for the company is to address customer needs and develop innovative products and stating, "*The company is doing more market research than ever on the current products under development and on new product concepts*".

Transferred to our research context, we conclude from this that managers' belief in integrating customers in service innovation increases level of customer involvement throughout NSD.

Hypothesis 4.2-3:
Customer involvement orientation positively influences customer involvement in NSD.

4.2.2 Antecedents on the Project Level

On the project level, customer involvement is contingent to the prior stock of customer knowledge of the NSD team, and the degree of project newness. While the first refers to the level of knowledge that is brought together from diverse sources to develop a new service (Grant, 1996b), the latter reflects the degree of demand uncertainty (Pfeffer and Salancik, 1978). These antecedents are discussed in detail in the following subsections.

4.2.2.1 Direct Effect of Project Innovativeness on Customer Involvement

Learning about and with customers is associated with the degree of service newness (e.g. O'Connor, 1998; Slater and Narver, 1999). Service innovativeness or newness refers to *the degree of familiarity organisations or users have with a service* (De Brentani, 2001). The degree of service newness is potentially linked to the level of uncertainty and risk as well as the resources required when undertaking NSD ventures (De Brentani, 2001; Veryzer, 1998). In their empirical study, Callahan and Lasry (2004) prove that because of the inherent risk of market failure, firms perceive customer integration as more important when services are very new. De Brentani (2001) adds that firms should develop in-depth customer understanding to control for the risk, which can be achieved by working with customers intensively in multiple NSD stages (Martin and Horne, 1995). Rothwell (1986) contend that this behaviour is due to the fact that changing user requirements can be detected and continuously fed into the development process to produce a modified design brief.

Thus, we hypothesize that service newness is positively related to customer involvement throughout the course of new service development:

Hypothesis 4.2-4:
The greater the service innovativeness, the greater the customer involvement is in NSD.

4.2.2.2 Direct Effect of Prior Customer Knowledge Stock on Customer Involvement

Firms are entities holding knowledge-based resources, bundled in their existing stock of knowledge to perform productive tasks such as innovation projects (Grant, 1996a). Organisational learning – as undertaken in the innovation process (Day, 1996b) - serves to utilize this existing knowledge and incorporate new knowledge into the knowledge base by which the competences of organizations are improved and new ones are developed (Liu, 2006). Developing new knowledge in service innovation implies a particularly important behaviour; the market-focused search of information (Slater and Narver, 1997, 3). In pursuit of efficiency, saving costs and time, a firm tends to avoid extensive search of market information. Consequently, it exploits its experiences of the past stored in the existing knowledge stock when innovating (Mcdonald and Madhavaram, 2007).

In his model, Nelson (1982, 460) indicates that strong existing knowledge enables firms to save time for searching for information that is useful for the projects. He stresses that this knowledge base increases the sensitivity of search to fine structure of the market situation. He illustrates the relationship as follows: "*If the R&D decision-maker can discriminate ex ante between techniques likely to save specially on labor input, and techniques likely to save specially on materials input, relative factor prices and their changes can influence the direction of search. Similarly, search can be guided by the particularities of a consumer demand for different product attributes. Stronger knowledge again means better ability to focus search*".

Mcdonald and Madhavaram (2007) emphasize that this practice increases efficiency of information acquisition, but restricts the firm's level of learning. They refer to Nelson and Winter (1982) who describe the role of prior knowledge in providing the necessary insight into the opportunities for innovation. The authors describe a metaphorical topography, upon which each competitor has a unique vantage point that is a function of their particular Hayekian circumstances of time and place, and at which it has arrived via its own unique path of history. The possibilities that each competitor sees depends on the view from the particular vantage point it occupies, i.e. these possibilities are path dependent. What the organization can do depends in large part on what it has done and learned before (Kogut and Zander, 1992).

Other researchers add that firms having efficient routines in place can become calloused to new ideas (Leonard-Barton, 1992) and therefore avoid extensive search of external information (Sinkula, 1994) and collaboration with diverse people (Dougherty, 1992). It has been shown that managers prefer market research results that contain few surprises since they disturb routines (Deshpandé and Zaltman, 1984).

In other words, firms may ignore the impetus of learning with customers in NSD. Both, existing knowledge about efficient information search and successful routines of the past may be seen as barriers to the in-depth work with customers in NSD.

Consequently, we propose that the level of prior customer knowledge negatively affects customer involvement in NSD. Because of the lack of prior literature, it is unclear whether prior tacit and explicit knowledge differs in their effects on customer involvement in NSD. Therefore, we hypothesize that the preceding arguments apply to both knowledge dimensions, but explore their distinct effects in data analysis.

Hypothesis 4.2-5 and Hypothesis 4.2-6:
The prior customer knowledge stock is negatively related to customer involvement in NSD.

Control variables. In testing our hypotheses, we controlled for environmental uncertainty because in unstable and dynamic environments, organisational knowledge and skills are increasingly important to deliver customer value (Grant, 1996a). Furthermore, we controlled for organisational slack, reflecting the availability of excess resources to fund new service development (De Luca and Atuahene-Gima, 2007).

As outlined in this section, customer involvement in NSD is directed by numerous internal factors. The analysis and results of hypotheses testing are summarized in chapter 6. The third objective of this study is to investigate key business practices of customer involvement in NSD to understand alternative approaches supporting a firm's new service strategy. In the following sub-chapter, we therefore conceptualize prevalent customer-involvement management practices.

4.3 Customer-Involvement Management Practices

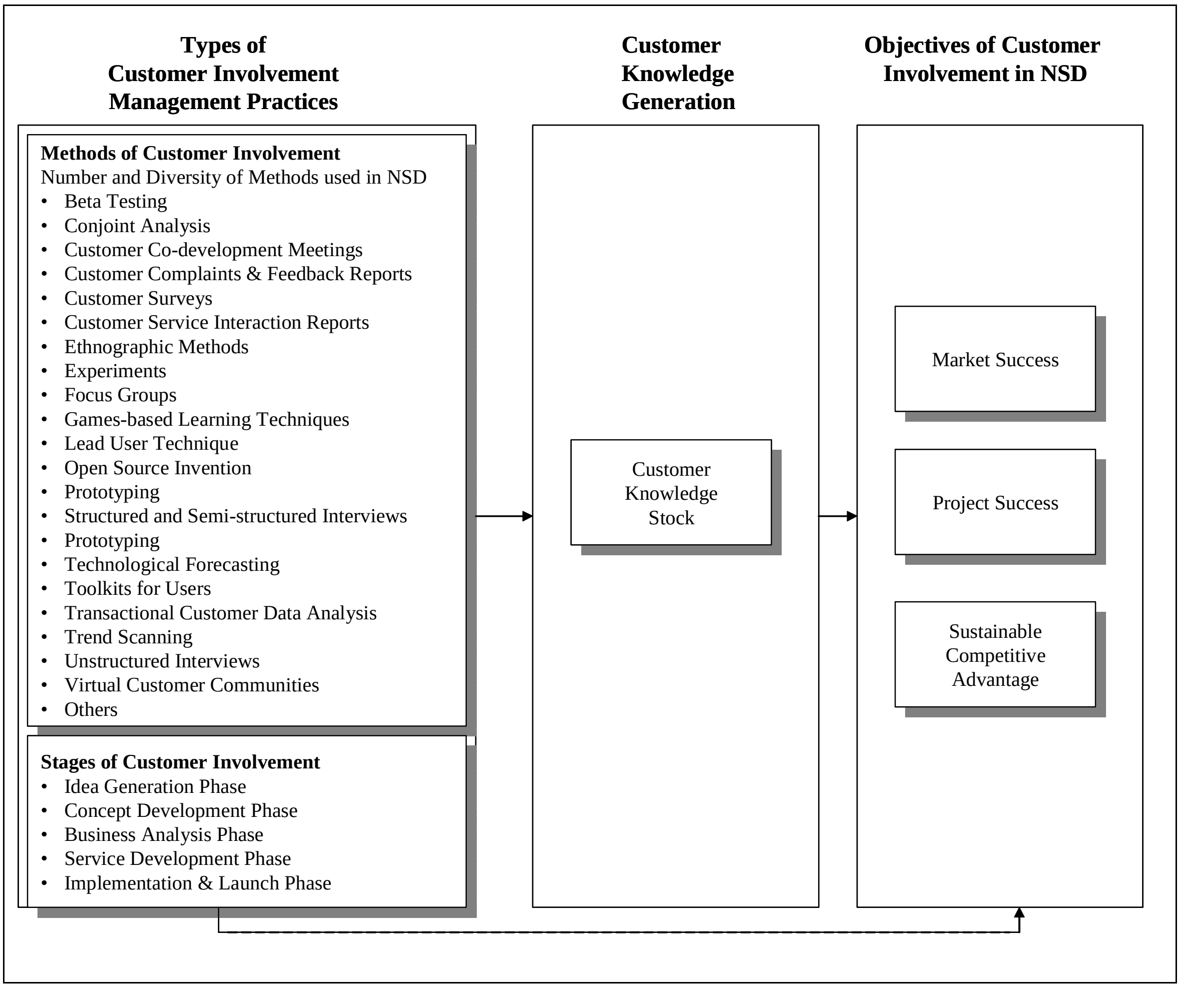
Customer involvement in NSD plays a pivotal role in new service strategy, since it is seen as an effective tool to create valuable new service for customers (Kristensson et al., 2007). As an important strategic element, customer involvement needs to be managed as any other business activity, implying the alignment of communication and resources with the organisation's objectives (Harrigan, 1985).

However, the spectrum of options to design this business activity is wide. Sandén et al. (2006) state in their study about Swedish service firms that most companies involve their customers, but there are large differences in their customer involvement practices. The authors report that the majority of service firms use a structural and formal approach to involve customers by selecting customers and using appropriate customer involvement techniques. We adapt the suggestions of Sandén et al. (2006) and design a model of customer involvement practices (Figure 7).

General beneficial customer involvement practices have been addressed in the early work of Kristensson et al. (2007). The authors propose seven key strategies of successful customers collaboration that when applied lead to the desired effects in NSD. For example, they suggest that customer knowledge is derived from various user roles and that co-creation is more likely to be realized if users are provided with analytical tools before being involved in the co-creation exercise.

Despite its valuable propositions about the design parameters of customer involvement, the study does not illuminate alternative, competing customer involvement practices that lead to success.

Figure 7: Model of Customer Involvement Practices



As illustrated in section 3.2, firms tend to elect and combine methods and stages of customer involvement according to their needs on information and knowledge of customers. According to Services Marketing literature, each dimension varies in respective levels and is supposed to affect new service success (e.g. Alam, 2002; Martin and Horne, 1995). We contend that determining the appropriate configuration of these parameters is one of the major challenges for NSD executives in this context. Examining the styles of customer integration practices in relation to new service results could therefore provide important insights about the relative strategic advantage of one management practice over others. Moreover, as customer involvement is interrelated to costs

(Griffin and Hauser, 1993), the analysis could illuminate striking cost-effective approaches.

4.3.1 Methods of Customer Involvement

Services Marketing literature suggests numerous techniques being conducive to identifying important customer needs that should be transformed into new service offerings. However, comparative research on customer involvement methods in innovation is rare. Thus, there is silence on the interrelation of methods. Except for Kaulio's review (1998), little is known about the mix of methods and its effects on new service development results. Moreover, there is an on-going debate on the general advantageousness of specific methods. For example, in the recent past, the lead user concept and virtual customer communities have become focal points of interest since they help firms to tap into the creativity of individuals induced by social interactions. In their study about computer music instruments, Jeppesen and Laursen (2009) bring to light that new knowledge about customers is generated when lead users share their ideas online with ordinary users. Likewise, the case study on America's leading experiential retailers, children's publishers, and direct marketers of "American Girl" demonstrates that the combination of customer feedback reports and rapid prototyping with customer panels supports the creation of successful emotional shopping experiences (Tekes, 2007).

The field of marketing has been extremely successful in developing, testing, and deploying tools to aid NPD/NSD. In addition to conventional market research tools, marketing literature emphasizes new directions associated with customer integration, such as web-based methods, the customer-active paradigm, design for consideration, and product-optimization design tools, for improving product design decisions (Hauser et al., 2006).

Our extensive review of new service and product development literature and marketing research textbooks revealed a list of thirty-five methods deemed to be useful when collaborating with customers. We consolidated similar techniques based on the definitions provided by researchers to reduce lengths of questionnaire and redundancy of techniques. For example, (1) user content collaboration community, (2) user development community, (3) user group feedback community and (4) user innovation communities were subsumed under virtual customer communities. A list of twenty methods accrued from the review process (Table 1). Definitions of methods are provided in Appendix 6.

Table 1: List of Methods of Customer Involvement in NSD

1. Beta Testing
2. Conjoint Analysis
3. Customer Co-development Meetings
4. Customer Complaints and Feedback Reports
5. Customer Surveys
6. Customer Service Interaction Reports
7. Ethnographic Methods
8. Experiments
9. Focus Groups
10. Games-based Learning Techniques
11. Lead User Technique
12. Open Source Invention
13. Prototyping
14. Structured or Semi-structured Interviews
15. Technological Forecasting
16. Toolkits for Users
17. Transactional Customer Data Analysis
18. Trend Scanning
19. Unstructured Interviews
20. Virtual Customer Communities
21. Other:
22. Other:

However, since this list was not considered exhaustive, we included two options of describing and rating other methods used, but not listed. Information about usage of methods is provided in chapter 6.1

Deciding for a particular method to be applied in NSD hinges on its inherent characteristics. For example, methods are associated with different approaches to learning. Learning on the individual and organisational level is a complex process related to the inseparability of body and mind of individuals. Hence, learning is embedded in mental and physical activities (Nonaka, 1994). These activities advert to (1) verbal communication of thoughts, (2) exhibition of behaviour or (3) use of activating tools. Following this logic, methods of customer involvement can be categorised as “say”, “do” and “make” tools according to their tendency to deliver different levels of creative outcomes. Since make-methods, associated with handicraft work, combine learning with mind and body, they elicit the maximum of individuals’ creativity. Researchers advocate using these methods when firms need to find innovative ideas and tap into verbally inexpressible needs (Sanders and William, 2003). A classification of methods is provided in Appendix 28.

Despite the benefits of single methods, firms use numerous methods of customer involvement to create knowledge. Empirical evidences of effective use of multiple tools can be found in NPD, in the context of IT-communication tools, e.g. web-based market research tools. Barczak et al. (2007) illustrate in their study that deploying numerous tools positively influences the performance of new products because of enhanced cooperation among individuals involved. Although our study does not exclusively refer to IT communication tools, we consider this as a plausible explanation for using multiple customer involvement methods within development projects. By using numerous research techniques, NSD teams may create and deepen necessary shared understanding of customers to transfer knowledge efficiently (Koners and Goffin, 2007). As a corollary to this, the use of multiple methods places service firms in a position to exploit advantages due to diversity of techniques. Diversity refers to the *unrelatedness among objects,* e.g. business units (Nayyar, 1992) or here, methods. By deploying various distinct methods, firms may gain multiple perspectives on customer needs, preferences and perceptions of service performance (ESOMAR, 2008, 59; Garver, 2003) or even create cognitive conflicts from which new knowledge accrues (Nonaka and Takeuchi, 1995).

In their concept of market orientation, Narver et al. (2004) stress the urgency to distinguish between proactive and reactive methods of customer involvement. Using reactive methods is associated with identifying present needs that are not fully satisfied which the company then endeavours to meet through apt offerings. Many of today's traditional market research tools tend to be rather reactive since they aim to chart customer's relation and attitude toward the current service offer (Sandén et al., 2006).

Conversely, proactive methods aim at discovering customers' latent needs and anticipating future customer demands (Narver et al., 2004). The authors do not recommend a solely proactive or reactive approach, but rather emphasize that organisations should focus on both to achieve short-term market success and reinforce long-term competitive advantage. However, prevalent literature in this field is silent on a clear classification in this context. Kristensson et al. (2007) assert that one method is neither clearly proactive nor purely reactive, but rather could be both.

Moreover, Ulwick (2002) has proved that combining methods can increase the degree of activeness of a firm's market-oriented research approach. He uses outcome-based interviews combined with customer satisfaction surveys to disclose latent future customer needs.

We conclude from this debate that each customer involvement method implies a particular degree of activeness. By using multiple methods, firms benefit from a growing level of activeness in their research setting.

4.3.2 Stages of Customer Involvement

As outlined in the chapter 3.2.4, involving customers in early and/or late stages of NSD is considered a key to service innovation. Although an extensive body of literature has proved timing of customer involvement in NSD as an important success factor, consensus has not been reached. Moreover, prevalent research stresses that methods and stages are interrelated (Alam, 2002; Alam and Perry, 2002; Kaulio, 1998). We conclude from the suggestions in the literature that stages and methods should be viewed as combinative facets of customer involvement in NSD.

As presented in this section, there are strong conceptual arguments for distinct ways of combining methods and stages of customer integration in NSD. Looking into the multiple approaches, which may result from this conceptualisation, could illuminate the important role, customer involvement plays in new service strategies. Moreover, since we relate these facets to new customer knowledge creation and NSD performance, we shed light on effective customer involvement practices. In the next chapter, we describe our research methodology and report on descriptive statistics to provide a first glance at customer involvement in NSD.

5 Research Methodology

Based on our three previously described models, we developed valid and reliable constructs. In this section, we provide definitions of the constructs, outline the process of developing and testing the constructs for validity and reliability, and finally describe details about our sample.

5.1 Definition of Constructs

We now draw from extant literature to offer precise definitions for the elements of customer involvement in NSD projects.

Table 2: Definition of Constructs

Construct	Definition
Customer Involvement Orientation / Belief	Represents a firm's belief in customers as knowledge and information providers and the advantages of learning about and with customers to achieve beneficial NSD outcomes (derived from Ramani and Kumar, 2008).
Customer Orientation	Is the firm's commitment of aligning the entire organisation to the credo of putting the customer first, prior to other stakeholders (Deshpandé et al., 1993; Slater and Narver, 1999).
Environment Uncertainty	Refers to the dynamics of business environments, evoked by changes in customer preferences and technologies (Jaworski and Kohli, 1993).
Increase in Stock of Customer Knowledge	Stands for the new customer knowledge generated "on top" of a firm's prior customer knowledge stock. It is the integrated, explored knowledge (Atuahene-Gima, 2005) about customers.
Innovativeness	Refers to the degree of familiarity organisations or users have with a new service (Griffin, 1997; McGrath, 2001).
Level of Customer Involvement	Represents the degree to which NSD teams use customers and means containing information about customers to develop new services, measured by richness of integration and, breadth - the size or scope of customer groups (Sawhney et al., 2005).
Market-driven New Service Development	As part of the concept of market-based learning (Morgan, 2004), this construct represents the firm's behaviour to discover and respond to expressed customer needs (Narver et al., 2004).
Methods of Customer Involvement	Refers to the means of acquiring customer insights through which NSD teams are able to develop new customer knowledge.
New Service Outcomes	Is the positive outcome of systematic new service development efforts measured by key performance indicators; market success, project success and overall new service success (Storey and Easingwood, 1999; Storey and Kelley, 2001)

Table 2: Definition of Constructs (contd.)

Construct	Definition
Organisational Slack	Is the availability of excess resources to fund new projects (De Luca and Atuahene-Gima, 2007)
Prior Stock of Customer Knowledge	Refers to a firm's repository of tacit and explicit knowledge and expertise about current and latent customer preferences, needs and wants, buying behaviour, motivation and attitudes (Joshi and Sharma, 2004).
Service Concept Adaptations	Refers to the degree the NSD teams modifies its initial ideas and plans (Stockstrom and Herstatt, 2008) about what creates customer value due to new insights obtained from customers.
Stages of Customer Involvement	Refers to the five stages of NSD according to Booz et al. (1982) incorporating (1) Idea Generation and Screening, (2) Concept Development, (3) Business Analysis, (4) New Service Development and Testing, and (5) New Service Implementation and Launch.
Sustainable Competitive Advantage	Represents the long-term advantage of one firm over its competitors in the market based on unique and inimitable resources and skills (Bharadwaj et al., 1993).

5.2 Development of Constructs

5.2.1 Field Interviews

We conducted semi-structured interviews with two experts in the field of customer involvement in NSD; namely, market research managers in the (1) telecommunication business and (2) financial service sector.

The choice of both types of businesses is in line with the innovation report of NESTA (2008) stating their affiliation to the group of innovative service sectors. The initial selection of innovative service businesses was imperative since sectors exhibiting low degree of service innovation, like hotels and restaurants or real estate services, (NESTA, 2008) may not be appropriate to tap insights on the relationship of facets of customer involvement and organisational learning in the NSD context due to the lack of experiences in innovation.

Because the purpose of the study was to examine the relationship of customer knowledge creation and customer involvement in NSD as well as its antecedents, we chose experts who are able to describe both the cognitive and the procedural view on new service development. Particularly we targeted marketing and marketing research managers who possess specific organisational knowledge on (1) procedures (Bogner et al., 2005) in NSD, (2) innovation competencies accruing from routines and systems developed, and (3) reflections based upon achieved outcomes (experiential learning), such as NSD performance (Comas and Sieber, 2001; Menor and Roth, 2008). We conducted field interviews in two stages:

(1) Initial interviews with two marketing research managers in the telecommunication and financial service sector,

(2) Five interviews with managers in the fields of marketing working in different service sectors: transport, financial intermediation, and information technology (Appendix 7).[3]

The interviewees were alumni and students of the University Of Applied Science Lucerne (CH) and regularly involved in NSD projects.

The sample reflected a diverse set of organisations and hence was well suited to obtaining relevant views on customers' contributions to new services and practices of customer involvement in NSD as described in the literature.

While the initial set of interviews were useful to determine constructs and their relationships, the second set of interviews, taking place a couple of months following the first wave of interviews, aimed at strengthening qualitative results to fine-tune constructs included in the main questionnaire. We chose this approach to ensure the interplay of

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[3] The interviewees were subsequently integrated to test face validity of constructs (see section 5.2.5).

inductive and deductive thinking that contributes to increasing the researchers' knowledge about the conceptualization of the constructs to be measured (Witzel, 2000).

The interviews were conducted face-to-face and followed a structured set of questions. After a brief introduction about scope of our research project, each interviewee was asked about five issues along the following lines:

(1) How can the firm be described in terms of customer focus and competing on service innovations?

(2) How is the firm's NSD process organized and who is involved in the process?

(3) What kind of customer knowledge already exists in the form of knowledge of NSD team members and knowledge repositories, e.g. databases? What are the intellectual contributions of customers involved in a particular NSD project?

(4) How do you manage customer involvement in NSD?

(5) What are important NSD success measures?

These questions provided a structure for each interview, but it was frequently necessary to probe deeper with additional questions to elicit examples, illustrations, and other insights. This procedure was also helpful to create a notion about the appropriateness of marketing and marketing research executives for evaluating constructs of customer knowledge, an important element in our main survey. All interviewees worked in their position for more than two years. The managers talked about their beliefs of collaborating with customers in service innovation and the cognitive effects customers induced in the NSD team. In organisational learning theory, beliefs of individuals and their social units mutually influence each other (Nonaka, 1994; Weick, 1995). Simultaneously, the beliefs and behaviour patterns may become widespread because of employees modelling themselves on the team that is perceived as successful. Thus, a more consistent style of management becomes visible within the organisation, an executive member can describe, since this style is reflected in his/her decision-making (Williams, 2001). Furthermore, since tacit knowledge accrues from experiences and shared events in the past, groups become a collective cognitive entity of which each representative is aware of the understanding that is shared. Erden et al. (2008) express it as follows: *"Through gaining exposure to shared events and developing shared experiences, groups develop a shared memory and the members understand the nature and value of 'collectively acting'. Shared memory and understanding enable the group to solve familiar tasks automatically by repeating pre-experienced activities. Each member knows how the others will act in certain situations due to previous experiences and coordinates herself accordingly. The group becomes a collective body and mind for certain familiar situations where the function of each component is well defined*."

We concluded from this that marketing executives involved in the social setting of NSD, although they talk about their individual view, are a good source of evaluating a firm's prevalent customer knowledge.

We audiotaped the personal interviews, which typically lasted about 45 minutes. The results of the transcribed interviews have been compared with concepts and theories prevalent in the literature.

We now summarize the responses to the key areas of questions asked during the interviews that affected the conceptualisation of our constructs and models.

Without exception, the managers interviewed were consistent in the view that a customer focus is the central element of their business. They agreed with the view that a customer focus involves obtaining information from customers about their needs and preferences. The comments suggest that being customer-oriented involves taking actions based on customer knowledge.

The managers voiced the need of involving customers to reduce the risk of market failure and to create new services fulfilling customer needs better than those of competitors. One manager stated that a new service failed because customers were not involved in the innovation process. Subsequent to the launch, the insurance company collaborated with customers to remedy inadequate new service features. The incident caused changes in their NSD strategy. It could be concluded from these comments that customer involvement in NSD is associated with firms' innovation process and strategy.

Few managers confirmed that multiple departments, directly and indirectly engaged with customers and potential buyers, were involved in the customer knowledge creation and sharing process. The process incorporated the exchange of views and assumptions about customer preferences and wishes, partly conveyed in stories about experiences with customers, a typical characteristic of knowledge stocks (Hedberg, 1981; Kyriakopoulos and De Ruyter, 2004). Hence, we term this amount of shared and piled-up customer knowledge embedded in people as the *stock of tacit customer knowledge*.

Furthermore, managers stated that they use information about customers and their purchase behaviour available in the form of transactional data and previous customer reports. We therefore concluded that when innovating, NSD firms also rely on their *stock of explicit customer knowledge*.

Few managers confirmed the integration of customers after the NSD team had determined the lack of customer information and the necessity of information acquisition. They stated that this is an important insight resulting from the team's knowledge-sharing sessions. Two managers explicitly mentioned that the degree to which customers are integrated in their NSD projects varies, depending on the identified lack of customer information. We concluded from this that prior existing customer knowledge stocks affect the work with customers.

Two managers stressed that listening to customers generates thoughts about new service concepts. They stated that customers are not innovative and it is the team's task to elicit ideas of novel services or service amendments from customer observations and interviews. We inferred from this statement that collaborating with customers enhances the knowledge stock of the NSD team and affects previously held concepts when decision makers recognize the value of the new insights.

It was emphasized by the majority of managers that methods of involvement are selected pertaining to the information need regarding customer preferences and wishes. Furthermore, they stressed that they predominantly integrate customers at the end of the NSD process. Only one financial service manager stated that customer involvement primarily takes place at the outset of the NSD process. Hence, it could be assumed that firms work with customers in different phases of NSD and manage customer knowledge acquisition by different methods.

All managers confirmed that new service outcomes are evaluated. They stated that general market and financial indicators are used to assess performance. However, one manager voiced the opinion that, pertaining to the NSD project, the level of customer satisfaction or number of new buyers may be more important. In contrast to the literature, the managers did not highlight the necessity of measuring long-term success. Three managers, however, mentioned that every NSD project might induce amendments of services in existing service product portfolios.

We concluded from the interviews and literature review that customer involvement is a multidimensional construct. It is associated with the existing customer knowledge stock being increased through a certain level of customer interaction, and usage of methods in different stages of the innovation process. We furthermore infer from the interview results that a firm's innovation strategy and its awareness of being cognizant to customer needs and preferences relate to customer involvement in NSD. The latter is considered an important element of the concept of market orientation (Kohli and Jaworski, 1990). Overall, the beliefs of the interviewees reflect the conceptualisation of the constructs and their interrelations in the context of collaborating with customers to innovate.

Despite the valuable insights emerging from the interviews conducted, a potential sampling bias referring to the selected industries may exist in the form of emphasized relationships of constructs that are less prevalent in service industries innovating to a lower degree. However, analysis of sample characteristics of the main survey indicates that no significant differences between service sectors pursuing distinct innovation strategies and level of customer involvement exist (see section 6.1.2).

We will now describe in more detail the measures of each construct.

5.2.2 Measures of Constructs

Subsequent to the interviews and literature review, we developed a structured survey instrument in two stages. First, based on our findings in the interviews, we designed an expert survey with academics to investigate our new scale on level of customer involvement in NSD (CUI). Second, we used the results of our expert survey in addition to existing measures from theory and empirical studies on organisational knowledge creation, market orientation and innovation to design the scale items of our main survey aiming for gauging customer involvement in NSD projects. Unless otherwise mentioned, the items were measured on a seven-point likert-scale referring to respondents' degree of agreement. In summary, we measured the following constructs:

Level of Customer Involvement in NSD. We selected seven statements resulting from an expert survey that aimed to measure depth and breadth of customer involvement. Regarding our new scale for CUI, we followed the framework proposed by Churchill (1979) and Haynes et al. (1995). The detailed procedure and results are described in the next chapter 5.2.4.

Stages of Customer Involvement in NSD. We selected two statements for depth and breadth of customer involvement that achieved the highest mean score in our expert survey and combined them with the prevailing terminology of development phases in NSD (Booz et al., 1982). We included these statements in our main survey to measure customer involvement in NSD stages. Thus, our main survey incorporated ten questions about customer involvement in five development stages. We also refer to the terminology of Alam (2006a) who calls the first three stages the *front-end* that typically involve imprecise processes and ad hoc decisions prior to the actual development of a new product. The two phases at the end of NSD process are termed *back-end*.

Methods of Customer Involvement in NSD.

Methods of customer involvement in NSD cover a wide range of modes and techniques, ranging from personal interactions with customers (Alam, 2002) to any media containing information about customers to which the NSD team adds meaning, e.g. transactional data analysis, customer complaints and feedback reports. A list of methods has been obtained from marketing literature. Definitions of methods are provided in Appendix 6.

Since we aimed to characterize methods with their degree of activeness according to the concept of market orientation of Narver et al. (2004), we included the list of methods in our expert survey. The experts were asked to rate the degree of activeness of each method on a five-point likert scale (1 = clearly reactive, 2 = fairly reactive, 3 = neither proactive nor reactive, 4 = fairly proactive, 5 = clearly proactive). Definitions of proactive and reactive market orientation have been provided in the survey.

In our main survey, we measured both the usage and usefulness of methods. Usage of methods was measured in terms of the five stages of customer involvement, whereas usefulness was assessed in terms of attaining pre-set goals on a five-point likert-scale (5 = very useful, 1 = not at all useful, 6 = not used).

Innovativeness.

We measured innovativeness of NSD projects by four items referring to the degree of newness for the company, the industry, as well as in terms of customer needs and target customers. All items were adapted from McGrath (2001) and measured on a five-point likert-scale (1 = strongly disagree, 5 = strongly agree).

Market-driven New Service Development.

We adapted six items from Narver et al. (2004) to measure firms' market-driven behaviour in new service development. We asked respondents to assess how good their firms are in detecting customer needs and transforming them into new services. We deleted two items (MOA01 and MOA02) since they tended to measure only the detection of customer needs, but not the response to them. Further details are provided in the measurement model of antecedents to customer involvement (chapter 6.3.1).

All items were measured on a seven-point likert-scale (1 = very poor, 7 = very good).

Customer Orientation.

As the commitment of the entire organisation to create customer value, customer orientation is associated with achieving high customer satisfaction of delivering expected services. Customer-oriented businesses are committed to satisfy customer needs and enhance their capabilities to create customer value throughout the organisation (Slater and Narver, 1999). We therefore measured this concept with three items requesting respondents to rate the degree of a firm's commitment to its customers, constantly improving its way of customer value creation and its tendency to acquire customer knowledge. The first two items were adapted from Gray et al. (1996), whereas the last item was developed especially for our research.

Customer Involvement Orientation.

As for a firm's belief that customer involvement in NSD pays off, we measured four items, which originate from the research of Ramani and Kumar (2008) who use them in the context of customer relationship management.

Prior Stock of Tacit and Explicit Customer Knowledge. We measured the prior stock of tacit customer knowledge with five items that asked respondents to evaluate their stock of customer knowledge in terms of intuition, subjective understanding, hunches, feelings and expertise as defined by Nonaka and Takeuchi (1995). We furthermore evaluated the explicit dimension of prior stock of customer knowledge by four items referring to facts, information and system data about customers as conceptualized by Nonaka and Takeuchi (1995). We measured both types of knowledge on a 7-point-likert-scale. Following the approach of Kyriakopoulos and De Ruyter (2004), we asked the respondents to refer to a recently completed NSD project.

Increase in Stock of Tacit and Explicit Customer Knowledge. Since we expected respondents not to be able to assess level of customer knowledge prior to and after their NSD project, we measured the increase of customer knowledge expressed by superlative adverbs of prior stock of tacit and explicit customer knowledge (Nonaka and Takeuchi, 1995) on the project level (Kyriakopoulos and De Ruyter, 2004).

Contrary to existing research on tacit knowledge, we desist from measuring the two constructs on tacit customer knowledge by associative measures, such as performance indicators that solely could be achieved by possessing appropriate expertise and knowhow (Edmondson et al, 2003), or metaphors (Ambrosini and Bowman, 2001). We assessed the constructs directly as employed in the empirical research of Kyriakopoulos and De Ruyter (2004).

This approach is based on the nature of this type of knowledge and the prevalent notion that tacit knowledge is a comprehensive justification of beliefs that are embedded in the human body and mind leading to such characteristics as ‘‘gut feelings” and intuitions (Erden et al., 2008; Varela et al., 1991). Metrics used to measure the nature of this type of knowledge based on self-reports are common in psychology and social cognition theory. Prominent examples are the Myers-Briggs Test and Cognitive Style Index (CSI) of managers (Allinson and Hayes, 1996; Jung, 1921). Hence, a general advantage of our measures is that they build on and reflect the meaning of the conceptual definitions (Nonaka and Takeuchi, 1995).

Service Concept Adaptation. Existing literature on market knowledge development and project management provides measures on how a firm’s initial ideas and plans have been reshaped due to new insights about customers[4]. We adapted one item from Joshi and Sharma (2004) and one item from Gupta et al. (1986). Furthermore, we modified two items from Stockstrom and Herstatt (2008) who measure the unforeseen findings and new elements emerged during project execution, which can be interpreted as new ideas of customers.

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[4] Akgün et al. (2006) refer this act to “unlearning”.

New Service Success. Based on previous research (Dvir et al., 2003; Storey and Easingwood, 1999; Storey and Kelley, 2001; Sandén et al., 2006; Van Riel et al., 2004), we measured new service success with nine items that asked respondents to indicate the degree of success the NSD project has achieved. One item measured the overall success related to the project objectives, whereas eight items assessed market success and feedback (incl. financial performance) and project success.

Sustainable Competitive Advantage. To measure long-term performance of new services, we modified three items from previous research (Lievens and Moenaert, 2000; Storey and Easingwood, 1998; Van Riel et al., 2004). Furthermore, we derived one item – representing the market learning effect – from the concept of Bharadwaj et al. (1993).

Control variables. In testing our hypotheses, we controlled environment uncertainty and organisational slack. We examined uncertainty by three items. We included market uncertainty, the speed of change in customer needs and preferences, and technological uncertainty, the speed of change and instability of the technology environment. We adapted the measures from Jaworski and Kohli (1993).

We evaluated the second control variable, organisational slack, by three items representing the availability of excess resources to fund new projects. The items were adapted from De Luca and Atuahene-Gima (2007).

All measures and their sources are summarized in Appendix 3.

5.2.3 Types of Relationship between Latent Constructs and their Items

We measured all latent variables using reflective (effect) indicators. Hence, according to prevailing convention, indicators are seen as functions of the latent variable, whereby changes in the latent variable are reflected (i.e. manifested) in changes in the observable indicators (Diamantopoulos and Singuaw, 2006). In contrast, formative scales (cause measures) cause the formation of or changes in the unobservable variable (Bollen and Lennox, 1991). In mathematical terms, the two types of relationship between the concept and its measurements can be expressed by the following equations (Bollen and Lennox, 1991; Diamantopoulos and Singuaw, 2006):

Equation 1: Reflective Specification of the Relationship

Reflective indicators are a function of their associated latent variable:

$$\mathbf{x_i = \lambda_i \eta + \varepsilon_i}$$

η: latent variable; λ: loading; x: reflective indicator;
ε: measurement error on level of indicators

Equation 2: Formative Specification of the Relationship

Formative indicators influence the latent variable:

$$\mathbf{\eta = \gamma y_1\, y_1 + \gamma y_2\, y_2 + \gamma y_3\, y_3 + \ldots + \gamma y_n\, y_n + \zeta.}$$

η: latent variable; **γ**: weight (parameter reflecting the contribution of y_i to the latent variable η);
y: formative indicator; ζ: disturbance term, the measurement error on level of the latent variable

The distinction between indicators as causes and indicators as effects of latent variables has fundamental implications for the conventional ideas about indicators (Bollen and Lennox, 1991). In a (principal factor) reflective scale, dropping an indicator from the measurement model does not alter the meaning of the construct, whereas dropping a causal indicator may omit a unique part of the composite latent construct and change the meaning of the variable. As a result, misspecification of the direction of causality can lead to inaccurate conclusions about the structural relationships between constructs (Jarvis et al., 2003).

As previously noted we adapted existing scales to measure latent constructs except for our new measurement model "level of customer involvement" (CUI) and its two derivative constructs (1) "customer involvement in early NSD phases" (CISE) and (2) "customer involvement in late NSD phases" (CISL).

Existing scales taken from marketing and knowledge creation literature are conceptualized as reflective latent constructs. We therefore inspected our new scales with regard to the types of relationship between latent construct and its items by following the guideline of Jarvis et al. (2003) and Coltman et al. (2008). The guideline provides a practical way for researchers to decide on the appropriate measurement model to use in their research and consists of five sets of considerations to be used to in combination to determine the appropriate measurement model:

Theoretical considerations:

1. Direction of causality between the construct and its indicators,
2. Interchangeability of indicators,

Empirical considerations:

3. Indicator intercorrelations,
4. Indicator relationship with construct antecedents and consequences, and
5. Measurement error and collinearity.

Direction of causality between the construct and indicators

In our research, we argue that the seven indicators selected are manifestations of the construct since the NSD managers' decision on intensifying customer involvement results in the increase of scope of customer groups and/or frequency of customer contact within multiple project stages. Prandelli et al. (2008, 47) underscore that level of customer involvement is associated with the firm's orientation towards its environment, that is to say, the company's propensity to involve customers during NSD rather than the sum of all possible ways a company could integrate its customers. This form of relationship indicates that indicators derive their meaning from the latent construct assuming a flow of causality inherent in reflective measurement models (Coltman et al., 2008). Albers and Hildebrandt (2006, 14) illustrate this assumption by stressing that a holistic strategy consists of highly correlated measures (indicators). However, it is unlikely that a shift in our latent variables change all observed variables simultaneously which is viewed as an indication of reflective measures in this context (Bollen and Ting, 2000, 4). Thus, at this stage, determination of directionality of the relationship is far from obvious and requires further investigation.

Interchangeability of items

The next set of analyses refers to whether items are interchangeable or not and share a common theme. Thus, in a reflective scale, inclusion or exclusion of one or more indicators from the domain does not materially alter the content validity of the construct. They can be viewed as a sample of all the possible items available within the conceptual domain of the construct (Hair et al., 2006, 787 referring to DeVellis (1991). We tested changes in Content Validity Index (CVI) (see section 5.2.5) by excluding or including one or more items in the measurement model. The CVI still exceeded the required value of 0.7. Thus, the remaining indicators still conceptually measure the same concept; that is the level of customer involvement in NSD.

Furthermore, the seven indicators selected in our scale are not mutually exclusive types of customer involvement behaviour and not distinct entities, a very nature of formative indicators since they measure different aspects of the construct. Thus, it would be entirely consistent for formative indicators to be completely uncorrelated. For example, socioeconomic status (SES) is defined in terms of occupation, education, and income (Bollen and Lennox, 1991; Edwards and Bagozzi, 2000, 158; Jarvis et al., 2003). The three indicators measure independent aspects causing socioeconomic status. In the case of our scales, measures are not independent, since a NSD manager could either involve a diverse range of customers in the project or integrate customers at every stage of the project or could do both, for example. Both types of indicators measure the number of customer contacts and it is the manager's decision to interchange the two mechanisms in order to achieve high level of customer involvement. Based on this second theoretical consideration, the measurement should be reflective.

Indicator intercorrelations

The prevalence of a common theme shared by items of reflective constructs can be empirically tested by principal component analysis (PCA). PCA aims for exploring factors based on the item intercorrelations. It considers the total variance and derives factors that contain small proportions of unique variance and in some instances, error variances (Field, 2006). A detailed analysis of dimensionality of factors, including our new scales "level of customer involvement in NSD", "customer involvement in early NSD phases" and “customer involvement in late NSD phases”, is provided in chapter 5.2.8. PCA furthermore yields three important measures of indicator intercorrelations: (1) partial correlations provided by the anti-image correlation matrix, (2) Bartlett test of sphericity and (3) measure of sampling adequacy (MSA) (Field, 2006, 647; Hair et al., 2006, 114):

(1) The partial correlation of items illustrated in the anti-image correlation matrix revealed that for all items of the three constructs, the diagonal values, representing the variable-specific measures of sampling adequacy (MSA), exceeded the minimum of .5, which is another indicator of the strength of the interrelationships among the variables in the data set. Furthermore, all items of the respective latent constructs attained a value greater than .3, indicating sufficient intercorrelation. No perfect correlation (> .9) between items was found. The results are shown in Appendix 12.

(2) Bartlett’s test found that identified correlations are significant at the .0001 level. It provides evidence that the correlation matrix has significant correlations among the variables (Field, 2006).

(3) As the third indicator to quantify the degree of intercorrelations among the variables, we inspected the measure of sampling adequacy (MSA) of the data set. For all three constructs analysed, the value is above .5, indicating appropriateness of factor analysis which purpose is to define the underlying structure among the variables in the analysis (Field, 2006). The outcome of the analysis is shown in Appendix 16.

The results demonstrate the theoretical structure of reflective constructs based on the directionality and strength of item intercorrelations found in PCA, indicating a stable association between a construct and its measures, a pattern associated with a reflective type of relationship (Bollen, 1984; Edwards and Bagozzi, 2000).

Indicator relationship with construct antecedents and consequences

Diamantopoulos and Winklhofer (2001) and Coltman et al. (2008) propose several methods to test indicator relationship with construct antecedents and consequences. At a basic level, to obtain an initial idea of the quality of formative indicators is to test correlation between each indicator of the construct and another variable external to this construct. Solid theoretical reasons why relationships should exist are prerequisites. At best, this external criterion is a global item summarizing the essence of the construct that the index purports to measure. For our research, no external criterion was measured to perform this type of test.

Furthermore, the researchers propose the MIMIC model (model indicators and multiple causes) to assess the indicators as a set. In this model, the formative indicators act as direct causes of the latent variable, which is indicated by one or more reflective measures. However, our study lacks additional reflective items to measure the three variables of customer involvement. In addition, solely SPAD PLS supports the specification of variables by means of the MIMIC model (Götz et al., 2010, 700) precluding the application of this method.

Finally, Diamantopoulos and Winklhofer (2001) suggest the validation of formative constructs by linking them to antecedents and consequences, which they would be expected to be linked. Such validation is particularly relevant when indicators have been eliminated from the original index. We used PLS and a bootstrapping procedure of 500 samples to test statistical significance of indicators with regard to their loadings/weights. As depicted in Table 3, the formative construct of level of customer involvement (CUI) consists of three variables – DCI01, BCI03 and DCI02 – because weights of BCI01, BCI02, DCI03 and DCI04 were statistically not significant ($p > .1$).

As for the formative construct of customer involvement in early NSD phases, solely DCI06 has been found significant (p < .1). Finally, two items – DCI09 and BCI07 – significantly measure customer involvement in late NSD stages (p < .1) when conceptualized in a formative manner.

Table 3: Comparison of Formative and Reflective Measurement Models

	CUI		CISE		CISL		Significance			
Items	Formative Weights	Reflective Loadings	Formative Weights	Reflective Loadings	Formative Weights	Reflective Loadings	Formative t-value	sig.	Reflective t-value	sig.
BCI01	.192	.864					1.216	(n.s.)	29.492	***
DCI01	.399	.758					2.035	**	16.233	***
BCI02	.194	.773					1.127	(n.s.)	16.228	***
BCI03	.306	.898					1.673	*	41.18	***
DCI02	.299	.829					1.724	**	28.732	***
DCI03	-.151	.909					.778	(n.s.)	48.175	***
DCI04	-.006	.879					.461	(n.s.)	40.848	***
DCI05			.211	.852			.749	(n.s.)	27.536	***
DCI06			.720	.866			2.001	**	23.691	***
DCI07			.293	.798			1.077	(n.s.)	19.759	***
BCI04			.515	.826			1.295	(n.s.)	25.302	***
BCI05			.433	.853			1.042	(n.s.)	24.747	***
BCI06			-.294	.803			1.064	(n.s.)	20.191	***
DCI08					1.013	.901	1.065	(n.s.)	39.063	***
DCI09					-.136	.822	1.741	**	16.169	***
BCI07					.524	.923	2.008	**	52.298	***
BCI08					-.703	.899	.340	(n.s.)	37.359	***

Significance: *** p < 0.01; ** p < 0.05; * p < 0.1; (n.s.) = not significant; one-tailed t-test and Bootstrapping procedure of 500 samples
Note: indicators in bold should be eliminated in the formative model since weights are not significant (p< 0.1)

According to Table 3, numerous indicators should be eliminated when constructs are considered as formative. However, this does not raise concerns unless the items in the final index exhibit sufficient breadth of content to capture the domain of the coordination construct (Diamantopoulos and Singuaw, 2006, 271). In the case of customer involvement in early and late NSD phases (CISE & CISL) this is questionable. We therefore continued testing the statistical soundness of the measures.

We examined the relationships of the formative constructs and their antecedents and consequences in the models described in chapters 4.1 and 4.2. The comparison between the models gives insights into whether a reflective or formative model should be preferred.

The fit – reflected in R^2 of the NSD outcome variables – of our customer knowledge model demonstrate no substantial differences in the way the level of customer involvement is measured (Appendix 17). The R^2 in both models are of equal size. However, the R^2 of increase in explicit customer knowledge stock (EKA) is slightly higher in the reflective model (reflective: $R^2 = .31$; formative: $R^2 = .28$), while the R^2 of increase in tacit customer knowledge stock (TKA) is slightly lower (reflective: $R^2 = .24$; formative: $R^2 = .25$). It appears the formative model of CUI measures different aspects of customer involvement in NSD due to the elimination of four items: (1) variety of customer involvement methods (BCI01), (2) diversity of customers involved (BCI02), (3) deep involvement of customers (DCI03), and (4) active engagement of customer (DCI04).

We found similar results in the model of antecedents of customer involvement stages. The R^2 of early customer involvement (CISE: $R^2 = .22$) and late customer involvement (CISL: $R^2 = .21$) measured in a formative manner are slightly lower than in the reflective model (CISE: $R^2 = .23$; CISL: $R^2 = .22$). Furthermore, in the formative measurement model of CISL another manifest variable had to be eliminated, because its weight was not significant, DCI09, the rich engagement of customer in the implementation and launch phase. Hence, both constructs are measured by one single item (Appendix 18). Finally, no significant relationships between innovativeness (INN) and market-driven NSD (MAO) and stages of customer involvement (CISE and CISL) have been found in this model. It appears that nomological validity is violated in the formative model, since both concepts, market orientation and innovation, are theoretically associated with customer value co-creation (e.g. Baker and Sinkula, 2007; Jeppesen and Molin, 2003; Langerak et al., 2004; Lukas and Ferrell, 2000; Matthing et al., 2004; Narver et al., 2004).

In the reflective model, more indicators are significant. The set of indicators demonstrate significant higher loadings on the construct, while in the formative model only three items showed significant results. According to the academic experts who tested content validity, all seven items should measure the construct in order to consider several ways of interpreting the concept (see section 5.2.5). Hence, the reflective model shows results, which are more consistent with theory.

These outcomes plead for a reflective approach. However, to consider all facets of model testing, we checked for multicollinearity.

Measurement error and collinearity

Because error of formative constructs is in the factor, the most important validation criteria relate to predictive validity. To assess measurement errors, Bollen and Ting (2000) recommend the vanishing tetrad-test. The test compares the intercorrelations between pairs of errors of indicators inherent in reflective models. Here, measurement errors can be identified by common factor analysis, because "*the factor score contains only that part of the indicator that is shared with other indicators, and excludes the error in the items used to compute the scale score*" (Coltman, 2008 referring to Spearman, 1904). Since the disturbance term (ζ) is not associated with the individual indicator or the set of indicators as a whole, a correlational structure of error terms (δ) of observed scores and measurement error in the latent variable is non-existent in the case of formative models.

Hence, a tetrad-test showing no difference between the products of two pairs of error covariances (i.e. vanishing tetrads tend to zero), could be an indication for rejecting a reflective relationship between manifest variables and the latent construct. However, since error structure could be contaminated due to common method error, the tetrad-test is limited in its ability to prove the correct measurement model (Coltman, 2008). Furthermore, the test is not incorporated in SmartPLS yet.

We therefore checked collinearity of indicators. In the presence of collinearity, estimation of indicator weights in the formative model becomes difficult resulting in imprecise values for these weights, but it is a virtue for reflective models (Coltman, 2008; Jarvis et al., 2003). We analysed collinearity by running a series of regression models with each item of the formative model of level of customer involvement (CUI)[5] serving as the dependent variable and the other items designated as independent variances (Mason and Perreault, 1991; Schloderer et al., 2005, 583). SPSS produces various collinearity diagnostics. The Variance Inflation Factor (VIF) indicates whether a predictor has a strong linear relationship with the other predictor(s) and measures the common variance of two indicators in the measurement model, VIF = $1/1\text{-}R^2$. In general, a VIF > 10 is a good value at which multicollinearity may be biasing the model (Field, 2006, 175). However, a multiple correlation of .9 between one independent variable and all others would imply that any VIF substantially greater than 5.0 indicates multicollinearity and should alert researchers to the typical problems of multicollinearity (Hair et al., 2006, 230; Henseler et al., 2009). All the variance inflation factors (VIF), levels of tolerance and condition indices in the regression models were below the cut-off levels (Hair et al.

5 The constructs measuring customer involvement in early and late NSD stages are single-item measures when conceptualized as formative variables. Hence, collinearity diagnostics do not apply to these constructs.

1998) (Appendix 19). Hence, no multicollinearity problems in the formative scale were found. Based on these results, it is inconclusive whether a formative or reflective measurement should be preferred.

Our preceding analyses demonstrate mixed results on the type of relationship between manifest indicators and latent constructs. Based upon the theoretical and empirical considerations we analysed (Table 4), the measurement model could be either formative or reflective. However, the majority of our findings support principal factor models. As a result, we adapt the reflective measurement models for the thesis. Hence, the effect indicators' main value is in providing a way to track the progress of the construct and discuss overall strategies with regard to degree of customer integration in NSD rather than distinguishing the effects of measures that help managers to design level of customer involvement (Albers and Hildebrandt, 2006, 11; Bollen and Ting, 2000, 4)

Finally, the analysis on validity and reliability of measures, described in the next chapter, substantiate that indicators share a common theme and are internally consistent as a construct. This supports our approach to conceptualize the constructs in a reflective manner.

Table 4: Summary of Results

Considerations	***Outcome***
Theoretical considerations	
Direction of causality between the construct and its items	Reflective or formative
Interchangeability of indications	Reflective
Empirical considerations	
Indicator intercorrelations	Reflective
Indicator relationship with construct antecedents and consequences	Reflective
Measurement error and collinearity	Reflective or formative

5.2.4 Assessing the Validity and Reliability of Measures

The issues of reliability and measurement validity are primarily matters relating to the quality of the measures that are employed to tap the concepts of interest (Bryman, 2004, 40). While reliability is concerned with the accuracy of the actual measuring instrument or procedure, validity refers to the degree to which the study accurately reflects or assesses the specific concept that the researcher is attempting to measure (Howell et al., 2005). It incorporates a number of different types of validity reflecting different ways of gauging the validity of a measure of a concept (Bryman, 2004, 73). We account for this by following the procedure used by Gatignon et al. (2002) and Haynes et al. (1995), and assessed dimensions of validity and reliability of our research constructs in three stages (referring to Churchill, 1979):

- Stage 1: Face and content validity analysis with expert judges
- Stage 2: Construct validity test including convergent and discriminant validity through analysis of covariance structures and factor loadings including the analysis of internal reliability.
- Stage 3: Nomological validity through the analysis of the hypotheses developed with regard to customer involvement in NSD.

Finally, we describe analysis of common method variance that is related to validity of constructs.

5.2.5 Face and Content Validity

For stage 1, we administered 16 items supposed to measure level of customer involvement in NSD to academic experts in service innovation and knowledge creation (see chapter 5.2.2). The 7 items of customer involvement in NSD and 10 items of customer involvement in early and late stages in NSD - representing new scales and judged by experts – were included in the final main questionnaire consisting of 122 questions in total (Appendix 3).

Face Validity

Face validity is a minimum requisite of testing that the measure apparently reflects the content of the concept in question (Bryman, 2004). It subjectively assesses the correspondence between the individual items and the concept through ratings by expert judges, pre-tests with multiple sub-populations, or other means (Hair et al., 2006).

Although the majority of items stems from existing literature, we administered the entire questionnaire to a pool of ten services marketing managers and four marketing academics to assess validity. We conducted face-to-face interviews. The selected marketing managers and academics were given the definition of each construct. They were asked to check whether items represent dimensions of the respective construct and correspond with the definition provided. The respondents proposed several refinements and modifications, but no major changes in or deletion of items. However, we eliminated one construct "customer selection strategy", we initially included, as respondents complained about the length of questionnaire. We considered this construct as less relevant with regard to our research focus, that is, the manageable aspects of customer involvement in NSD (Figure 4).

Content Validity

In essence, both types of validity, i.e. face and content validity, attempt to assess the degree to which the researcher has accurately *translated* the construct into the operationalization (Trochim, 2006). However, while face validity refers to whether the operationalization seems like a good translation of the construct "on its face", content validity provides evidence about the degree to which the elements of the questionnaire are relevant to and representative of the targeted construct. As such, it is an important component or a form of construct validity that proves the utility, domain, facets, boundaries, and predictive efficacy of the construct (Haynes et al., 1995). Carmines and Zeller (1979, 22) state there is still disagreement about content validation, because it is difficult to deal with abstract concepts typically found in social science. The authors argue that the exact number of dimensions to be specified is unknown, and there is no agreed criterion to determine when a measure has attained content validity, i.e. rigorous and objective measures for achieving content validity are absent in the literature.

Because of these concerns, we followed the general guidelines of Haynes et al. (1995) and Churchill (1979). We also considered recent recommendations of Rossiter (2008) who contends that a construct has to be defined in terms of three elements: (1) the object to be rated, (2) the attribute on which the rating is to be made, and (3) the rater entity that provides the rating. The guidelines include following steps:

1. *Careful definition of the domain and attributes of the construct* (Nunnally and Bernstein, 1978; Walsh, 1995), *i.e. the object to be rated* (Rossiter, 2008)

Since our research is based on the new construct of level of customer involvement we explored available Service Marketing literature and studies on innovation concerning alternatives reflecting the meaning of depth and breadth of customer involvement in NSD (see chapter 3.2.3) (Carmines and Zeller, 1980). The domain of interest, i.e. theoretical conceptualisation of level of customer involvement in new service development is associated with the degree of integrating customers or information about customers to govern level of learning about customers within the NSD team. Furthermore, the concept should represent the perspective of managers who organize the integration of customers throughout the NSD project. This is contrary to the evaluation from the perspective of customers. Customers could state their individual involvement level, however may be unable to determine the degree to which other customers and information about customers the NSD team were resorting to while innovating.

Published, popular and theoretical conceptions about the level of customer involvement in NSD refer the construct to (1) duration of work with customer, (2) depth and breadth of involvement, (3) number of methods of involvement, (4) degree of activeness of customers, (5) direct and social interaction between customers and NSD team, (6) cognitive efforts of customers, (7) frequency of contact with customers, (8) intensity – the state or quality of being intense – of work with customers, and (9) enjoy and interest of customers in being involved (Appendix 4). In total, we generated a pool of sixteen items that should represent the dimensions of the construct.

2. *Subject all elements to content validation* (Murphy and Davidshofer, 1994).

We developed an online questionnaire and a response scales which attempted to measure the degree to which the items represent level of customer involvement in NSD (5 = very representative, 1 = not at all representative). We additionally measured each item on a dichotomous scale whether it represents breadth or depth of customer involvement (1 = breadth, 2 = depth).

A description about the scope of research, the concept and a definition of breadth and depth (Sawhney et al., 2005) were provided in the questionnaire. The experts were solicited to comment on items and make suggestions for refinement.

3. *Use population and expert sampling for the initial generation of items and use multiple judges of content validity and quantify judgements using formalised scaling procedures* (e.g. Lynn, 1986, Wynd et al, 2003)

The online survey included 38 academic experts in knowledge creation and service innovation who published several works in these realms.

We received 10 complete responses. We selected seven statements the experts agreed on representing depth and breadth of customer involvement at best (Sawhney et al., 2005); i.e. statements attained a mean value above 3.5 and a "necessary" content validity index (CVI) of 72% (Hartmann, 1977; House et al., 1981). The CVI is a proportion agreement procedure that indicates the proportion of items that received a rating of 4 or 5 by the experts, i.e. "representative" and "very representative" (Lynn, 1986; Waltz and Baussell, 1983; Wynd et al, 2003).

We calculated the CVI based upon the Content Validity Rate (CVR) of each item. The rate represents the number of experts who rated the items as "representative" or "very representative" in relation to the total panellists. Lawshe (1975) argues that "*the more panellists (beyond 50%) who perceive the item as essential, the greater the extent or degree of its content validity*". Derived from these considerations we applied the following equation:

Equation 3: Content Validity Rate (CVR)

$$CVR = \frac{n_e - N/2}{N/2}$$

where n_e is the number of panellists indicating „representative" or „very representative“ and N refers to the total number of panellists.

According to the author, when all say “representative”, the CVR is computed to be 1.00 and the ratio is negative when fewer than half of experts say “representative”. Researchers should eliminate those items in which concurrence by members of the panel might reasonably occur through chance; that is in the case of ten experts a minimum CVR of 0.62. After items have been identified for inclusion, the CVI is computed for the seven retained items. The CVI is the mean of the CVR values of the retained items. It should exceed a cut-off value of 0.7 (Hartmann, 1977; House et al., 1981; Lawshe, 1975)[6]. Appendix 5 summarizes the results of the expert survey.

Based on several comments, we refined three items because two experts stated the need of specificity. We modified the items and retested them with four marketing and service innovation academics when we examined face validity of the entire questionnaire.

4. Use subsequent analyses for scale refinement.

Since all types of validity are interrelated, Haynes et al. (1995) suggest the analysis on internal consistency of concepts and the obtained factor structure that provides essential information on the degree to which an item taps the intended constructs and facets (referring to Smith and McCarthy, 1995). Thus, in addition to our analysis on face and content validity, we tested construct validity of our theoretical concepts (stage 2).

5.2.6 Construct Validity

Construct validity is concerned with the extent to which a particular measure relates to other measures consistent with theoretically derived hypotheses related to the concepts

[6] For calculation of CVR, we excluded the number of experts from the total number of experts who rated the particular item as “neither representative nor representative” since this rating does not contribute to the determination of the stability of agreement. Moreover, the ordinal response rankings cannot be collapsed into two dichotomous categories of responses (“content invalid” and “content valid”) to calculate agreement or disagreement as advocated by Lynn (1986).

(or constructs) that are being measured (Bryman, 2004; Carmines and Zeller, 1979). Evidence of construct validity provides confidence that item measures taken from a sample represent the actual true score that exists in the population (Hair et al., 2006, 776). Construct validity can be broken down into two sub-categories: Convergent validity and discriminate validity (Bagozzi et al., 1991 referring to Campbell and Fiske, 1959). The items that are indicators of a specific construct should converge or share a high proportion of variance, known as convergent validity. Hair et al., (2006) outline several ways in Confirmatory Factor Analysis (CFA) to estimate amount of convergent validity among item measures:

- *Factor Loadings*: in the case of high convergent validity, high loadings on a factor would indicate that they converge on some common point. Standardized loading estimates should be statistically significant and attain a minimum of .5 or higher, and ideally .7 or higher. The cut-off value of factor loadings is related to an item's communality, the total amount of variance an original variable shares with all other variables included in the analysis. The square of a standardised factor loading represents how much variation in an item is explained by the latent factor. A loading of .71 squared equals .5, that means that a factor explains half the variation in the item with the other half being error variance.
- *Variance Extracted*: With CFA, the average percentage of variance extracted (AVE) among a set of construct items is a summary indicator of convergence (referring to Fornell and Larcker, 1981). AVE is computed as the total of all squared standardized factor loadings (squared multiple correlations) divided by the number of items, that is the average squared factor loadings. An AVE of less

than .5 indicates that, on average, more error remains in the items than variance explained by the latent factor structure imposed on the measure.

- *Construct Reliability*: Construct Reliability (CR) is computed from the square sum of factor loadings for each construct and the sum of the error variance terms for a construct. High reliability indicates that internal consistency exists, meaning that the measures all consistently represent the same latent construct. A minimum value of .6 may be acceptable if other indicators of a model's construct validity are good and above .7. SEM Techniques, such as Partial Least Squares (PLS), provide indicators on reliability in the form of Cronbach's alpha and Composite Reliability (CR). Both should exceed the cut-off point of .7 to indicate internal consistency of constructs.

Discriminant validity is the extent to which a construct is truly distinct from other constructs (Campbell and Fiske, 1959; Hair et al., 2006). Thus, high discriminant validity provides evidence on the uniqueness of a construct and the fact, that the construct captures some distinct phenomena not measured by other measures. Path modelling techniques provide two common ways of assessing discriminant validity (Hair et al., 2006):

- Correlation between any two constructs can be specified as equal to one. It is the same as specifying that the items making up two constructs could just as well make up only one construct. The two-construct model should be significantly better than that of the one-construct model in case of high discriminant validity.
- As a better test, the variance-extracted percentages for any two constructs with the square of the correlation estimate between these two constructs can be compared (referring to Fornell and Larcker, 1981). The variance-extracted estimates

should be greater than the squared correlation estimate. The logic here is based on the idea that a latent construct should explain its item measures better than it explains another construct.

Based on the recommendations of Hair et al. (2006) we tested convergent and discriminant validity by inspecting (1) factor loadings, (2) AVE and (3) reliability.

Overall, our tests indicate sufficient convergent and discriminant validity after elimination of several items. The results of the first model are summarized in chapter 6.2.1. As for the second model, the results are condensed in section 6.3.1. In addition to the tests provided in the measurement models of PLS and to prevent significant changes in latent constructs subsequent to our PLS analysis, we pre-assessed reliability of constructs by performing the split-half method in SPSS for the first thirty responses we received (section 5.2.7). We furthermore inspected the dimensionality of the constructs by performing a principal component analysis (section 5.2.8). Since we expected multidimensionality of some constructs, and reliability analysis does not account for it (Field, 2006), we performed a principal component analysis based upon the entire sample data.

5.2.7 Reliability

We sent the questionnaire to our sample respondents and initially conducted a reliability test of the first thirty responses received. Reliability, a measure whether a scale consistently represents the construct, has been tested by the split-half method. Most of our latent constructs achieved a Cronbach's α above .7, a value that indicates a reliable scale (Field, 2006). However, the analysis revealed that reliability of "service concept adaptation" (SCM) will improve from .711 to .783 when SCM02 is deleted. Similar results have been found regarding the construct “innovativeness” (INN). Elimination of INN04 resulted in a Cronbach’s α of .64.

We kept all items and rechecked our initial results by a second reliability analysis for the entire sample data. The results of the reliability test are summarised in Appendix 8.

5.2.8 Dimensionality of Constructs

We conducted principal component analyses (PCA) with Varimax (orthogonal) rotation for data obtained from all respondents to reduce number of variables by simultaneously conveying as much information of the variances in the data set. PCA is a method, which should be preferred over Exploratory Factor Analysis (EFA) when the number of participants is lower than the number of items and the aim is to reduce number of items (Leech et al., 2005). We included variables that are not supposed to be causes of other variables and have at least reasonable correlations (De Vaus, 2002).

We identified 19 composite constructs with eigenvalues greater than 1 for all items of the questionnaire, accounting for between 65% and 73.3% of the total variance (Appendix 9). We checked KMO, a measure of sampling adequacy. Most of the constructs had values greater than .7 reflecting suitable variables for factor analysis (De Vaus, 2002). Solely the values of INN and EUN achieved mediocre results (values between .5 and .7 according to Field, 2006).

Factor loadings on constructs were above .6, except for MOA01 and MOP01 of the concept of market-driven NSD. Furthermore, the item CUB03 of the concept customer orientation considerably loaded on two constructs. Thus, we deleted these items.

We identified – apart from the overall single measure overall success – three dimensions of success (SUC); we termed them “market success” (SUC02-04, SUC09), “project success” (SUC05-07), and “sustainable competitive advantage” (SCA). With regard to customer involvement, we identified three dimensions: level of customer involvement (CUI), and two measures pertaining to customer involvement in the early (CISE) and late stages (CISL) of NSD. Despite the substantiated results, we recognised that SCM02 of the construct "service concept adaptations" (SCM) and INN04 of the construct innovativeness loaded on separate constructs and reduced reliability of the concepts. We deleted them, resulting in a significant improvement of reliability and total variance explained. Hence, we used 17 latent constructs, one single-item variable (SUC01) and a list of 20 methods of customer involvement in our research. Respondents were requested to mention other methods used, if so.

5.2.9 Nomological Validity

In stage 3 of our validity analysis, we tested nomological validity by examining whether the correlations among the constructs in the measurement theory make sense (Hair et al, 2006, 778). We therefore inspected the matrix of construct correlation for significant relationships as theorized in our models (Appendix 20).

Regarding our first model, customer knowledge creation, we identified significant relationships as theorized. However, the correlation matrix indicates that the increase in explicit customer knowledge stock has a small effect on market success ($p < .05$ $R = .200$) and a medium effect on sustainable competitive advantage ($p < .01$ $R = .290$). However, the strongest relationship exists between increase in explicit customer knowledge stock and service concept adaptations ($p < 0.01$ $R = .470$), as hypothesized.

Furthermore, we identified small and medium effects of level of customer involvement in NSD and two service outcome variables, project success ($p < .05$ $R = .170$) and sustainable competitive advantage ($p < .01$ $R = .280$).

In addition, we explored the relative effect of the constructs by PLS (Appendix 22). The results are provided in chapter 6.

As for our second model, antecedents of customer involvement in NSD stages, we recognised that market-driven NSD has a small significant effect on customer involvement in early NSD stages ($p < .05$ $R = .150$), and is not a significant predictor of customer involvement in late NSD stages ($p > .1$ $R = .140$). It appears that customers are a good source of ideas in new service development projects focussing on incremental service improvements. Support of this assumption is provided by the significant effect of innovativeness on customer involvement in late NSD ($p < .05$ $R = .190$). New service development executives manage very innovative and incremental service innovation projects differently (De Brentani, 2001). The nomological validity of these effects is further investigated in section 7.1.3.

As with all self-reported data, there is a potential for common method biases resulting from multiple sources such as consistency motif, illusory correlations and social desirability (Podsakoff et al. 2003; Podsakoff and Organ 1986). The subsequent section describes multiple tests performed to identify any problems arising from our research settings.

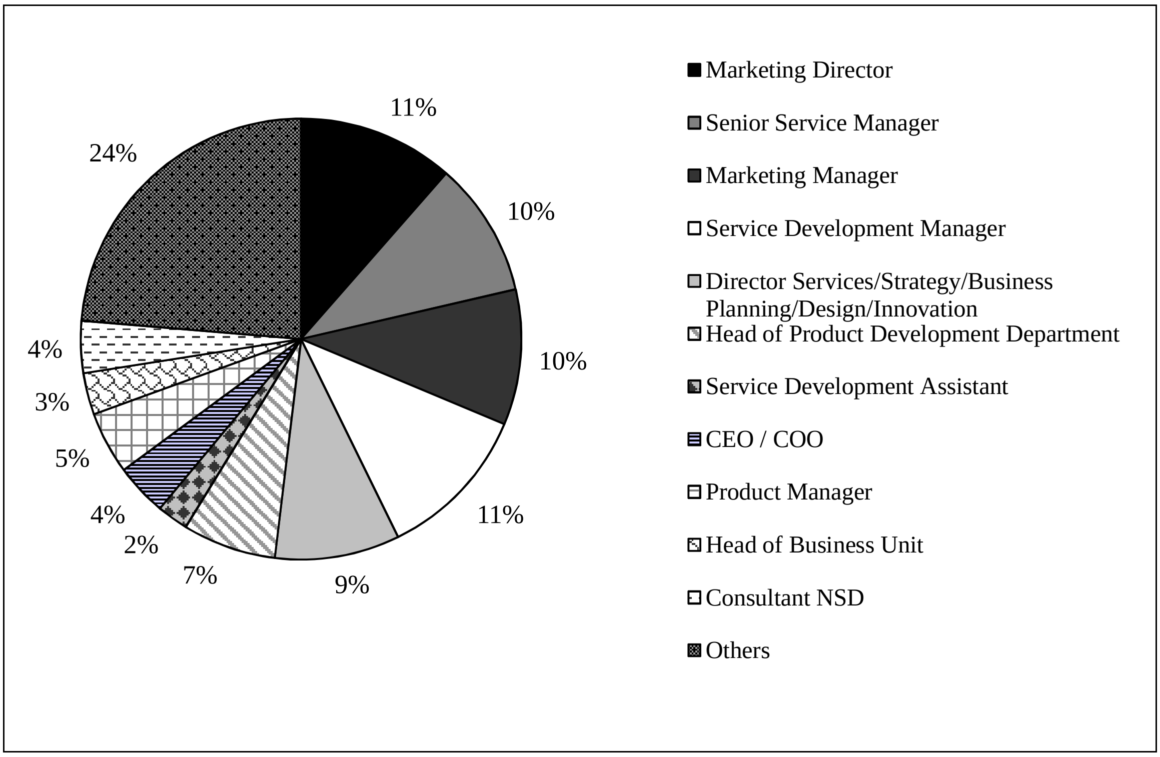
5.2.10 Common Method Variance

Common method variance refers to *variance that is attributable to the measurement method rather than to the construct, the measures represent*. The term method refers to the form of measurement at different levels of abstraction such as the content of specific items, scale types, response format, and the general context. At the more abstract level, method effects result in common method biases such as halo effects, social desirability, acquiescence, or leniency effects, and can either inflate or deflate observed relationships between constructs; leading to both Type I and Type II errors (Fiske, 1982, 77-92; Podsakoff et al. 2003). Because method biases are a problem and one of the main sources of measurement error that threatens the validity of the conclusions about relationships between measures, the authors propose procedural and statistical remedies to minimize or control for potential effects of common method variance.

As one of the procedural remedies, we attempted to increase construct validity and reduce systematic measurement error, the degree to which expectations of judgements do not equal the true value (Van Bruggen et al., 2002), by conceptualising our survey as a two-informant study. We sent the questionnaire to one key informant asking him/her to send the questionnaire to another NSD team member who also should complete the questionnaire. Despite all efforts, we did not receive more than one response per firm.
As one informant may not be able to form "true" social judgements due to the difficulty or complexity of factors pertaining to the research, e.g. breadth of information sources available to the informant, we furthermore attempted to improve validity by focusing on high-ranking informants. High-ranking informants are organisational executives who are the most knowledgeable source of information about their firms, its strategies, and the plans to achieve them. They are representatives of their firms and the have similar duties and responsibilities regardless the type of business (Cycyota and Harrison, 2002; Norburn, 1989). Hence, executive respondents are a prime source of information about processes in diverse areas of an organisation, such as marketing strategy and its implementation (Jaworski and Kohli, 1993).

According to the job titles of survey participants (Figure 8), our sample consists of marketing executives and informants who usually participate in innovation decision-making (e.g. Jaworski and Kohli, 1993; Kyriakopoulos and De Ruyter, 2004; Moorman, 1995) and hence, are considered as knowledgeable in their field (Phillips, 1981, 398).

Figure 8: Job Titles of Key Informants[7]



Since we chose the key informant method, a technique used to collect information from a selected number of participants who were not chosen on a random basis but because of their special qualifications, a rigorous assessment of the convergent and discriminant validity of informant reports is mandatory for researchers (Campbell and Fiske, 1959;

[7] Others: Customer Engagement Manager (1), Business Analyst (2), User Experience Designer (1), Research Director (2), Principal Partner (2), Innovation Manager (2), Vice President (1), Manager Business Intelligence (1), Operations Manager (2), Event Manager (2), Marketing Specialist (1), Key Account Manager (2), Portfolio Manager (2), Project Manager (2), Service Level Manager (1), Technical Captive Manager (1), Head of Business Development (1), Head of Dealing (1), Content Manager (1), Segment Manager (1), Senior Marketing Manager (2). Number in brackets represents the quantity of responses.

Phillips, 1981). Results of tests demonstrate that validity is not a major concern (chapter 5.2.6).

In addition to this, Phillips (1981) proposes to reduce measurement error by asking questions in a manner, which requires less demanding judgments by the informant. We accounted for this by contacting respective informants and choosing recently completed NSD projects as unit of analysis to confine breadth of information.

In terms of controlling for biases caused by obvious relationships between variables, we "psychologically" separated measurement items by short introductory texts and created separate pages for constructs measured in our questionnaire. Furthermore, we used two types of likert scales and included open-end questions to minimize saliency of any contextually provided retrieval cues and the respondent's ability and/or motivation to use previously answers to fill in gaps in what is recalled and/or to infer missing details. Finally, respondents were assured of the confidentiality of their identities; a procedural remedy to reduce their evaluation apprehension and make them less likely to edit their responses to be more socially desirable (Podsakoff et al., 2003).

In addition to these procedural measures to reduce method bias and measurement errors, we performed two statistical analyses to assess presence and severity of common method bias.

Harman's One Factor Test

We conducted Harman’s one-factor test and loaded all items of our study into an exploratory factor analysis (Varimax rotation). The basic assumption of this technique is that if a substantial amount of common method variance is present, either (a) a single factor will emerge or (b) one general factor will account for the majority of the covariance among the measures (Podsakoff et al., 2003). The results from this test (Appendix 13) reveal that the first factor explains 19,4% variance (unrotated solution) and 24 factors have greater Eigenvalues than 1.0, indicating that common method variance is not a major problem. However, since this test is sensitive to major problems regarding common method variance only (Podsakoff and Organ, 1986), we additionally performed the Latent Method Test.

Latent Method Test

Following Podsakoff et al. (2003), Williams et al. (2003) and Liang et al. (2007), we included a common method factor in our two PLS models, namely (1) Customer Knowledge Creation and (2) Antecedents of Customer Involvement. Although this method has been conceptualized for covariance-based SEM models (Williams et al., 2003), Liang et al. (2007) and Podsakoff et al. (2003) argue that using covariance-based SEM to execute the latent method test may result in problems with identification due to disproportion of latent variables and manifest items in the model, and therefore emphasize that PLS is an appropriate alternative to it.

We followed the procedure of Liang et al. (2007) and converted each indicator to a single-indicator (substantive) construct to finesse the constraint of PLS of not accommodating random errors. The original constructs became second-order constructs. The path coefficients between second-order and first-order constructs are equivalent to factor loadings, which are tested for statistical significance. When manifest items are converted into single-item constructs, the measurement error and loading have to be constrained to zero and one, respectively.

We estimated each of our models twice to assess effects of common method bias. The first estimation considered the first- and second-order constructs without the common method factor. The second model included the method factor whose indicators incorporated all the principal construct items. The factor was linked to all of the single-indicator constructs that were converted from observed items. We subsequently calculated each indicator's variance substantively explained by the principal construct and by the latent method. Hence, we could detect and partial out variance shared among substantive indicators unrelated to the substantive constructs (Richardson et al., 2009) by inspecting the squared values of the method factor loadings ($R2^2$). The squared loadings of substantive constructs ($R1^2$) were interpreted as the per cent of indicator variance caused by substantive constructs. The indicator variance should be significant and substantially greater than their method variance to indicate that common method bias is not a serious concern (Liang et al., 2007).

Appendix 14 and Appendix 15 summarize the results and demonstrate that the average substantively explained variance of the indicators is .64 and .70, while the average method-based variance is .01 in both cases. The ratio of substantive variance to method variance is more than 60:1. The inclusion of the method factor does not improve the factor loadings or variance explained in the models. Furthermore, the majority of method factor loadings are not significant.

We conclude from these tests that common method bias is unlikely to be a serious concern for this study.

5.3 Sample and Data Collection

5.3.1 Data Collection Strategy

The sample was not constrained to one industry. We focused on profit-oriented service organisations according to the international classification of industries (NOGA, SIC): (1) Consulting and legal services, (2) Education, (3) Energy and water supply, (4) Facilities management services, (5) Financial intermediation (incl. insurance), (6) Hotels and restaurants (incl. bars), (7) Information and information technology services, (8) Labour market services, (9) Telecommunication services, (10) Transport (incl. storage), travel and tourism services, and (11) Wholesale and retail trade services.

For the survey portion of this study, we acquired a mailing list from the American Marketing Association (US) listing marketing managers and obtained addresses from FAME (UK), and Betriebsunternehmensregister Schweiz BUR (CH). All three databases provide good information on categories of service industries. In addition, AMA mailing lists include marketing managers of international companies with strong professional orientation (Ramani and Kumar, 2008) and interest in topic; an important survey feature to achieve higher response rates from executives (Cycyota and Harrison, 2002). Responsible marketing and NSD managers of companies listed in the databases of FAME and BUR were identified by internet search and initial phone contact.

We removed all addresses of manufacturing firms in the AMA mailing list and came up with a sample frame of 913 service firms. For the first stage of data collection, we assessed the qualification of the informants in order to ensure that executives with service innovation competences are approached. To this end, we contacted them by email, phone, and requests in web communities, in which the potential respondents were members, and asked them to participate if they have been involved in decisions of a new service development project recently completed. In instances, where the respondents identified stated that they were not competent to answer, we requested them to forward our questionnaire to the manager responsible. Two originally chosen managers replied that they passed on our request to the appropriate executive.

Of the 913 service firms we contacted, 253 addresses were invalid. Hence, our sample frame consisted of 659 potential respondents. The discrepancy between these two populations results in coverage error (Salant and Dillman, 1994). Even though, slight discrepancies in quota of the two populations exist (Table 5), the targeted types of service industries appear to be well presented in the sample frame.

Table 5: Overview of Industry Origin of Sample Frame and Target Population

Origin of Service Industries	Sample frame Total	Sample frame Percentage	Target population Total	Target population Percentage
1 Consulting and legal services	42	6.4%	69	7.6%
2 Education	21	3.2%	32	3.5%
3 Energy and water supply	7	1.1%	12	1.3%
4 Facilities management services	21	3.2%	28	3.1%
5 Financial intermediation	167	25.3%	220	24.1%
6 Hotels and restaurants	72	10.9%	83	9.1%
7 Information and information technology services	152	23.1%	190	20.8%
8 Labour market services	15	2.3%	28	3.1%
9 Telecommunication services	23	3.5%	39	4.3%
10 Transport, travel and tourism services	105	15.9%	156	17.1%
11 Wholesale and retail trade services	34	5.2%	56	6.1%
Total	659	100%	913	100%

5.3.2 Description of Sample

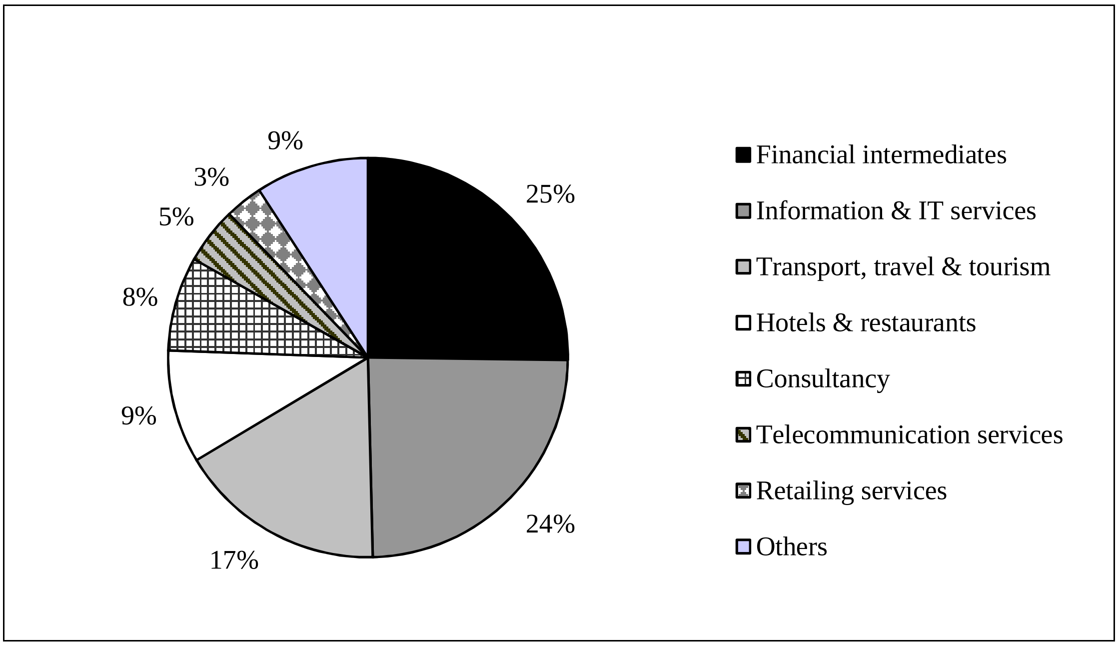
Potential respondents were contacted with a request to participate in an online survey or to complete and return the attached electronic document that contained the survey. We granted a monetary incentive of approximately € 20 to respondents and those who forwarded our request to the managers in charge. In addition, respondents were promised a summary of the results.

A second reminder was sent by mail and e-mail after three weeks. Whenever direct extensions were available, we reminded potential respondents by telephone. Nonrespondents were contacted a third time six weeks after initial correspondence. We received responses from 126 informants of which 96 were valid and complete (response rate = 15%). The average time taken to view the online questionnaire was 12 minutes.

Since we initiated a request in two web 2.0 communities, we received 35 additional responses from service marketing managers who solicited participation without being initially included in our sample; an effect of networked groups such as management executives that justifies the mode of contact (Cycyota and Harrison, 2006). However to recognise bias we examined means of sample and non-sample respondents on the scale item "overall success of the NSD project" (SUC01). The analysis indicated no significant differences in responses of groups (t-value: 1.412; $p < 0.1$) (Appendix 40).

The major industries represented in our study are financial services (25%), information and IT service businesses (24%), and transport, and tourism industry (17%) (Figure 9).

Figure 9: Overview of Industry Origin of Sample



Despite all efforts to increase response rate, the sample size did not achieve the threshold of 198[8] respondents required to make estimates with a sampling error of no more than ± 5 per cent, at the 95 per cent confidence level (Salant and Dillman, 1994). In our study, a sampling error of ± 10 per cent at the 95 per cent confidence level is estimated.

Of the firms, 42% serve industrial customers, 21% are in the B2C-market and 37% serve both B2B and B2C-customers (Appendix 41). Furthermore, we received responses from nine countries (Appendix 42). The average size of the NSD project, measured by number of team members, is 26. However, the majority of projects (37%) involve 5 – 10 people. The annual sales of the firms range from USD 100'000 to USD 118 Billion. The average sales value was USD 10 Billion.

We conducted two tests to examine the possibility of nonresponse bias. First, we compared the distributions of the respondents in the sample and the potential respondents in the sampling frame. The low chi-square indicated a lack of significant difference (χ^2 = 3,354; $p > 0.1$). Second, we compared early with late respondents. The respondents answering within the first wave were defined as early responses (54%), whereas the responses after the first reminder were considered late responses (46%). We compared the means of our key measure SUC01 in the two groups. No statistically significant differences were found (t-value: -.700; $p > 0.1$) (Appendix 44).

We furthermore examined the univariate skewness and kurtosis of data by transforming observed scores into z-scores, i.e. we subtracted the mean of the distribution from the

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8 Considering a less varied population, an 80/20 split for example, most people have a certain characteristic and a few do not. The threshold is applicable for a target population consisting of 1,000 firms.

observed value and then divided the results by the standard deviation of the distribution (Field, 2006). No significant levels of skewness and kurtosis have been found ($p < 0.1$).

As previously noted we conducted a web-based survey. A link to the survey website was sent by e-mail to the potential respondents. Web-based surveys are considered as fast and economical. Moreover, they are convenient for respondents to reply and do not need special software or technical expertise. Web page questionnaires can include a wide variety of question types. Furthermore, it can be programmed dynamically, in the form of filtering questions based on previously given answers (Sue and Ritter, 2007, 11). Although this survey mode has several advantages, there are a few drawbacks. First, empirical studies have demonstrated that response rates of web-based are considerably lower than traditional mail-administered ones. Potential problems are typically invalid e-mail addresses, spam filters and the easiness to quit in the middle of questionnaire (Roy and Berger, 2005; Sue and Ritter, 2007, 13). It has also been recognised (Churchill, 1999; Chisnall, 2001) that web samples are not representative, since they exclude non-Internet users causing a bias towards those with more experience of the Internet. In addition, Grandcolas et al. (2003) stress in their study on survey modes that bias of web administration mode is not a major concern, but effects of sample bias in web surveys may be higher compared to other modes.

As outlined in this chapter, the chi-square test did not reveal significant biases. However, we cannot entirely alleviate the concerns over the incompletion of the sample frame due to the chosen survey mode. Overall we considered several response rate enhancement techniques: (1) monetary rewards, (2) prior contact to potential respondents, (3) alternative response modes to our web survey (telefax), and (4) use of reminders to attain an acceptable response rate for surveying executives (Cycyota and Harrison, 2002; Grandcolas et al., 2003).

In the subsequent chapter, analyses and results of our research are synthesized.

6 Analysis and Results

First, we provide a baseline analysis of how, when and to what extent service firms integrate customers in NSD projects. We compare and contrast the key aspects of customer involvement in service innovation projects and present how customer involvement is part of the corporate culture of creating customer value. Second, with regard to these key aspects we provide evidence about differences between groups of entities: (1) firms serving industrial and consumer markets, (2) types of services, and (3) firms pursuing distinct innovation projects. The objective of this part is to investigate the heterogeneity of firms and their common practices in customer involvement and to check the appropriateness of our research for all service companies. Third, we examine the relationship of customer involvement and new service outcomes since our knowledge is limited about the extent to which customer involvement is used to achieve particular NSD objectives.

The final sub-section comprises the analysis of our three models conceptualized in chapter 4: (1) customer knowledge creation, (2) antecedents to customer involvement in NSD, and (3) customer involvement management practices. The models explore the cause-and-effect relationships that are amply discussed in the Services Marketing literature.

6.1 Descriptive Statistics on Customer Involvement in NSD

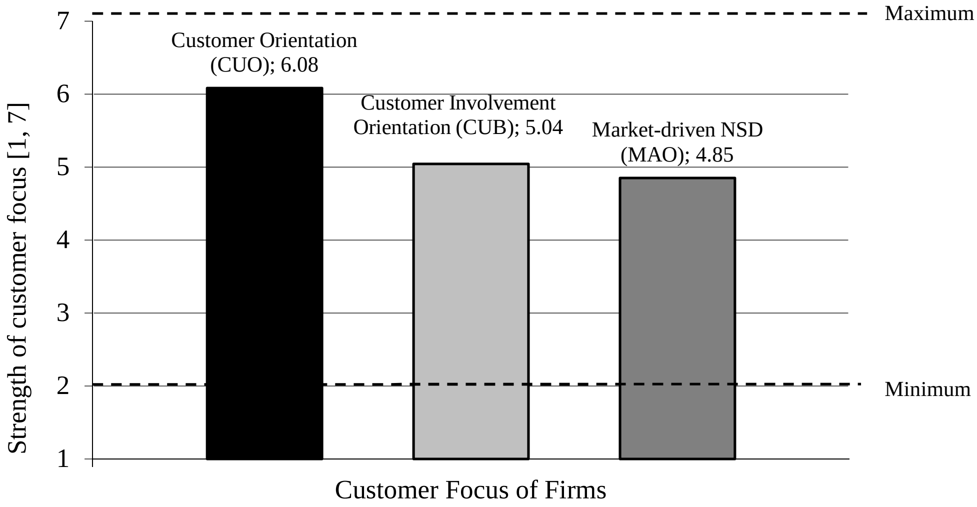
6.1.1 Frequencies and Mean Values

In this part of our empirical investigation, we explore and describe service companies of our sample regarding their behaviour and attributes related to customer involvement in NSD. To achieve this, we form individual variables of a construct into single composite measures and create summated scales, all measured on a 7-point likert scale. We compare mean scores to explore our data (Hair et al., 2006). Furthermore, to discriminate general tendencies of patterns and characteristics related to customer involvement we construct and investigate grouped scores (class intervals) (Pagano, 2007, 40).

At the outset of our research, we give an overview on the strength of firms' customer focus – market-driven new service development, customer orientation, and customer involvement orientation – major antecedents to customer involvement in NSD.
Figure 10 illustrates that service firms are prominently committed to their customers and look at new ways to create customer value. More than 80% of firms consider themselves as highly customer-oriented. The average degree of customer orientation is above 6.0. However, being customer-oriented does not entail being convinced that customer involvement in NSD pays off. As indicated on the graph, the mean of customer involvement orientation is below customer orientation. Hence, it seems that distinct customer-oriented capabilities form an organisation's cohesive customer focus, offering a rich array of ways to design market-oriented programmes (Day, 1994b).

In the same context, the "low" mean value regarding market-driven NSD should be viewed (mean = 4.85). Merely 30% of firms put a great effort in identifying existing customer needs, which are unmet.

Figure 10: Strength of Customer Focus



Customer Focus of Firms

	Customer Orientation (CUO)		Customer Involvement Orientation (CUB)		Market-driven NSD (MAO)	
Frequencies **(%)**						
High	109	**83%**	53	**41%**	39	**30%**
Medium	18	**14%**	65	**50%**	76	**58%**
Low	4	**3%**	13	**9%**	16	**12%**
Maximum	7.00		7.00		7.00	
Minimum	2.00		2.00		2.00	
Mean	6.08		5.04		4.85	
SD	1.025		1.199		1.035	
t-value (sig)	68.187***		48.101***		53.644***	

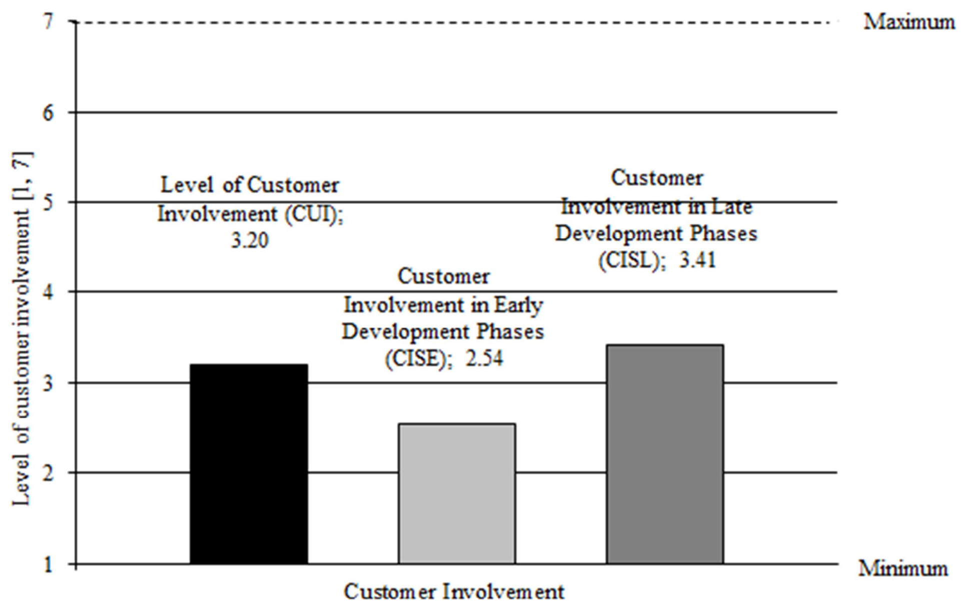
High = values of summated scores ranging from 5.5 - 7
Medium = values of summated scores ranging from 3.5 - 5.49
Low = values of summated scores ranging from 0 - 3.49
Summated scores: CUO = CUO01, CUO02; CUB = CUB01 - CUB04; MAO = MOA01- MOA03; MOP03 - MOP04
Significance: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$; (n.s.) = not significant
n = 131

In terms of intensity of customer involvement, our results support empirical findings of Sandén et al (2006) who reveal that Swedish companies fall in the middle and the least intense end of the customer involvement continuum and tend to use buyers as passive sources of customer information.

As depicted in Figure 11 more than 50% of the responding services companies in our sample state that they do not work intensively with customers throughout NSD.

Furthermore, 18% of the organisations report that they integrate customers in late stages of the innovation process. It appears that there is a tendency to use customers as evaluators at the very end of NSD. Collaborating with users to generate fresh service ideas does not seem to be attractive to service firms.

Figure 11: Level and Stages of Customer Involvement in NSD Projects



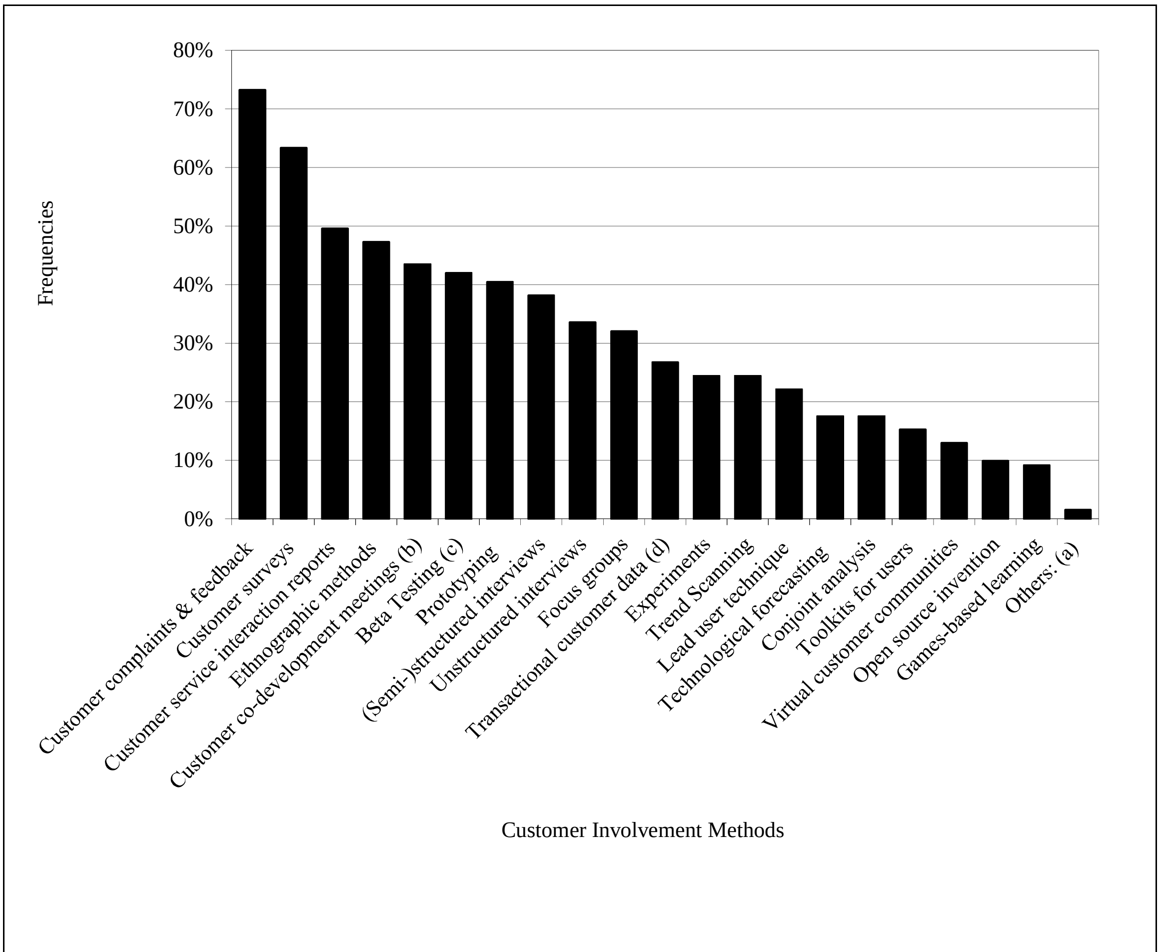
Customer Involvement

	Level of Customer Involvement (CUI)		Customer Involvement in Early Development Phases (CISE)		Customer Involvement in Late Development Phases (CISL)	
Frequencies **(%)**						
High	12	**9%**	4	**3%**	23	**18%**
Medium	46	**35%**	35	**27%**	42	**32%**
Low	73	**56%**	92	**70%**	66	**50%**
Maximum	7,00		5,83		7,00	
Minimum	1,00		1,00		1,00	
Mean	3,20		2,54		3,41	
SD	1,703		1,423		1,835	
t-value (sig)	21.523***		20.463***		21.277***	

High = values of summated scores ranging from 5.5 - 7
Medium = values of summated scores ranging from 3.5 - 5.49
Low = values of summated scores ranging from 0 - 3.49
Summated scores: CUI = BCI01-03, DCI01-04; CISE = BCI04-06,DCI05-07; CISL = BCI07-08, DCI08-09
Significance: *** p < 0.01; ** p < 0.05; * p < 0.1; (n.s.) = not significant
n = 131

One area where large differences can be found concerns customer involvement methods. Although traditional market research techniques have been criticized as being costly and failing to deliver what companies expect (Ogawa and Piller, 2006), firms still prefer them over methods of intensive social interaction. The latter are deemed to be better modes for tapping into the tacit, sticky knowledge of customers e.g. co-development meetings (Wikström, 1996) or virtual customer communities (Sawhney et al., 2005). Methods like virtual customer communities and open source invention still have not found their way into business practices. According to our research, customer complaints and feedback reports are the most common methods used in NSD (73.3%) (Figure 12).

Figure 12: Usage of Methods



These findings are in line with the research results of Sandén et al. (2006) who state that costs are one of the major reasons for using these techniques. Moreover, information from customers can be easily obtained. However, contrary to their study we find that surveys are secondary (63.4% of firms) followed by customer service interaction reports (49.6%). Games-based learning is not being utilized in NSD.

The investigation of usefulness of these methods provides some important insights. Table 6 illustrates that other modes, customer advisory board, competitive analysis and truth tables, are viewed as the most useful methods. Likewise, beta testing and prototyping are rated among the most useful techniques of customer integration. Our findings also show that open source invention and games-based learning are considered not appropriate as a means to achieve NSD goals.

Table 6: Usefulness of Methods

Usefulness of Methods

	Frequency (Usage)	Usefulness [1, 5]	SD	t-value
Customer complaints & feedback	73,3%	4,06	0,98	13,455***
Customer surveys	63,4%	4,05	0,85	10,986***
Customer service interaction reports	49,6%	4,03	1,07	9,016***
Ethnographic methods	47,3%	3,91	1,05	8,290***
Customer co-development meetings (b)	43,5%	4,05	1,04	8,142***
Beta Testing (c)	42,0%	4,15	1,07	7,771***
Prototyping	40,5%	4,13	0,95	7,737***
(Semi-)structured interviews	38,2%	3,95	1,01	7,214***
Unstructured interviews	33,6%	3,73	1,12	6,439***
Focus groups	32,1%	3,90	1,02	6,536***
Transactional customer data (d)	26,7%	3,71	1,06	5,653***
Experiments	24,4%	3,69	1,17	5,455***
Trend Scanning	24,4%	3,59	1,00	5,403***
Lead user technique	22,1%	3,71	1,33	5,055***
Technological forecasting	17,6%	3,78	1,16	4,546***
Conjoint analysis	17,6%	3,53	1,19	4,796***
Toolkits for users	15,3%	3,54	1,20	3,954***
Virtual customer communities	13,0%	3,63	1,28	3,859***
Open source invention	9,9%	3,39	1,44	3,395***
Games-based learning	9,2%	2,56	1,43	3,395***
Others: (a)	1,5%	4,67	0,58	2,577***

Significance: *** p < 0.01; ** p < 0.05; * p < 0.1; (n.s.) = not significant n = 131

(a) Customer advisory board, truth tables and competitor analysis

(b) includes customer innovation workshops and customer information meetings

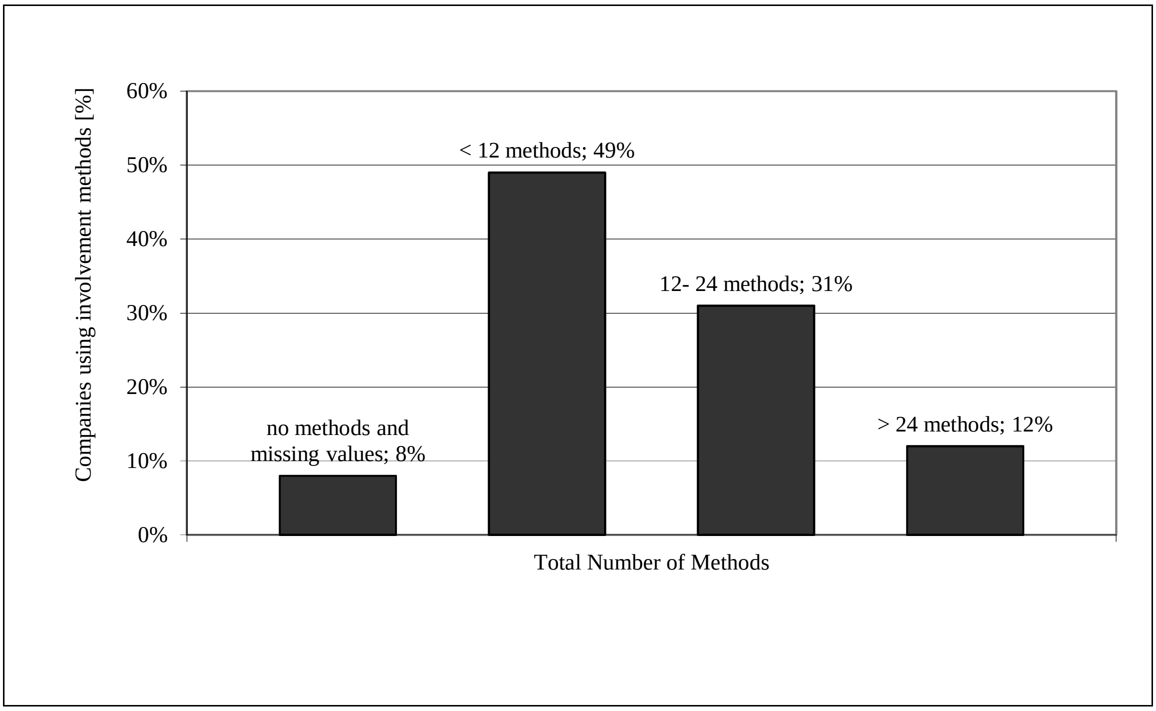
(c) includes beta testing with employees who are similiar to potential buyer groups

(d) includes data analysis of modems

Zahay et al. (2011) stress that different customer information need to be obtained by distinct methods. For example, customer wants and needs can be expressed in statements available in reports, while customer problems are captured through videos and finally, customer demographics and profiles are contained in customer databases. Thus, it could be assumed that customer involvement in NSD is not limited to a single method preferred that is applied once in NSD.

In our empirical investigation we find that on average, firms apply thirteen methods throughout NSD to form knowledge about customers. The majority of firms use one method more than once in NSD, i.e. in different phases, and do not employ different techniques to capture diverse knowledge (see chapter 6.4).

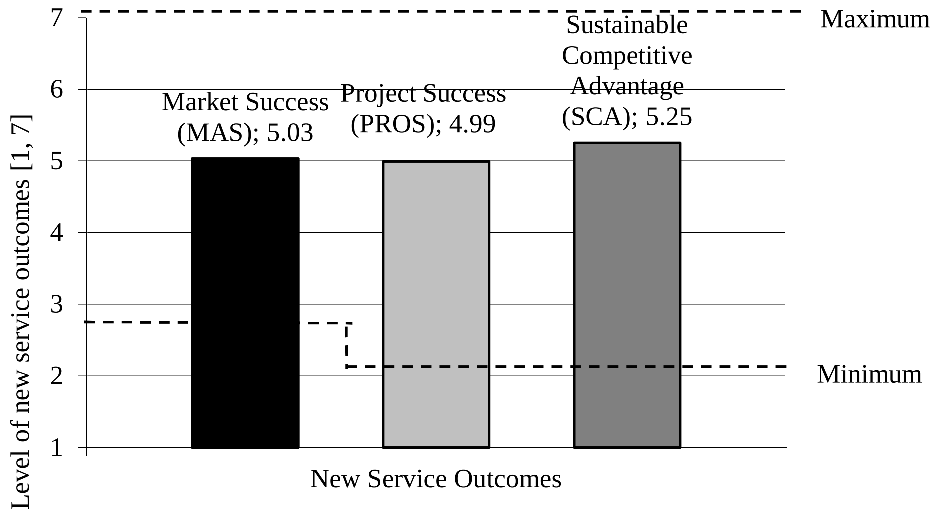
Figure 13: *Number of Methods Used Throughout NSD*



The last part of our descriptive statistics contains returns of service companies' NSD efforts. More than 85% of firms report that NSD was very or moderately successful, overall.

However, notable is the high number of new service projects that considerably prosper in terms of project success and sustainable competitive advantage. More than 40% of firms state major achievements in time to market and future opportunities (Figure 14).

Figure 14: New Service Outcomes



New Service Outcomes

	Market Success (MAS)		Project Success (PROS)		Sustainable Competitive Advantage (SCA)	
Frequencies **(%)**						
High	46	**35%**	55	**42%**	56	**43%**
Medium	74	**55%**	65	**50%**	68	**52%**
Low	11	**8%**	11	**8%**	7	**5%**
Maximum	7,00		7,00		7,00	
Minimum	2,75		2,00		2,00	
Mean	5,03		4,99		5,25	
SD	0,912		1,148		1,105	
t-value (sig)	61.190***		49.756***		54.447***	

High = values of summated scores ranging from 5.5 - 7
Medium = values of summated scores ranging from 3.5 - 5.49
Low = values of summated scores ranging from 0 - 3.49
Summated scores: MAS = SUC02-04,SUC09; PROS = SUC05-08; SCA=SCA01-04
Significance: *** p < 0.01; ** p < 0.05; * p < 0.1; (n.s.) = not significant
n = 131

To summarize, service firms tend to involve customers in NSD to a low degree. Particular in the early stages of the innovation process, it appears that firms rely on other sources than customers. Paradoxically, respondents claim to be customer-oriented to a high degree. Furthermore, service organisations tend to use of numerous traditional research methods in NSD instead of breaking new grounds in developing customer knowledge. However, these findings may not appropriate for all service industries. For example, Sandén et al (2006) stress that new service development practices considerably differ regarding the type of market serving, B2B or B2C. Hence, in the next section, differences in firm characteristics and NSD projects are examined.

6.1.2 Characteristics of Service Businesses and New Service Projects

The major focus of this section is to disclose the diversity of service firms and new service development projects and whether different customer involvement practices exist in our sample. Hence, we are able to conclude whether our results are generally applicable to service firms.

To study diversity of firms and projects, we analyse three important characteristics in relation to level and phases of customer involvement in NSD, namely (1) type of markets served, (2) class of services, and (3) degree of service newness. The reason for doing so is that these characteristics are expected to influence the decision on how to work with customers in NSD:

<u>Type of markets served</u>

Companies operating under different market characteristics, that are B2B and B2C, should deal with customer involvement in NSD differently. Companies serving B2B-markets need to involve customers to a higher extent, since close supplier-customer cooperation in innovation enhance acceptance of the novel product/service (Kujala, 2003) in markets where a relatively small set of influential customers dominate (Bonner and Walker, 2004).

<u>Class of services</u>

Process design is a key characteristic of the service systems. Processes determine how value is delivered to the customer. To avoid customer dissatisfaction upon service delivery, processes need to be specified according to customer needs (Edvardsson and Olson, 1996). To solve design-related problems in a meaningful way and improve learning transfer from one service business to another, researchers in the field of service management and operations develop classifications of service process types (e.g. Lovelock, 1983; Shostack, 1987; Silvestro et al., 1992; Wemmerlöv, 1990). In this context, researchers combine two distinctive characteristics of services to describe what to specify in service design phase (Lovelock, 1983)[9]. Solely the classification of Silvestro et al. (1992) considers a variety of characteristics inherent in services: (1) equipment/people focus, (2) customer contact time, (3) degree of customization, (4) degree of discretion, (5) value added front and back office, and (6) product/process focus. The types of services that arise from these attributes are:

- *Professional services*: organisations with relatively few transactions, highly customized, process-oriented, with relatively long contact time, with most value added in the front office, where considerable judgement is applied in meeting customer needs. For example: management consultancy, field service and bank corporate.
- *Mass services*: organisations where there are many customer transactions, involving limited contact time and little customization. The offering is predominantly product-oriented with most value being added in the back office and little

9 Most of them consider the nature of services from a strategic perspective (Lovelock, 1983) and are ambiguous, e.g. complexity of services proposed by Shostack (1983) (Silvestro et al., 1992; Wemmerlöv, 1990).

judgement applied by the front office staff. For example: retailer and transportation service providers.

- *Service shops*: a categorization, which falls between professional and mass services with the levels of the classification dimensions falling between the other two extremes. For example: Hotel, rental service, retail, retail bank, distribution enquiries.

We adapt this classification of the authors since we assume that customer needs vary according to the outlined service characteristics, which consequently require different approaches towards acquiring customer information. We therefore categorized service businesses and their NSD project in our sample according to this classification. Only seven projects could not be classified.

<u>Degree of service newness</u>

It has been argued in the marketing literature that customer involvement should be different in radical and incremental new services due to the degree of uncertainty and ambiguity associated with service newness (Bonner, 2010; De Brentani, 2001). Hence, we created summated and grouped scores of the latent variable “innovativeness” to analyse its effect in relation to customer involvement in NSD

We examined the appropriateness of our research by performing a battery of non-parametric tests (Mann-Whitney U [U] and Kruskal-Wallis [H] test type) since an initial Kolmogorov-Smirnov test showed that data of categorized groups were not normally distributed. In this case, non-parametric tests are more likely to detect an existing effect than a parametric test (Field, 2006). The three categorized groups were examined with regard to the key variables of our conceptual models: (1) customer involvement, (2) antecedents to customer involvement, and (3) increase in customer knowledge stock as well as environment uncertainty.

The results of the statistical analyses indicate differences between service firms related to the characteristics chosen. Hence, we cannot generalize our findings. The results are the following:

- Service firms serving industrial markets (B2B) integrate customers to a higher degree in NSD (mean = 3.77) than service firms serving consumer markets (B2C) (mean = 2.13; H = 17,817; $p < .01$). However, the effect of types of markets served on level of customer involvement is small (r = 0.23).
- Service firms in B2B-markets also involve their customers to a higher degree in the front end of NSD (mean = 2.83) than firms operating in the B2C-market (mean = 1.83; H = 10,100; $p < .01$). The effect size is small (r = 0.19).
- Service companies serving consumers (B2C) seem to differ in levels of customer involvement orientation (mean = 4.44) from companies serving B2B (mean = 5.23) or B2B/B2C-markets (mean = 5.15; H = 9,804; $p < .01$). The effect of this variable is small (r = 0.16).
- B2C service companies differ in increase in explicit customer knowledge stock (mean = 3.58) from companies which serve B2B and B2C markets (mean = 4.55; H = 7,978; $p < .05$). We found a medium effect size r = -0.28).
- Service shops (mean = 2.10) appear to be different to mass service providers (mean = 2.44) and professional service firms (mean = 3.60, H = 11,384; $p < .01$) in terms of customer involvement in late phases of NSD. The effects ranges from medium to high (r = -0.31; -0.45; -0.53).

No significant differences have been identified in terms of degree of innovation. The results are summarized in Appendix 45.

Our study confirms the results of Sandén et al. (2006) who investigate companies in B2B and B2C-markets with regard to customer involvement in NSD.

As with types of services, it is surprising that service shops behave differently in terms of late customer involvement. These organisations seem to rely on other data at the back-end of NSD. Further investigations are necessary to shed light on diversity of customer involvement patterns. It is beyond the scope of this research.

6.1.3 Customer Involvement related to New Service Outcomes

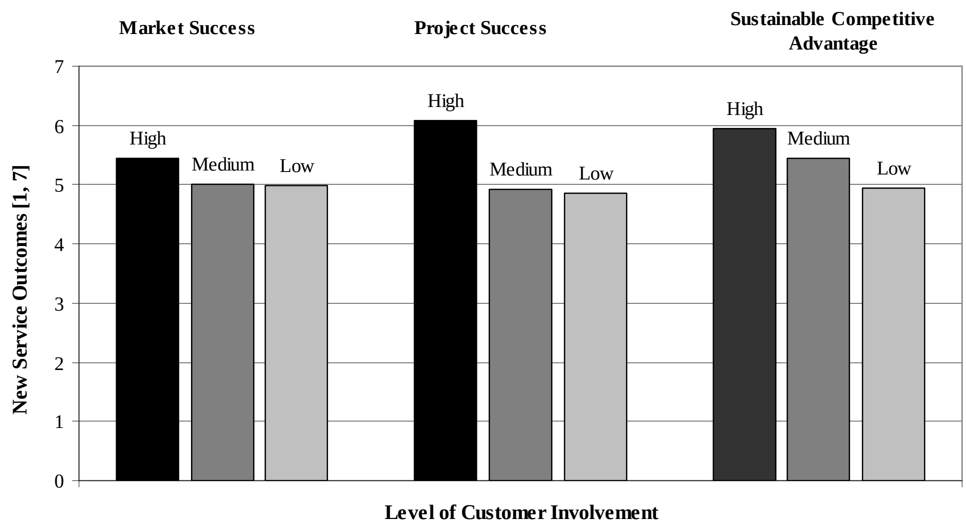
In this section, an attempt is made to broaden our understanding of customer involvement related to new service outcomes. For example, numerous researchers stress that particular methods are pertinent to distinct new service development achievements. Von Hippel and Katz (2002) demonstrate in their studies that toolkits for users endorse long-term competitive advantage, and Nambisan (2002) stresses that virtual customer communities enhance the creation of customer value leading to market success.

Based on these notions we performed non-parametric Kruskal-Wallis and posthoc Mann-Whitney U-tests to identify significant differences between groups of service firms and their general pattern of customer involvement in NSD in association with new service outcomes.

Consistent with previous analyses described in section 6.1.2, we calculated summated and grouped scores of the factors: (1) level of customer involvement, (2) customer involvement in early NSD phases and (3) customer involvement in late NSD phases as well as the dependent variables representing different dimensions of new service success: (1) market success, (2) project success, and (3) sustainable competitive advantage.

The results reveal significant differences between service companies working intensively with customers while they innovate. Groups of firms that involve customers to a high degree report that they are more successful than other businesses in terms of project success (mean = 6.08; H = 14,022; p < .01) and sustainable competitive advantage (mean = 5.96; H = 9,738; p < .01). Furthermore, service businesses that integrate buyers to a medium degree state a higher level of sustainable competitive advantage (mean = 5.44) than service firms minimizing efforts of collaboration (Figure 15).

Figure 15: New Service Outcomes in Relation to Degree of Customer Involvement



Level of Customer Involvement (CUI) ->New Service Outcomes

		Market Success (MAS)		Project Success (PROS)		Sustainable Competitive Advantage (SCA)	
	Frequencies	Mean	SD	Mean	SD	Mean	SD
High	12	5.44	0.84	6.08	0.75	5.96	0.99
Medium	59	5.01	0.88	4.92	1.11	5.44	1.11
Low	60	4.98	0.95	4.85	1.11	4.94	1.04
Significant Different to Group (a)							
High		(n.s.)		Medium, Low		Low	
Medium		(n.s.)		High		Low	
Low		(n.s.)		High		High, Medium	
H-statistics (sig)		3,030 (n.s.)		14,022**		9,738**	

Sample (n) = 131
High = values of summated scores (CUI) ranging from 5.5 - 7
Medium = values of summated scores (CUI) ranging from 3.5 - 5.49
Low = values of summated scores (CUI) ranging from 0 - 3.49
Summated scores: MAS = SUC02-04,SUC09; PROS = SUC05-08; SCA=SCA01-04
(a) Based on non-parametric Kruskal-Wallis test type (Monte Carlo exact test); significance: *** p < 0.01; ** p < 0.05; n.s. = not significant

With regard to stages of customer involvement, no statistically significant differences have been found (Table 7).

Table 7: New Service Outcomes in Relation to Stages of Customer Involvement

Early Customer Involvement (CISE) -> New Service Outcomes

		Market Success (MAS)		Project Success (PROS)		Sustainable Competitive Advantage (SCA)	
	Frequencies	Mean	SD	Mean	SD	Mean	SD
High	4	5.19	0.90	4.13	1.16	5.96	0.99
Medium	47	4.98	0.90	4.92	1.25	5.44	1.1
Low	80	5.08	0.92	5.07	1.07	4.94	1.04
Significant Different to Group (a)							
High		(n.s.)		(n.s.)		(n.s.)	
Medium		(n.s.)		(n.s.)		(n.s.)	
Low		(n.s.)		(n.s.)		(n.s.)	
H-statistics (sig)		0,628 (n.s.)		2,545 (n.s.)		1,087 (n.s.)	

Sample (n) = 131
High = values of summated scores (CISE) ranging from 5.5 - 7
Medium = values of summated scores (CISE) ranging from 3.5 - 5.49
Low = values of summated scores (CISE) ranging from 0 - 3.49
Summated scores: MAS = SUC02-04,SUC09; PROS = SUC05-08; SCA=SCA01-04
(a) Based on non-parametric Kruskal-Wallis test type (Monte Carlo exact test); significance: *** p < 0.01; ** p < 0.05; n.s. = not significant

Late Customer Involvement (CISL) -> New Service Outcomes

		Market Success (MAS)		Project Success (PROS)		Sustainable Competitive	
	Frequencies	Mean	SD	Mean	SD	Mean	SD
High	23	5.20	0.83	5.41	1.26	5.52	1.36
Medium	54	5.05	0.89	4.96	1.21	5.30	1.00
Low	54	4.95	0.97	4.84	1.00	5.10	1.08
Significant Different to Group (a)							
High		(n.s.)		(n.s.)		(n.s.)	
Medium		(n.s.)		(n.s.)		(n.s.)	
Low		(n.s.)		(n.s.)		(n.s.)	
H-statistics (sig)		0,9701 (n.s.)		4,956 (n.s.)		2,152 (n.s.)	

Sample (n) = 131
High = values of summated scores (CISL) ranging from 5.5 - 7
Medium = values of summated scores (CISL) ranging from 3.5 - 5.49
Low = values of summated scores (CISL) ranging from 0 - 3.49
Summated scores: MAS = SUC02-04,SUC09; PROS = SUC05-08; SCA=SCA01-04
(a) Based on non-parametric Kruskal-Wallis test type (Monte Carlo exact test); significance: *** p < 0.01; ** p < 0.05; n.s. = not significant

Furthermore, all methods of customer involvement were tested on their relation to new service outcomes. It could be argued that different methods are used to accomplish pre-set objectives. Several independent t-tests were conducted to identify statistical differences on the usage of methods. To be more specific, we tested methods applied in each phase of NSD. Statistically significant differences in the usage of methods are summarized in Table 8. Further details of analysis are provided in Appendix 46.

Table 8: Usage of Customer Methods in Relation to New Service Outcomes

Customer Involvement Phases		New Service Outcomes			
		Overall Success (SUC01)	Market Success (MAS)	Project Success (PROS)	Sustainable Competitive Advantage (SCA)
Early NSD Phases	Idea Generation & Screening Phase	- Experiments - Lead user technique - Technological forecasting	- Customer co-development meetings - Customer complaints & feedback reports - Experiments - Focus groups		- Beta testing - (Semi-)structured interviews - Trend scanning - Unstructured interviews - Customer sounding board
	Concept Development Phase	- Focus groups - Games-based learning - Technological forecasting - Virtual customer communities - Truth tables - Customer sounding board - Competitive analysis	- Customer complaints & feedback reports - Games-based learning - Unstructured interviews	*- Beta testing* *- Customer co-development meetings* - Customer complaints & feedback reports - Ethnographic methods - Truth tables - Customer sounding board - Competitive analysis	*- Beta testing* - Focus groups - Toolkits for users - Trend scanning - Unstructured interviews
	Business Analysis Phase	- Experiments -Transactional customer data analysis	- Customer co-development meetings - Trend scanning	- Customer co-development meetings - Ethnographic methods	- Customer co-development meetings - Customer surveys - Prototyping - Trend scanning
Late NSD Phases	Development and Testing Phase	- Beta testing - Customer service interaction reports - Focus groups - Trend scanning - Virtual customer communities	- Toolkits for users - Trend scanning	*- Beta testing* *- Customer co-development meetings* - Ethnographic methods - Open source invention	- Customer surveys - Trend scanning
	Implementation and Launch Phase	- Beta testing - Conjoint analysis - Customer complaints & feedback reports - Customer surveys - Ethnographic methods - (Semi-)structured interviews - Transactional customer data analysis - Trend scanning	- Beta testing - Focus groups - Transactional customer data analysis - Trend scanning - Virtual customer communities	- Open source invention - Prototyping	- Beta testing - Customer surveys - Experiments - Lead user technique - Open source invention - Prototyping - (Semi-)structured interviews - Toolkits for users - Transactional customer data analysis - Trend scanning - Unstructured interviews

It appears that customer co-development meetings and beta testing are related to all three new service outcomes. However, firms tend to employ these techniques in different NSD phases to achieve better NSD results. Furthermore, transactional customer data analysis, applied at the end of innovation processes appears to nurture market success and sustainable competitive advantage. Surprisingly, the usage of customer complaints and feedback reports, reported as the most useful methods of involvement, seem to be related to market and project success solely, but do not help companies to enhance their competitive positioning. A reason for this could be that customers tend to report service experiences in lieu of new service opportunities (Tax and Brown, 1998). One remarkable finding refers to the usage of user toolkits. When applied towards the end of NSD, toolkits are an appropriate means to generate market success and long-term sustainable competitive advantage. Since this technique helps to transfer sticky knowledge about user needs to the service provider without extensive iterative communication, it allows easy and error-free translation of users' design requirements. Consequently, the service fits better to the market needs. Moreover, when being first into a marketplace with a toolkit may yield first-mover advantages with respect to setting a standard for a user design language that has a good chance of being generally adopted by the user community in that marketplace (Von Hippel and Katz, 2002).

Additionally, semi-structured and structured interviews reveal significant differences regarding long-term competitive advantage. Since these types of interviews focus on the researcher's instead of the interviewee's concerns (Bryman, 2004, 110), service providers can obtain representative and specific information about a new service idea or concept. It could be argued that (semi-)structured interviews deliver explicit results and are more valuable in NSD, since they reduce ambiguity and uncertainty associated with long-term achievements (Griffin and Hauser, 1996).

Although the analysis provides interesting findings, further research is needed. Our study is limited regarding the combination of methods to achieve service innovation objectives, and lacks qualitative insights on rationales of method application to strengthen the assumptions on the identified relationships.

In summary, service firms tend to be highly customer-oriented, although this is not reflected in higher degrees of customer involvement in service innovation. In our sample, the usage of traditional market research methods and application of numerous techniques is prevalent in service industries. Notable are the unveiled differences in types of services and customer participation in NSD. Mass service providers and professional service firms tend to involve customers to a higher degree. Further insights are necessary to ground this result in Services Marketing theory. Additionally, our findings confirm Sandén et al.'s work (2006) on customer involvement in B2B and B2C-markets. Service firms operating in the B2B-market use customers in NSD differently than companies serving consumers. We also found statistically significant differences in methods of customer involvement in relation to new service outcomes. Finally, limitations of our research regarding generalizability of results and needs of future research are addressed.

In the subsequent section, we describe the techniques of analysis we applied in our research. We outline the main reasons for using component-based structural equation modelling, i.e. Partial Least Squares (PLS)

6.1.4 Techniques of Analysis

We used a combination of SPSS 18.0, Smart PLS 2.0 M3 (Ringle et al, 2005) and Microsoft Excel XP software packages to carry out the analyses. While SPSS was applied to conduct descriptive statistics described in the preceding chapter, and to test dimensionality and internal consistency of constructs, Partial Least Squares (PLS) was used for assessing both, the structural and measurement model. The PLS methodology has achieved an increasingly popular role in empirical research in international marketing and is the method of choice for success factor studies in marketing (Albers, 2009; Henseler et al., 2009, 278). PLS techniques have also been used in prior innovation research (e.g. Akgün et al., 2010; Spanjol et al., 2011), and particularly in the field of innovation capabilities and forms of collaboration (e.g. Brettel et al., 2011; Carbonell et al., 2009; Ettlie and Pavlou, 2006). Contrary to covariance-based Structural Equation

Modelling (CB-SEM), available in the form of LISREL and AMOS computer programmes, PLS path modelling is variance-based and focuses on predicting or exploring relationships rather confirming them. Although CB-SEM and PLS are different approaches, both are considered as the next generation of statistical instruments to analyse multivariate structures of latent variables and their relationships and are less limited in analysing spheres of the complex, realistic world. For example, regression-based approaches, such as multiple regression analysis, are restricted in their ability to investigate potential effects of mediating or moderating variables and interrelations between multiple dependent and independent variables (Haenlein and Kaplan, 2004). Furthermore, none of the regression-based approaches of the first generation techniques enables researchers to assess both measurement properties - including measurement errors - and numerous cause-and-effect relationships between latent constructs simultaneously (Hair et al., 2006, 711), which are prevalent characteristics in the realm of services marketing.

Both, CB-SEM and PLS overcome these limitations. However, in their approach to estimate parameters in a theoretical model, the two techniques are distinct. The covariance-based approach of SEM "*attempts to minimize the difference between the sample covariances and those predicted in the theoretical model.... Therefore, the parameter estimation process attempts to reproduce the covariance matrix of the observed measures*" (Chin and Newsted, 1999, 309). Unlike CB-SEM, component-based PLS focuses on maximization the variance of the dependent variables explained by the independent ones instead of reproducing the empirical covariance matrix (Haenlein and Kaplan, 2004, 290). PLS models consist of a structural part - relationships between the latent variables, a measurement component – the relationships between latent variables and their manifest items - and, unlike any SEM, a third component, the weight relations[10] that are used to estimate case values for the latent variables (Chin and Newsted, 1999). The weights used to determine case values, i.e. estimated values for each latent variable in each data set, are estimated so that the resulting case values capture most of the variance of the independent variables that is useful for predicting the dependent variables (Haenlein and Kaplan, 2004 referring to Garthwaite, 1994). Finally, these case values are employed in a set of regression equations to determine the parameters for the structural equations (Fornell and Bookstein, 1982). This approach to structural equation modelling and further underlying assumptions about the data existent in PLS has several advantages over other methods (Chin, 1998). PLS does not make any assumptions about the population and error terms. Hence, the technique works without distributional assumptions and with nominal, ordinal, and interval scaled variables. Due to this lack of assumptions about the normal distribution of observations, PLS can also be applied when marketing data do not attain the sample size required by maximum likelihood estimation ($n \geq 200$), like CB-SEM (Fornell and Bookstein, 1982, 443). However, this may be also seen as a major disadvantage of PLS which can be subsumed as the problem of consistency at large. "*In general, a consistent estimator can be described as one that converges in probability to the value of the parameter being estimated as the sample size increases. However, because the case values for the latent variables in PLS aggregates of manifest variables that involve measurement error, they must be considered as inconsistent. Therefore, the path coefficients estimated through PLS converge on the parameters of the latent-variable model [only] as both the sample size and the number of indicators of each latent variable become infinite*" (Haenlein and Kaplan,

10 Weight relations link the indicators (observed manifest items) to their respective unobserved variables.

2004 referring to McDonald, 1996, 248; Fornell and Cha, 1994). Hence, when the number of cases in the sample and number of indicators per latent variable are infinite, PLS tends to underestimate the correlations between the latent variables and overestimate the loadings, i.e. the parameters of the measurement model (Haenlein and Kaplan, 2004; Henseler et al., 2009). Goodhue et al (2006) stress even though PLS has its limitations with regard to consistency at large, in terms of statistical power; it is equal to other techniques for normally distributed data. In their view, PLS path modelling is a powerful technique appropriate for many research situations such as complex research models with sample sizes too small for CB-SEM.

For a theoretically well-grounded research setting, which main objective is to validate and confirm theoretical models, covariance-based SEM and its underlying maximum-likelihood method should be applied. Whereas PLS is adequate for causal modelling applications whose purpose is prediction and/or theory building (Henseler et al., 2009).

The latter refers to our research objectives and is in line with the reasoning of using PLS. We attempt to explore causal relationships of customer involvement and new service outcomes as well as its antecedents. In this context, we aim for predicting the effect of customer knowledge stock intending to expand theory about customer collaboration in NSD. As noted before, services marketing literature has not addressed the mediating effect of different types of customer knowledge yet. Furthermore, our sample size does not exceed the required threshold of 200 observations to apply other SEM techniques. In addition, PLS is useful when formative constructs are estimated in the measurement model and when data is not normally distributed (Henseler et al., 2009). We tested the formative specification (chapter 5.2.3) of our new constructs and confirmed by empirical tests that some groups of firms do not have a normal distribution (chapter 6.1.2)

Hence, we considered the application of PLS as justified and an adequate technique for our study.

It has been argued that PLS does not provide fit statistics (e.g. χ^2, CFI, RMSEA) to assess the structural and theoretical fit of the model. However, it incorporates multiple criteria in order to evaluate the relationships and predictive power of variables in the model, R^2 of endogenous latent variables, estimates of path coefficients, effect size f^2, and prediction relevance Q^2 (Henseler et al., 2009, 303). All criteria are explained in the next section.

In order to test stability and statistical significance of the parameters estimates (t-values) in the structural model; i.e. testing the hypothesis H0 against the alternative hypothesis H1, we applied bootstrapping procedure incorporated in PLS. Chin (1998) proposes a bootstrapping procedure with 500 re-samples based on the individual sign changes method (Tenenhaus et al., 2005). We furthermore corroborated construct validity of the measurement model in PLS (Huber et al., 2007) to be consistent with common approaches of measuring complex relationships within path models.

The next chapter represents the analysis of causal relationships of level of customer involvement in the context of customer knowledge creation and new service outcomes. Key success factors are identified.

6.2 Model of Customer Knowledge Creation

We tested all scale items of the model to reflect the hypothesized directions. With regard to the analysis of 10 indicators within our model, assuming a medium effect size ($R^2 = .13$) for the outcome variables, a minimum sample size of N = 119 is required (α-level .05, statistical power .80) (Green, 1991). Our sample of 131 exceeds this.

6.2.1 Measurement Model

Before estimating the path coefficients of the hypothesized structural model, we examined the measurement model in PLS, incorporating all ten latent constructs (Table 9).

Composite reliability is a measure of shared variance among the set of observed variables used as an indicator of convergent validity of latent constructs (Fornell and Larcker, 1981; Hair et al., 2006). All reflective constructs achieved the cut-off point of .7 indicating a good reliability (Field, 2006; Hair et al., 2006). Furthermore, the average variance explained (AVE), as another summary indicator of convergence, was above .5 for all reflective constructs, reflecting that on average less error remains in the items than variance explained (Hair et al., 2006). We tested all manifest items by the bootstrapping procedure and identified significant factor loadings (λ), the correlation between a factor and a variable, at $p < .05$ (Appendix 10). This provided the necessary evidence of convergent validity of constructs. Table 9 summarizes the quality criteria of the PLS measurement model.

Table 9: Measurement Model

Construct		Cronbach's a	Composite reliability	Communality (AVE)	R^2
Level of Customer Involvement	(CUI)	.933	.946	.716	
Increase in Explicit Customer Knowledge Stock	(EKA)	.814	.878	.643	.31
Prior Explicit Customer Knowledge Stock	(EKP)	.820	.879	.645	
Environment Uncertainty	(EUN)	.796	.880	.711	
Market Success	(MAS)	.745	.830	.567	.22
Project Change	(PROCH)	.757	.861	.674	.33
Project Success	(PROS)	.733	.830	.552	.15
Sustainable Competitive Advantage	(SCA)	.811	.873	.636	.29
Increase in Tacit Customer Knowledge Stock	(TKA)	.872	.907	.662	.24
Prior Tacit Customer Knowledge Stock	(TKP)	.820	.842	.526	

We tested for discriminant validity of the constructs, the degree of which conceptually similar concepts are distinct (Hair et al., 2006), by examining whether the square root of the AVE of each construct was greater than the highest correlation between latent variables involving the focal construct (Fornell and Larcker, 1981). All correlation coefficients were lower than the values of AVE (Appendix 20).

6.2.2 Structural Model

The structural model used to test the hypotheses consisted of all constructs tested in the measurement model. Since PLS makes no distributional assumptions, traditional parametric methods of significance testing (e.g., confidence intervals, χ^2) are not appropriate. Its primary objective is to minimize the error (or, equivalently, the maximization of variance explained) in all endogenous constructs. The degree to which any particular PLS model accomplishes this objective can be conceived by examining the R^2 values for the dependent (endogenous) constructs (Hulland, 1999). Furthermore, the quality of the model can be evaluated by the effect size (f^2), the influence of one exogenous variable on the endogenous latent variable, as well as the Stone-Geisser-criterion Q^2, indicating the quality of prediction of constructs (Schloderer et al., 2005).

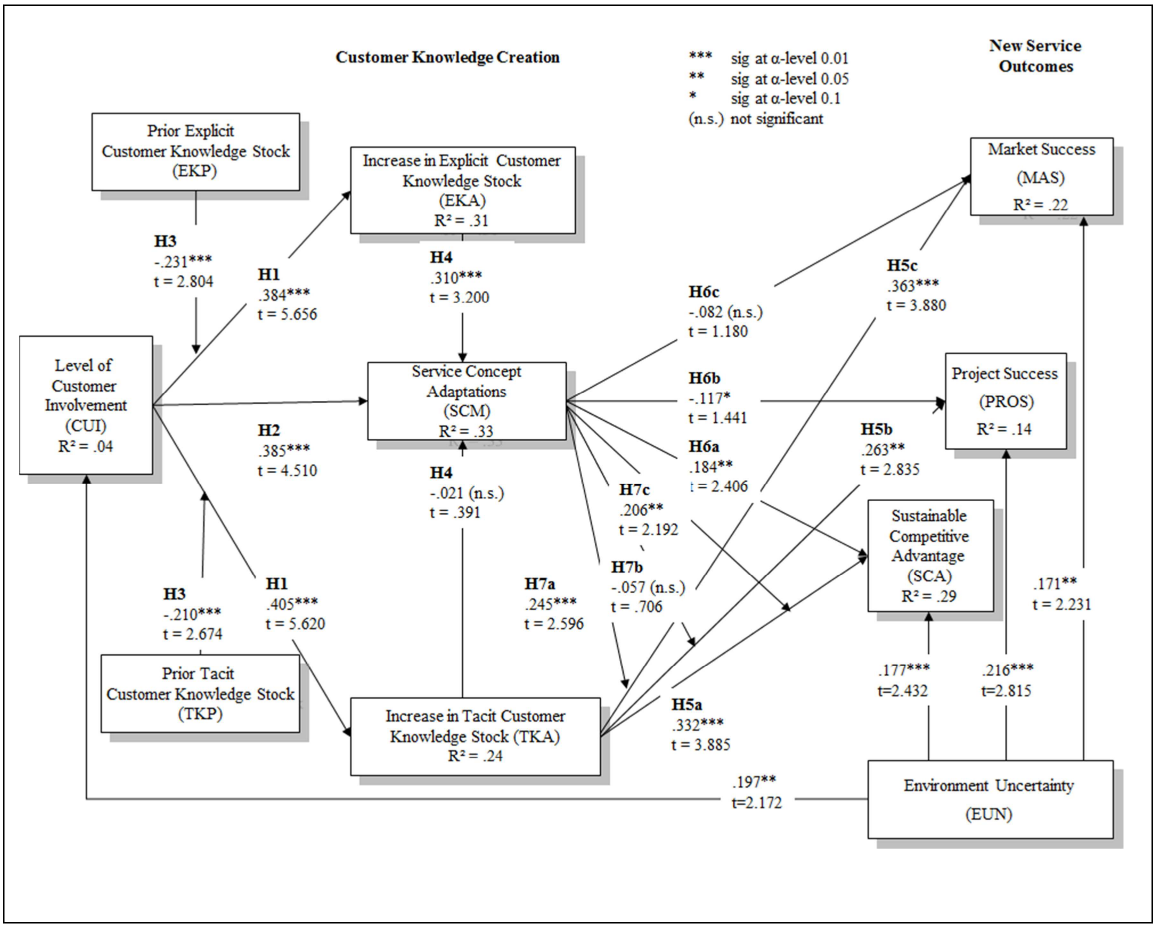
We use PLS path modelling to estimate both direct and the interaction effects in our model (Figure 5). To test the two moderating hypotheses, we employed the two-step moderation effect calculation of Baron and Kenny (1986) described by Schloderer et al. (2005) in terms of SmartPLS 2.0. First, we estimate a model with the direct effects (Model 1 and Model 2) only and then add the interaction effects in model M3, that is, our hypothesized model. A moderating effect should exist if the moderating variable significantly affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable (Baron and Kenny, 1986).

Furthermore, we tested the mediating role of knowledge variables, increase in tacit customer knowledge stock, increase in explicit customer knowledge stock, and service concept adaptations by comparing results of our hypothesized and a rival model. The hypothesized model does not have direct paths from level of customer involvement to the consequence constructs (MAS, PROS and SCA). In the rival model, we allowed the construct of customer involvement to have a direct effect on the success variables. Thus, in the rival model, the two constructs, increase in tacit and explicit customer knowledge stock, are not mediators.

6.2.3 Direct Effects

In our first model (M1), we examined the direct effects of independent variables and obtained the estimates that we report in Figure 16.

Figure 16: *Results of Direct Effect Model*



With regard to the relationship of customer involvement, service concept adaptations, and increase in tacit and explicit customer knowledge stock and their effects on the outcome variables market success, project success and sustainable competitive advantage, our results reveal that only two effects were not significant on the α-level of .1. Service concept adaptations do not affect market success and increase in tacit customer knowledge stock is not related to service concept adaptations.

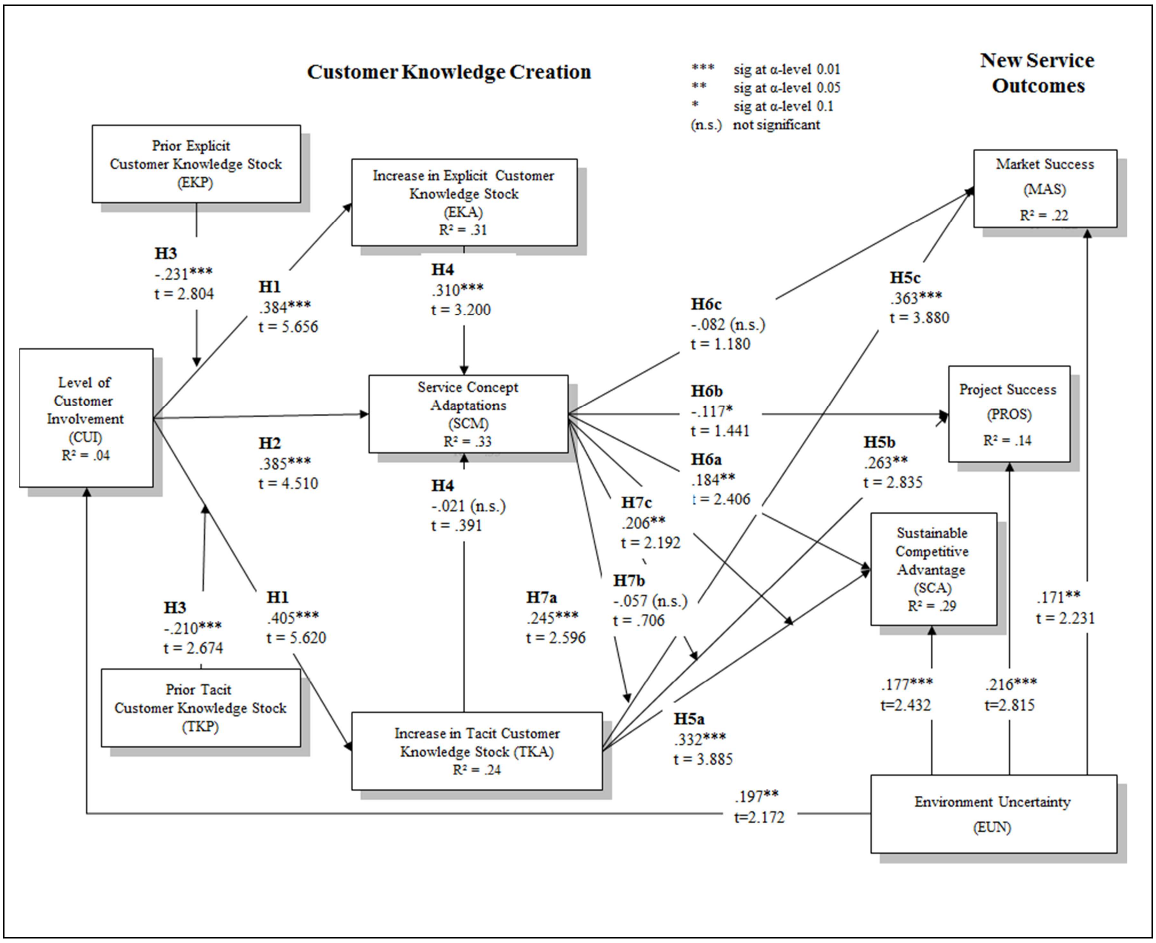
In support of H1, customer involvement was positively associated with increase in tacit customer knowledge stock ($\beta = .414$, $p < .01$; $R^2 = .171$) and increase in explicit customer knowledge stock ($\beta = .428$; $p < .01$; $R^2 = .180$). Furthermore, we hypothesized a positive relationship of increase in explicit customer knowledge stock and service concept adaptations (H4). According to the respective path coefficient, increase in explicit customer knowledge stock substantially predicts service concept adaptations ($\beta = .304$; $p < .01$; $R^2 = .326$). In contrast, H4, the relationship of increase in tacit customer knowledge stock and service concept adaptations was not supported ($\beta = -.012$, $p > .1$). We also found a non-significant relationship between service concept adaptations and market success (MAS) ($\beta = -.042$; $p > .1$; $R^2 = .162$), contrary to our hypothesis H6c. However, service concept adaptations influence project success (PROS) ($\beta = -.127$, $p < .1$, $R^2 = .171$). Thus, H6b was supported. As expected, we did also find a positive impact of service concept adaptations on competitive advantage (SCA) ($\beta = .238$, $p < .05$, $R^2 = .263$) (H6a). Moreover, corresponding to our hypothesis H5, increase in tacit customer knowledge stock positively affects market success ($\beta = .318$, $p < .01$, $R^2 = .162$), project success ($\beta = .279$, $p < .05$, $R^2 = .133$), and sustainable competitive advantage ($\beta = 309$, $p < .05$, $R^2 = .263$).

In order to test hypothesized interaction effects, we calculated moderating variables prior tacit customer knowledge stock, prior explicit customer knowledge stock, and service concept adaptations according to the recommendations of Baron and Kenny (1986) by incorporating the product of predictor and moderator within our model.

6.2.4 Moderating Effects

As suggested by Chin et al. (2003), we applied a hierarchical approach to test our hypotheses, in which we first estimated a model with the direct effects (model M1). Subsequently, we included predictor variables prior explicit customer knowledge stock and prior tacit customer knowledge stock in model M2, which we completed with interaction terms in model M3 (Figure 17).

Figure 17: Results of Hypothesized Model



Regarding the moderating hypotheses, we found that hypothesis H7 was only partially supported. The relationship between increase in tacit customer knowledge stock (TKA) and project success (PROS) does not seem to be moderated by service concept adaptations (β = -.057, p > .1). However, as shown in Figure 17, our hypotheses H3, H7a and H7c were supported. In line with the recommendations of Baron and Kenny (1986), we tested whether integrating interaction effects result in significant changes in the amount of variances explained (R^2) of constructs. Appendix 24 summarizes our results. Comparing model M2 to model M3, the interaction term prior explicit customer knowledge stock*customer involvement, as hypothesized in H3, caused a significant increase in R^2 of increase in explicit customer knowledge stock ($\Delta R^2 = .044$; $p < .01$). Furthermore, the R^2 for increase in tacit customer knowledge stock rose from .196 to .240 due to the interaction effect of prior tacit customer knowledge stock ($\Delta R^2 = .045$; $p < .01$), supporting H2b.

In addition, two moderating effects of service concept adaptations were found significant (market success: $\Delta R^2 = .057$; $p < .01$; sustainable competitive advantage: $\Delta R^2 = .028$; $p < .05$). Thus, H7a and H7c were supported.

The moderating effect of prior customer knowledge stock on the relationship between level of customer involvement and increase in customer knowledge has been described and proven. However, it has been argued in the literature on absorptive capacity that organisations' ability to exploit external knowledge is largely a function of the level of prior related knowledge (Cohen and Levinthal, 1990). A firm possesses multiple domains of knowledge, which determines its amount of knowledge. Germain and Dröge (1997) find that this stock of knowledge is an antecedent to processes of knowledge integration. These processes are the necessary mechanisms to build up a shared understanding throughout the organisation in which newly acquired knowledge is to be embedded.

We conclude from this that a direct effect of prior customer knowledge stock on level of customer involvement may exist. Hence, we explore the type of relationship between level of customer involvement, prior customer knowledge stock - EKP and TKP – and its increase in detail. To this end, we first analyse the direct effects of prior explicit and tacit customer knowledge stock on level of customer involvement (Model A). Subsequently, we integrate the moderation effect of EKP and TKP, and finally add a direct link between prior customer knowledge stock and level of customer integration in our hypothesized model (Model B).

Table 10 indicates significant changes in R^2 of increase in customer knowledge (EKA: $\Delta R^2 = .12$; $p < .01$; TKA: $\Delta R^2 = .07$; $p < .01$) between Model A and the hypothesized Model. In addition, the ΔR^2 of the hypothesized model and model A, measuring the direct effect of environment uncertainty, prior customer knowledge stock (EKP and TKP) on level of involvement, is not significant ($\Delta R^2 = -.03$; $p > .01$). Moreover, the results of model B show that EKP and TKP are not directly related to CUI ($\Delta R^2 = .03$; $p > .1$). We infer from these findings that a prior customer knowledge stock fully moderates the relationship between customer involvement and increase in customer knowledge stock.

Table 10: Test Results on Type of Moderation Effect of EKP and TKP

Type of Moderation Effect of Prior Customer Knowledge Stock (Testing Hierarchical Model)									
	R^2				ΔR^2, (ΔF)				Average R^2
Model	**CUI**	**EKA**	**TKA**	**SCM**	**CUI**	**EKA**	**TKA**	**SCM**	
Model A	.07	.19	.17	.32	n.a.	n.a.	n.a.	n.a.	.15
Hypo. Model	.04	.31	.24	.33	-.03 (2.084) (n.s.)	.12 (11.403) ***	.07 (5.848) ***	.01 (a)	.18
Model B	.07	.31	.24	.33	.03 (2.084) (n.s.)	.00 (a)	.00 (a)	.00 (a)	.14

sig. = Significance: * sig at p<0.1, ** sig. at p<0.05, *** sig. at p<0.01; one-tailed t-test
(a) number of independent variables to explain variance of EKA, TKA & SCM remain unchanged
Hypo Model: EUN → CUI
TKP & CUIxTKP → TKA
EKP & CUIxEKP → EKA
Model A: EUN, EKP & TKP → CUI
CUI → TKA & EKA
Model B: EUN, EKP & TKP → CUI
TKP & CUIxTKP → TKA
EKP & CUIxEKP → EKA

Appendix 26 and Appendix 27 summarize the results of direct and total effects in model A and B. It is worth noting that prior tacit customer knowledge stock has no direct effect on level of customer involvement ($\beta = -.009$; $p > .1$), while explicit customer knowledge positively affects level of customer involvement ($\beta = .188$; $p < .05$). However, the change in R^2 indicates solely a minor effect.

Overall, the results of our hypothesized model demonstrate important relationships in the learning context when working with customers in new service development. Five of the seven hypotheses tested through the structural model received full support.

6.2.5 The Rival Model – Direct Effect of Customer Involvement on New Service Success and Sustainable Competitive Advantage

The conceptual model expected the firm's increase in tacit customer knowledge stock and service concept adaptations to mediate the relationship between customer involvement (CUI) and the three outcome variables: market success, project success and sustainable competitive advantage. To test the causal relationship of customer involvement on the three outcome variables, we ran a rival model in PLS incorporating customer involvement, market success, project success and sustainable competitive advantage and environment uncertainty (control variable) solely. The path coefficients of customer involvement revealed a significant prediction of the construct on sustainable competitive advantage and project success, but not on market success (MAS: $\beta = .088$, $R^2 = .08$, $p > .1$; PROS: $\beta = .141$, $R^2 = .08$, $p < .05$; SCA: $\beta = .245$, $R^2 = .13$, $p < .01$). Thus, customer involvement does not influence market success.

To investigate the mediation effect of increase in tacit customer knowledge stock and service concept adaptations further, we followed the recommended procedure of Preacher and Hayes (2008). The authors propose a concomitant test: (1) investigating the total indirect effect and (2) testing hypotheses regarding individual mediators in the context of a multiple mediator model (i.e. investigating the specific indirect effect associated with each putative mediator). Thus, we included customer involvement in model M3. Applying the product-of-coefficient approach, we first calculated the sum of the specific indirect effects ($f = a_1b_1 + a_2b_2$)[11] and the asymptotic variance of a total indirect effect (var[f])[12]. The square root of the latter is the first-order standard error (SE) of the total indirect effect. The approach described is different to the indirect effect of the two mediators alone, since it takes correlations of intervening constructs into account.

According to Baron and Kenny (1986), a mediating effect can be identified when the independent variable (CUI) has a significant effect on the potential mediating variables (TKA and SCM), which significantly affects the consequence variables (MAS, PROS, SCA). When these paths[13] (a and b) are controlled, a previously significant relation between the independent and consequence variables (path c) is no longer significant, with the strongest demonstration of mediation occurring when path c is zero. When path c is reduced to zero, a strong evidence for a single, dominant mediator is existent.

Table 11 shows that the two mediators, increase in tacit customer knowledge stock and service concept adaptations, significantly intervene the relation between the input variable (CUI) and the two output-variables market success ($f = .132$; t-value = 2.267; $p < .05$) and sustainable competitive advantage ($f = .199$; t-value = 3.264; $p < .01$).

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11 For example, a1 represents the path coefficient of CUI on TKA, b1 stands for path coefficient of TKA on the respective outcome variable e.g. MAS, whereas the values a2+b2 symbolize the sum of coefficients of SCM.

12 $\mathrm{Var}[f] = b_1^2 s^2_{a1} + a_1^2 s^2_{b1} + b_2^2 s^2_{a2} + a_2^2 s^2_{b2} + 2\,(a_1 a_2 s_{b1b2} + b_1 b_2 s_{a1a2})$

13 CUI → TKA and SCM; TKA and SCM → MAS, PROS & SCM

We also found a significant direct impact of customer involvement on project success by testing its direct effect in the hypothesized model[14] (β = .133; t-value = 1.467; $p < .1$).

Table 11: Multiple Mediator Test

Strength of multiple mediator effect

	Mediating Effect of TKA and SCM				Effects of CUI	
	sum of specific indirect effects (f)¹	var(f)³	t-values	significance²	direct effect, (t-value)	total effect, (t-value)
MAS	0.132	0.003	2.267	p < .05	-.058 (.905) (n.s.)	.067 (n.s.) (.826)
PROS	0.027	0.003	0.530	(n.s.)	.133* (1.467)	.139* (1.590)
SCA	0.199	0.004	3.264	p < .01	.019 (.330) (n.s.)	.238*** (3.355)

*** signficant at p<0.1, ** significant at p<0.05, * significant at p<0.1
¹ sum of specific indirect effect: f = a1b1+a2b2
² (one-tailed t-test)
³ asymptotic variance of a total indirect effect

Thus, we further examined the results of specific indirect effects of increase in tacit customer knowledge stock and service concept adaptations (Sobel, 1982)[15] by testing the individual indirect effects of mediators. The test gives insights about the individual strength of each mediator (Baron and Kenny, 1986).

The results confirmed the significant transmission of each mediator with regard to the two outcome variables project success and sustainable competitive advantage (Table 12). However, as shown in Table 12, the effect of service concept adaptations on project success is negative ($a2 \times b2 = -.066$; $p < .1$). It may occur that the effects of the two mediators on project success cancel each other out, producing a non-significant total specific indirect effect as illustrated in Table 11 (Frazier et al., 2004).

[14] More details on direct and total effects of customer involvement see Appendix 22

[15] Online Sobel Test: (http://www.people.ku.edu/~preacher/sobel/sobel.htm), created by Preacher, Kristopher J.

Although service concept adaptations do not have an indirect effect on market success ($a2 \times b2 = -.023$; $p > .1$) (Table 12), the sum of specific indirect effect of the two mediating variables is significant ($f = .132$; t-value = 2.267; $p < .05$) (Table 11).

Thus, the strong transmission effect of increase in tacit customer knowledge stock appears to compensate for the non-significant effect of service concept adaptations on market success.

Table 12: Individual Indirect Effects of Mediators

	Indirect effects (a*b)		
	Market Success	**Project Success**	**Sustainable Competitive Advantage**
Increase in tacit customer knowledge stock	.155***	.093**	.133***
Service concept adaptations	-.023 (n.s.)	-.066*	.066*

*** significant at p<.01; ** significant at p<.05; * significant at p<0.1

We also assessed the overall quality of the models by reliable and valid outer model estimations, the R^2 of endogenous latent variables, the effect size (f^2), the prediction relevance (Q^2), and the goodness-of-fit index (GOF). The effect size[16] (f^2) is viewed as a gauge for whether a predictor latent variable has a weak (.02), medium (.15), or a large (.35) effect at the structural level. The prediction relevance of variables (Q^2 or Stone-Geisser-criterion) is based on the cross-validation of the sum of squares of predication errors (SSE), and the sum of squares of observations (SSO); i.e. cv-redundancy index.

16 $f^2 = R^2_{included} - R^2_{excluded} / 1 - R^2_{included}$

Furthermore, we assessed the average communality and average R^2 for all endogenous variables. The square root of their product is a global criterion of goodness-of-fit (GOF) (Henseler et al., 2009; Tenenhaus et al., 2005).

Appendix 25 shows a GOF value above zero for both the rival and our hypothesized model, indicating a good predicting relevance. The results demonstrate a higher quality of prediction (GOF) of our hypothesized model, achieving 40.4% of the total fit. The result of the rival model is considerably lower, 23.1% of the total fit. Moreover, our hypothesized model shows higher and significant R^2-values for all three outcome variables. Additionally, the increase in tacit customer knowledge stock (TKA), the most important antecedent to new service outcomes, considerably achieves higher effect sizes on all three outcome measures (market success: $f^2 = .186$, project success: $f^2 = .094$, sustainable competitive advantage: $f^2 = .152$)[17].

We conclude from these results that the two mediating variables of the hypothesized model better predict the outcome variables than customer involvement (CUI).

6.2.6 Extended Analysis – Direct Effect of Increase in Explicit Customer Knowledge Stock on New Service Outcomes

In our conceptualisation of cause-effect relationships (chapter 4.1.4), we argue that increase in explicit customer knowledge stock does not affect market success, project success and sustainable competitive advantage. However, since previous research (e.g. Kyriakopoulos and De Ruyter, 2004) found significant effects of fact knowledge on performance, we extended our hypothesized model by including paths from increase in explicit customer knowledge stock (EKA) to the outcome variables.

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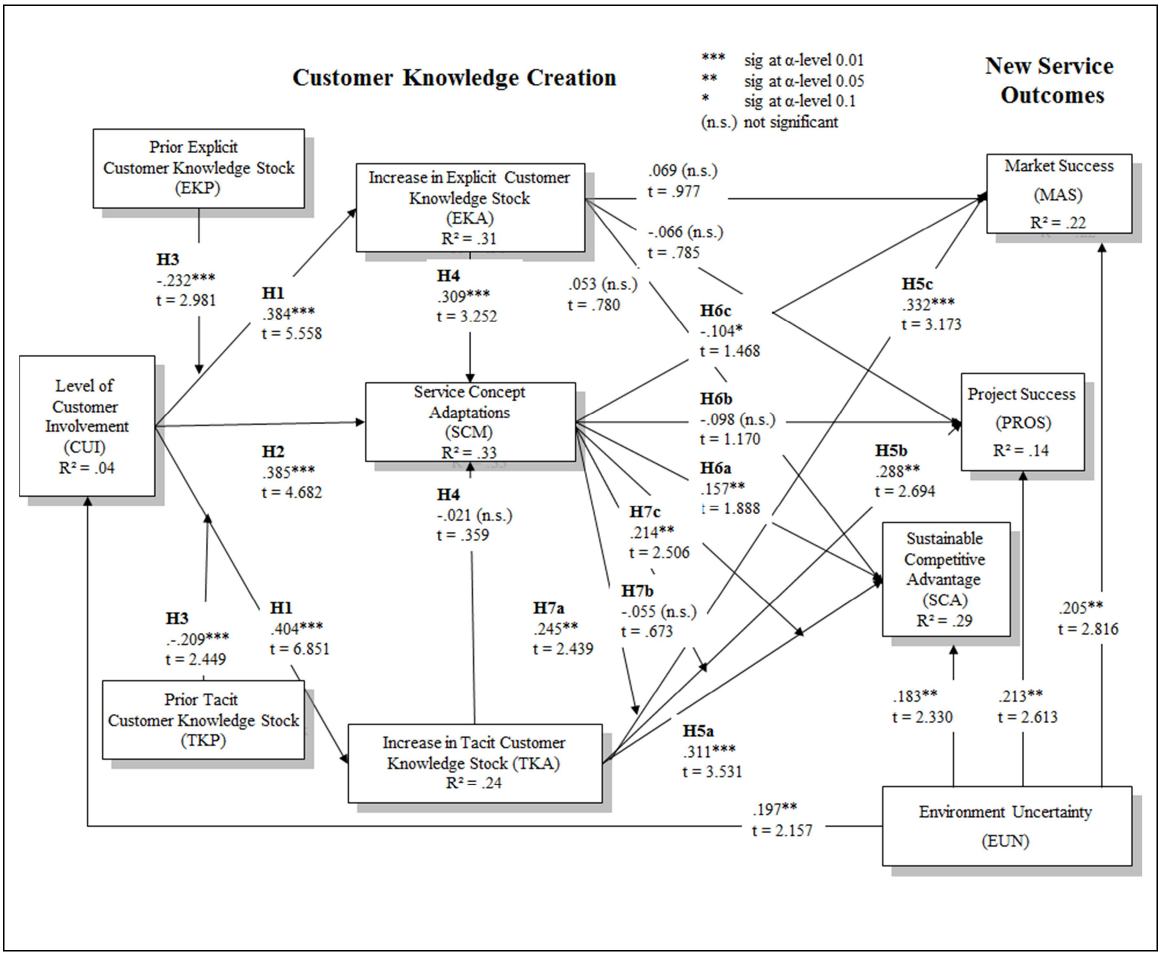
17 Rival model: market success; $f^2= .71$; project success: $f^2 = .065$ and competitive advantage: $f^2 = .077$)

Figure 18 indicates that explicit fact knowledge is not related to new service outcomes. The direct and total effects of increase in explicit customer knowledge stock are summarized in Appendix 23.

Figure 18: Results of Extended Model



Overall, the findings imply high management attention to the learning process inherent in customer involvement in NSD. Intensive work with customers enhances the stock of customer knowledge, of which only the tacit dimension positively affects new services outcomes.

Further findings and managerial implications are discussed in detail in chapter 7.

6.3 Model of Antecedents to Customer Involvement in New Service Development

The following section details our analysis of the hypothesized relationships between antecedent factors and customer involvement in NSD (chapter 4.2). Important results and findings from statistical procedures are delineated.

6.3.1 Measurement Model

Before testing the hypothesised structural model, we evaluated the measurement model in PLS, incorporating all ten latent constructs (Table 13).

The analysis showed that two latent variables failed to achieve the recommended cut-off of .70 with regard to composite reliability (Hair et al. 2006) (customer orientation: .52 and prior tacit customer knowledge: .11); indicating low internal consistency of the two constructs. Furthermore, along with market-driven NSD (MAO), the two constructs did not achieve the recommended minimum of .50 for AVE, reflecting a low percentage of variation explained among the items (Hair et al. 2006). For the remaining measures, the composite reliability (CR) and average variance explained (AVE) exceeded the required cut-off values.

As for the variable prior tacit customer knowledge stock (TKP), the factor loadings of two items, TKP02 and TKP03, were not significant and below the threshold of .50 (Hair et al. 2006). We kept TKP05, although its loadings were just under the cut-off, since its effect was significant at $p < .05$.

Furthermore, the loading of the item CUO03 indicated that the manifest variable did not measure the concept of customer orientation. Re-examining the question showed that this item was rather related to knowledge acquisition than to a firm‘s commitment to create customer value. Thus, the three items TKP02, TKP03 and CUO03 were excluded from further analysis (Appendix 11).

Pertaining to the construct market-driven NSD, the two items MOA01 and MOA02 measured the detection of customer changes, whereas the remaining items were prone to account for the firm’s behaviour in developing new valuable services. The elimination of these two items significantly enhanced CR and AVE of the constructs. Both measures, TKP and MAO, exceeded the recommended cut-off values of .70 (CR) and .50 (AVE) after elimination of selected items. Subsequently, we evaluated all manifest variables by the bootstrapping procedure and identified factor loadings (λ) above the threshold of .5 (Hair et al., 2006) at the significance level of $p < .05$. Table 13 summarizes the quality criteria of the PLS measurement model.

Table 13: Measurement Model

Construct		Cronbach's a	Composite reliability	Communality (AVE)	R^2
Customer Involvement in Early NSD Stages	(CISE)	.913	.931	.695	.23
Customer Involvement in Late NSD Stages	(CISL)	.912	.937	.787	.22
Customer Involvement Orientation	(CUB)	.855	.900	.750	
Customer Orientation	(CUO)	.828	.921	.852	
Prior Explicit Customer Knowledge Stock	(EKP)	.820	.854	.599	
Environment Uncertainty	(EUN)	.796	.876	.704	
Innovativeness	(INN)	.616	.792	.562	
Market-driven NSD	(MAO)	.762	.828	.550	
Organisational Slack	(ORG)	.840	.899	.748	
Prior Tacit Customer Knowledge Stock	(TKP)	.772	.787	.569	

Discriminant validity was assessed by examining whether each construct shared more variance with its measures than with other constructs in the model (Chin, 1998). The square root of the AVE should exceed the intercorrelations of the construct with the other constructs in the model (Fornell and Larcker, 1981). In our study, none of the intercorrelations of the constructs exceeded the square root of the AVE of the constructs (Appendix 20).

6.3.2 Structural Model

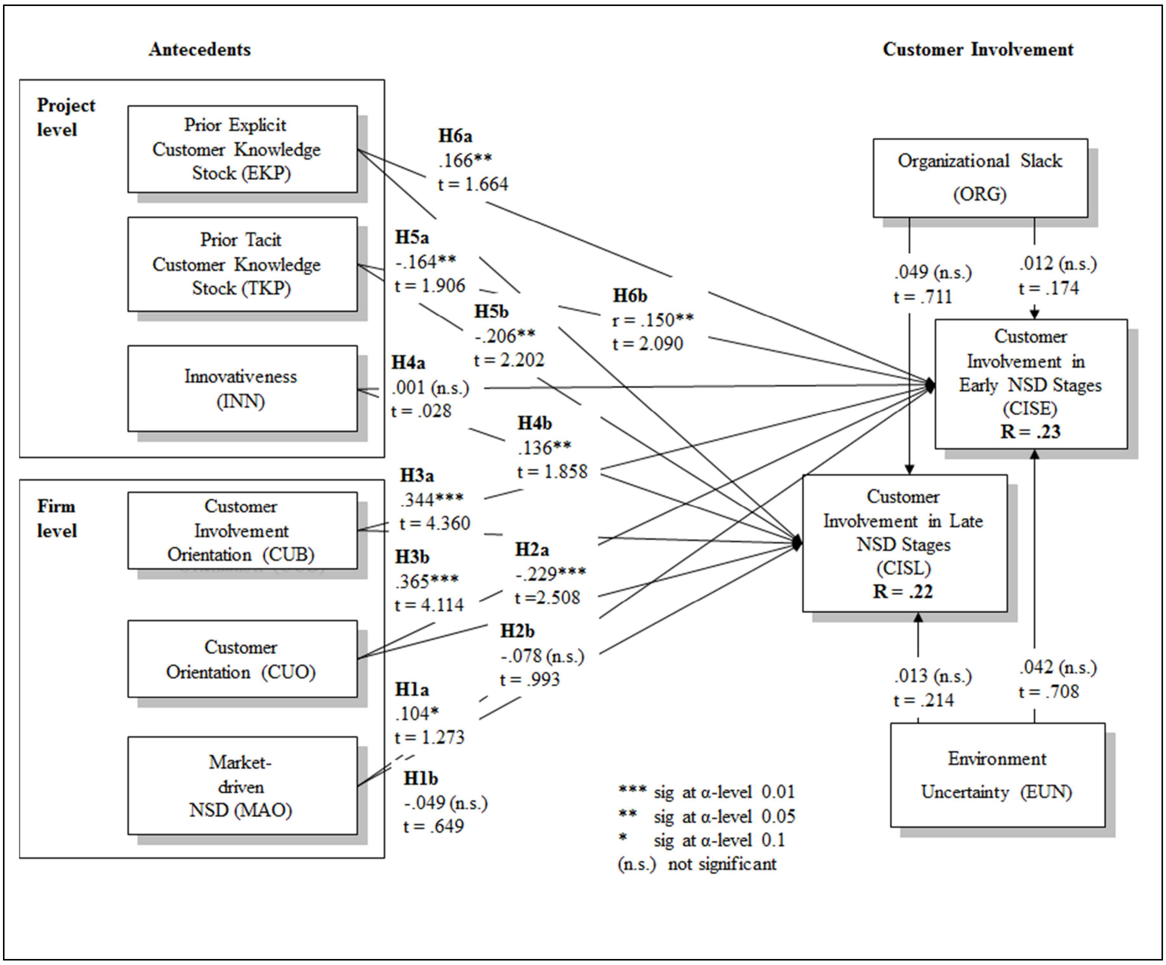
We used PLS path modelling to estimate the direct effects in our model (see Figure 6). To test the effects and statistical significance of the parameters in our model, we used a bootstrapping procedure of 500 samples (Chin, 1998).

Our results are summarized in Figure 19 and Appendix 38. At a significance α-level of .1 (one-tailed), our results revealed that market-driven NSD (MAO) had a significant effect on customer involvement in early NSD stages (CISE) ($\beta = .104$; $p < .1$), but did not affect customer involvement in late NSD stages (CISL) ($\beta = -.049$; $p > .1$). Thus, our hypothesis H1 was not fully supported. As for the second antecedent, customer orientation, our hypothesized positive effects (H2) on customer involvement were not supported (Early NSD: $\beta = -.229$; $p < .01$; Late NSD: $\beta =-.078$; $p > .1$). Surprisingly, we detected a negative effect of customer orientation on early customer involvement and no significant effect on late customer involvement.

In support of H3, customer involvement orientation was positively associated with customer involvement in the front- and back-end of NSD ($\beta = .344$; $p < .01$ and $\beta =.365$; $p < .01$). Furthermore, we hypothesized a positive relationship of degree of innovativeness and customer involvement (H4). According to the respective path coefficients, innovativeness significantly predicts customer involvement in late NSD stages ($\beta = .136$;

p < .05). However, H4 was not supported in terms of early customer involvement (β =.001; p > .1). Concerning prior customer knowledge stock, we only found partial support of our hypotheses. As expected, we also found a negative impact of prior tacit customer knowledge stock (H5: β = -.164; p < .05 and β = -.206; p < .05). Much to our surprise, we found that prior explicit customer knowledge stock positively affects customer involvement in early and late NSD stages (H6: β = .166; p < .05 and β = .150; p < .05). No significant effects were found for our control variables.

Figure 19: Results of Direct Effects of Antecedents to Customer Involvement



Additionally, we assessed the overall quality of the model by its prediction relevance (Q^2), and the goodness-of-fit index (GOF). Both indicators should be above zero and were satisfactory for model (Appendix 39). The quality of model prediction (GOF) was 39% of the total fit, indicating a good prediction. Overall, six of twelve relationships were supported.

Our research revealed important insights about internal factors that impede and facilitate customer involvement in NSD. On the firm level, we found a positive effect of market-driven NSD on early customer involvement, but not for customer orientation, the complementary ingredient of market-based learning. This putative contradiction is part of our elaborate discussion in chapter 7.1.3. Furthermore, we recognised that innovativeness supports late, but not early, customer involvement and finally, we identified contrary effects of the two types of customer knowledge stocks.

The next chapter builds from the methods and stages of customer involvement to explore the interrelations of the two facets and customer knowledge creation in more detail.

6.4 Analysis on Customer Involvement Management Practices

6.4.1 Introduction

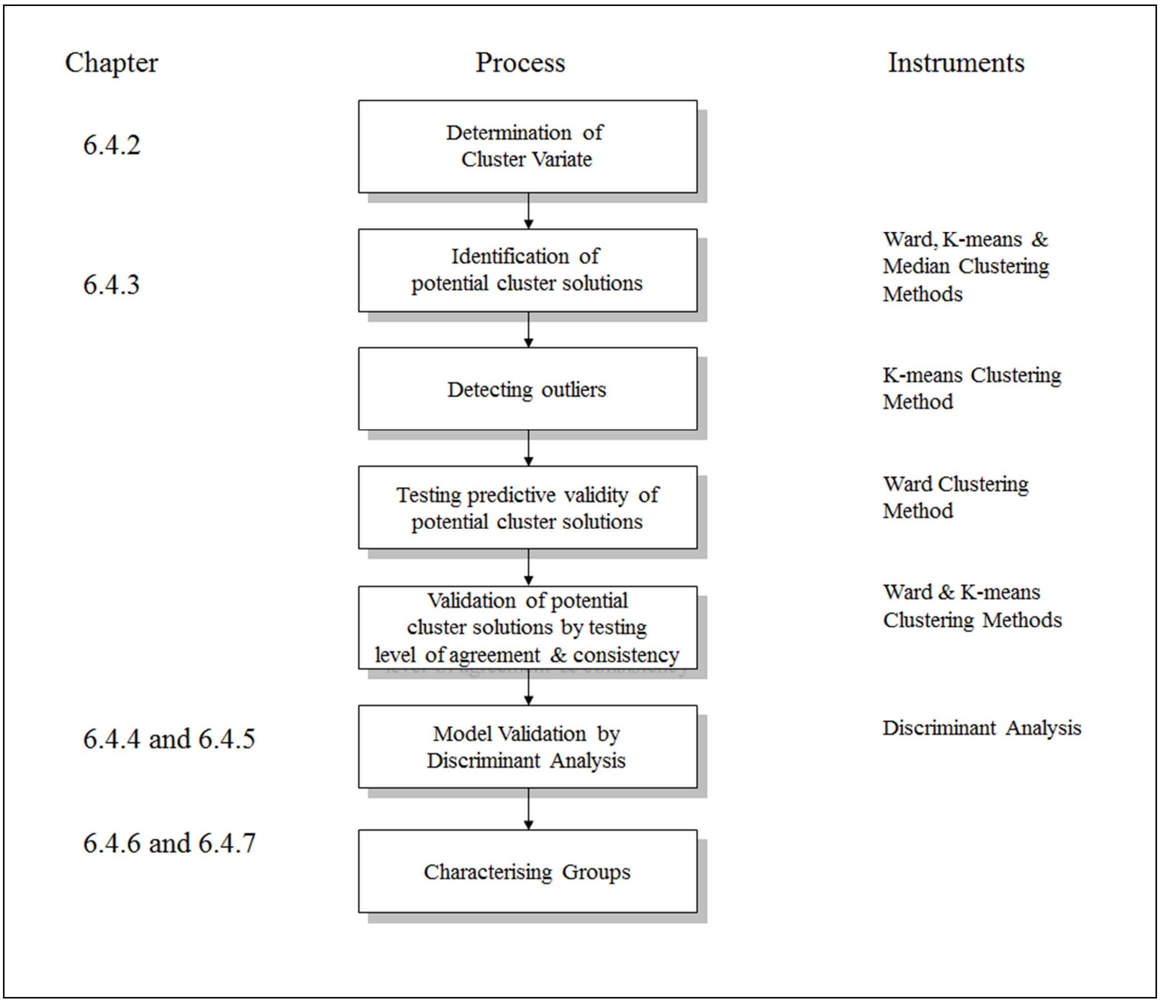
As mentioned earlier, numerous studies have examined methods and stages of customer involvement in NSD separately. However, none of the existing literature has studied the combined strengths of these two facets.

We approach the question about effective planning and designing customer involvement in NSD by performing various analyses. As shown in Figure 20, we start with the determination of the set of variables (cluster variate) that are relevant factors of managers' decision when working with customers in NSD. The selection of variables is done with regard to theoretical, conceptual as well as practical considerations as described in chapter 6.4.2.

Subsequently, we generate potential cluster solutions, which we purify by detecting and eliminating outliers. We test our final solution for validity and finally, describe groups of customer-involvement management practices. To this end, we also profile cluster solutions on additional variables not included in the clustering procedure, but relevant to characterize different customer involvement strategies.

This proceeding is in line with common literature on cluster analysis (Hair et al., 2006).

Figure 20: Process of Analysis



6.4.2 Determination of Cluster Variate

As for our elaboration of customer-involvement management practices, we employed two distinct model-testing approaches to examine types of customer-involvement management practices. First, we used cluster analysis to identify strategic groups based on the decision of when and by what means should customers be integrated in service innovation initiatives. Second, we applied multiple discriminant analyses to test the relevance and the ability of the selected variables to determine groups of customer-involvement management practices.

Within this primarily exploratory research context, we used multiple ANOVA-tests to analyse significance of variance explained (F-value) of different cluster solutions. Our principal measures of management types are: (1) methods used in idea generation phase, (2) methods used in concept development phase, (3) methods used in business analysis phase, (4) methods used in development and testing phase, (5) methods used in implementation and launch phase, (6) diversity of methods used, (7) customer involvement in early development stages and, (8) customer involvement in late development stages.

We calculated two measures, (1) number and (2) diversity of methods used, to obtain insights about quantity and variety of methods used. The first refers to the total number of methods used (M) throughout the NSD process:

Equation 4: Number of Methods Used in NSD

$$M = \sum_{i=1}^{n} m_i$$

m_i = frequency of single method used

The latter (D) stands for the unrelatedness of methods used and has been taken from strategic management literature (Nayyar, 1992; Rumelt, 1982). It is measured as follows:

Equation 5: Diversity of Methods Used in NSD

$$D = \sum_{i=1}^{n} P \times Ln(1/P)$$

$P = m_i/M$
m_i = frequency of single method used
M = total number of methods used

According to Rumelt (1982), ratios of 0.95 or more indicate very low variation in methods. Firms that have diversified to some extent, but still obtain the preponderance of their customer knowledge from the frequent use of few methods achieve values in the range of 0.7 to 0.95. Firms using numerous unrelated methods of customer involvement are those with ratios less than 0.7.

6.4.3 Types of Customer Involvement Management Practices

There has been a variety of techniques used, e.g. a priori grouping and Q-sort techniques, to classify firms, individuals or objects in management research (Harrigan, 1985). The most commonly used technique to identify groups within the population is cluster analysis since it does not create overlapping solutions (i.e. a firm is not classified in more than one group), and measures both a high degree of homogeneity within groups (similarity) and heterogeneity between groups (distances) (Hair et al., 2006). Cluster algorithms are a preferable means of sorting firms into strategic groups, because additional interpretation of competitive dynamics is possible (Harrigan, 1985).

We used cluster analysis application of SPSS 18.0 and Microsoft Excel XP software package to classify and analyse firms we surveyed. A sample size of 100 is considered large enough to provide sufficient representation of small groups within the population (Hair et al., 2006). Our sample size exceeded this.

We aimed for detecting homogeneous groups of firms based on our assumptions that the proxy variables (1) methods and (2) stages of customer involvement in NSD determine the underlying structure of customer-involvement management practices to achieve beneficial NSD outcomes.

To portray the structure in our set of data, we conducted two types of cluster analysis. First, Ward's method of cluster analysis, a hierarchical and agglomerative cluster procedure, was used because it minimizes the within-cluster sum of squares across the complete set of disjoint cluster each time it combines two clusters. By doing so, the clustering pattern is useful when seeking for somewhat equally sized clusters. The measure of similarity was the Squared Euclidean distance measure, although Mahalanobis distance (D^2) is recommended when proxy variables are correlated[18] (Hair et al., 2006) (Appendix 29).

We standardized proxy variables (z-scores) used in our analysis, since they were measured at different scales and distance measures are quiet sensitive to differing scales. To determine how many clusters should be formed, we used multiple criteria. One rule of thumb suggests choosing between n/60 to n/30 groups, where n is the sample size (Lehmann, 1979). Given the original n = 131, we should expect two to five groups. We examined both the agglomeration schedule by the stopping rule procedure (Appendix 30) and the dendrogram. The agglomeration coefficient indicated three options: three, four and five clusters. The result was confirmed by Median clustering method. We tested the preliminary results by performing a non-hierarchical clustering procedure (K-means clustering) using the cluster centroids, the average value of the objects contained

18 Mahalanobis distance is not available as proximity measure in SPSS.

in the cluster on all the variables in the cluster variate[19], from Ward's method as the initial seed points. Cluster seeds are starting points that initiate non-hierarchical clustering procedures to build cluster around these pre-specified points (Hair et al., 2006).

This approach facilitates "fine-tuning of the results" (Milligan and Cooper, 1987) and detection of outliers to find valid cluster solutions.

The three-cluster solution of K-means clustering analysis yielded one dominating group (60% of sample) with large amount of heterogeneity in comparison with the five- and four-cluster solution. Hence, we considered both, the five- and four-cluster solution as preliminary set of our analysis.

The two candidates were inspected for outliers. Five outliers were detected upon examination the icicle diagram, the dendrogram, the proximity matrix, and the non-hierarchical K-means analysis. Outliers can either represent observations of insignificant segments within the population, truly aberrant non-representative observations or an undersampling of actual groups, poorly represented in the sample (Hair et al., 2006). After outlier elimination (n = 126), each cluster solution has been inspected whether they correspond with our research objectives. The four-cluster solution showed distinct patterns of groups, whereas the five-cluster solution contained two groups with a similar pattern. To confirm the two solutions identified, we tested them for validity.

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[19] Set of proxy variables describing the objects to be clustered; the basis of calculating the similarity between objects.

6.4.4 Validation and Reliability of Cluster Solutions

"*Validation involves attempts by the researcher to assure that the cluster solution is representative of the general population*" (Hair et al., 2006, 618). As with other optimizing procedures, researchers can use a wide variety of methods to validate cluster solutions. We chose three forms of cluster validation to obtain assurance on the typology identified.

First, we analysed criterion validity to examine theoretical relationships of potential cluster solution. Second, we cross-validated potential cluster solutions to examine the degree of agreement of two types of cluster analysis. Third, we investigated validity of the expected final cluster solution by performing discriminant analysis on randomly selected subsamples, i.e. we compare a cluster typology resulting from the data set of a subsample with that from another subsample. The procedure is a form of validation or reliable assessment that gives some assurance on the "true typology" (Huberty et al., 1997; Milligan and Cooper, 1987, 333-335).

Criterion Validity

The two potential cluster solutions, namely the four-cluster and five-cluster solution, were assessed as for predictive or criterion validity on three additional outcome measures that are indicative of the potential for distinct patterns of the clusters. The validation attempts to provide insights whether the clusters vary regarding relevant variables not included in the cluster variate and to form the clusters as theoretically expected, i.e. criterion validity (Hair et al., 2006; 597).

To test criterion validity we selected three relevant variables: (1) increase in tacit customer knowledge stock (TKA), (2) increase in explicit customer knowledge stock

(EKA), and (3) service concept adaptations (SCM) as predicted outcome variables. As outlined in previous chapters, they are theoretically related to the concept of customer involvement in NSD. Appendix 31 and Appendix 32 indicate that the clustering variables of both cluster solutions are related to the three outcome variables. However, no significant differences in these variables across the clusters were found. Hence, we can conclude that the clusters do not depict groups that have predictive validity (Hair et al., 2006, 618).

Cross-Validation

Cross-validation refers to the application of alternative cluster methods. The objective is to determine the degree of consistency between the two cluster solutions (Hair et al., 2006). The validation technique incorporates a two-step procedure. A Ward hierarchical analysis is applied followed by an iterative cluster portioning via a K-means non-hierarchical clustering procedure (Huberty et al., 1997). A Ward method successively assigns objects to clusters by minimizing the within-cluster sum of squares across the complete set of disjoint or separate clusters. At each step, a combination of clusters is performed to minimize the increase in the total sum of squares across all variables in all clusters (Hair et al., 2006, 588). Major advantage of this technique is its overall cluster recovery ability and sensitivity to profile elevation and dispersion (Milligan and Cooper, 1987).

Because hierarchical clustering makes only one pass through the data, cluster membership of objects cannot change to identify the most appropriate cluster typology (Hair et al., 2006, 618; Huberty et al., 1997). Hence, the usage of a non-hierarchical clustering procedure is advisable, e.g. K-means method. K-means uses cluster centroids identified by a hierarchical method, i.e. “seeds” as starting points, to optimize assignment of observations to cluster and hence provides more accurate cluster memberships (Hair et al., 2006, 618). The Kappa Coefficient, an objective measure of stability (Punj and Stewart, 1983), should indicate the distinctiveness and validity of cluster solutions.

Table 14 illustrates the results of the cross-validation test of the four-cluster solution. The test demonstrated superiority in terms of level of consistency over the five-cluster solution. The two clustering methods assigned 85.7% of the observations to the same cluster. The alternative five-cluster solution indicated a consistency level of 82.5%. The Kappa-Coefficient confirmed these results estimating superior stability for the four-cluster solution (0.801) in comparison to the five-cluster solution (0.771).

Table 14: Results of Cross-Validation Analysis of Four-Cluster Solution

	Ward Method				
K-Means	**1**	**2**	**3**	**4**	**total**
1	**14**	0	1	0	15
2	0	**39**	0	0	39
3	7	4	**36**	3	50
4	0	0	3	**19**	22
total	49	43	40	22	126
Consistency of results =		85.71%			
Kappa coefficient = 0.801***					
Signficance: *** p < .01; **p < .05: * p < .1					

We conclude from these indicators that the four-cluster solution is more appropriate in representing the structure of the sample. We therefore consider it as the final cluster solution, which is further tested. Appendix 33 and Appendix 35 summarize cluster centroids and test statistics of the final cluster solution.

As an indicator of “fit” of this solution, we calculated the remaining within-groups heterogeneity (RS) from the dendrogram. The measure reflects the variation explained by the cluster solution relative to the total variation in the similarities observed. The value of RS ranges from 0 to 1, with 0 indicating no differences between groups and 1 indicating the maximum difference between groups. A good cluster solution should result in high variability between groups and low variability within groups (Franke et al. 2009; Sharma, 1996). In our study, the RS-value is 0.5, demonstrating that 50% of variation is explained by the cluster solution.

Equation 6: Remaining Within-Groups Heterogeneity of Cluster Solution

$$RS = SSB/SST \text{ or } 1 - SSW/SST$$

where RS is the variation explained by the cluster solution relative to the total variation in the similarities or dissimilarities observed,
SSW is the sum of squares within groups,
SST represents the sum of squares total and
SSB is the sum of squares between groups.

According to the identified characteristics, we labelled the four groups of customer-involvement management practices: (1) “early involvement strategist”, (2) “minimalist”, (3) “balanced involvement strategist”, and (4) “maximizer”. Figure 21 illustrates the characteristics of the four groups with regard to number of methods used in NSD phases. Figure 22 depicts the groups’ pattern pertaining to the diversity of methods used throughout NSD and the intensity of integration in the front- and back-end phases.[20]
A substantive description of each of the four clusters is given later in section 6.4.7.

[20] We standardized values to facilitate comparison of variables measured on different scales. Mean values are summarized in Appendix 36.

Figure 21: Pattern of Clusters in terms of Using Methods in NSD[21]

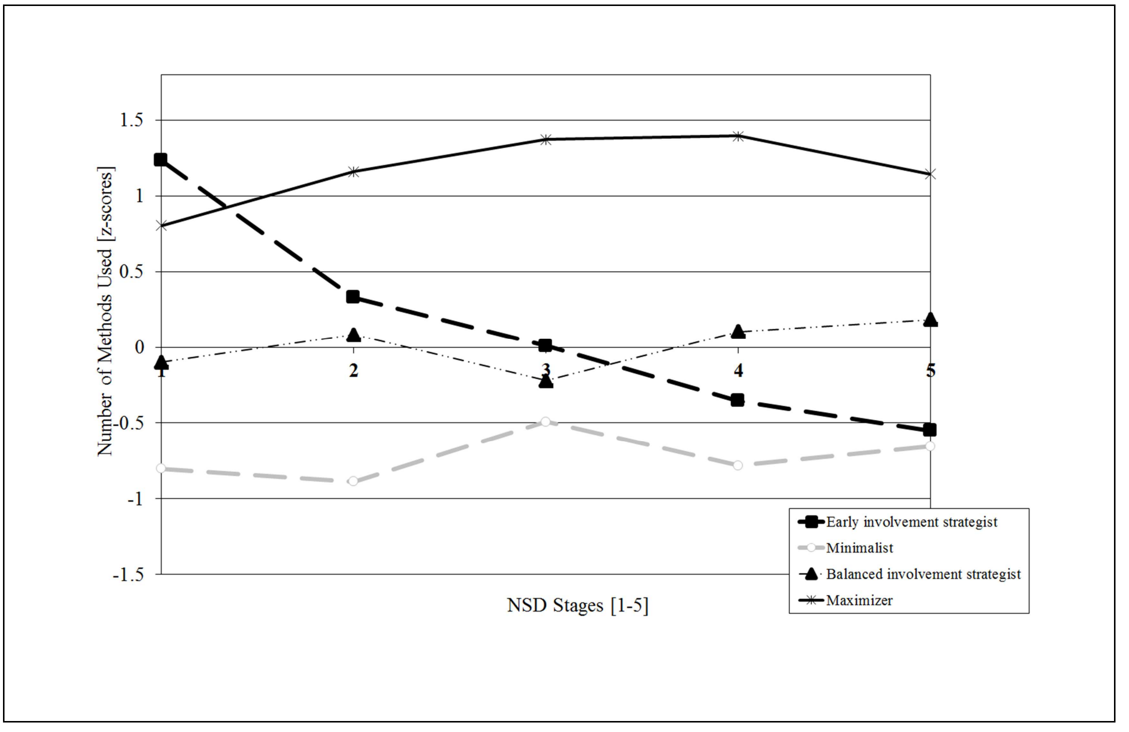
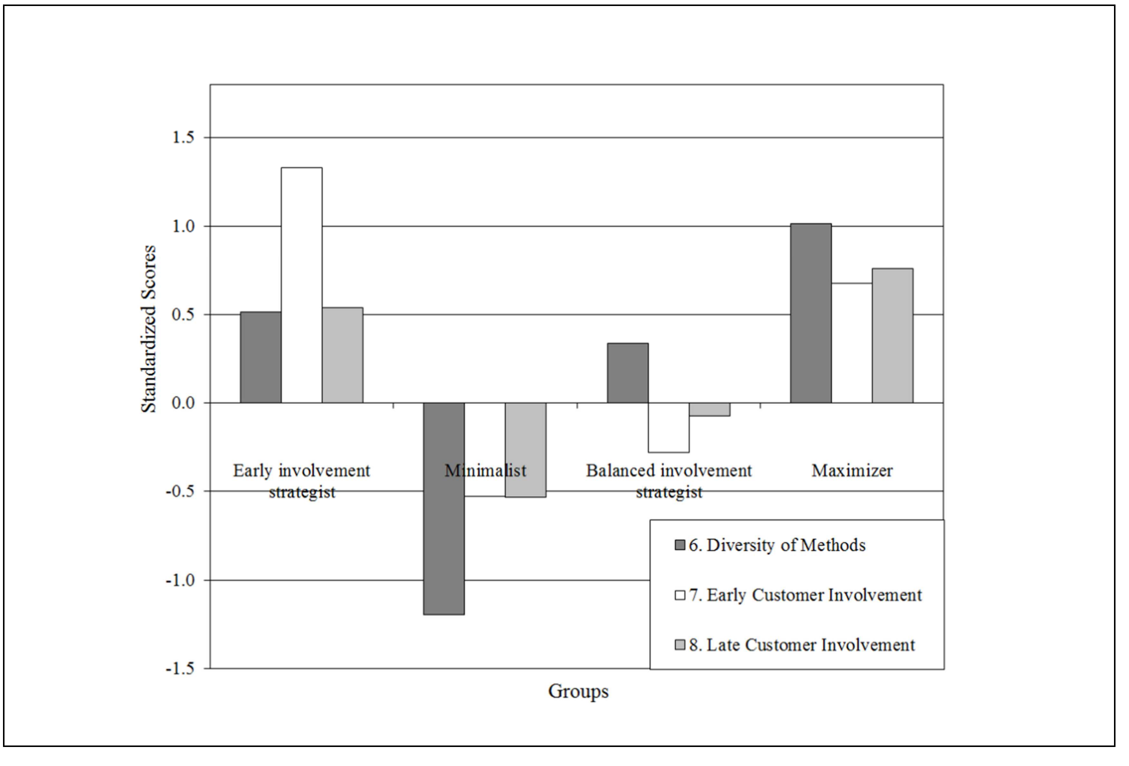


Figure 22: Pattern of Clusters regarding Diversity of Methods and Stages



21 NSD Stages = (1) Idea Generation, (2) Concept Development, (3) Business Analysis, (4) Development & Testing and (5) Implementation and Launch; lines in the graph represent the four clusters.

Model Validation By Using Discriminant Analysis

In addition to the previously described validation analyses, we performed several discriminant analyses in the conjunction with randomly selected observations from the sample to validate the final cluster model. Subsequently, we applied this technique to profile the groups of customer involvement practices (section 6.4.5), since it is also an appropriate means to determine the distinct characteristics of the clusters after they are identified (Hair et al., 2006, 598).

To validate the model we followed the suggestion of Huberty et al. (1997) and randomly split the whole data (N = 126) into two $m \times 8$ data sets. The procedure of splitting of the total sample into two half-samples was performed three times to obtain three distinct pairs of samples. The *m* for the half-samples ranged from 59 to 67. The data of half-samples was clustered using the Ward-Method followed by a K-means analysis as described previously. We chose a maximum of ten iterations for the K-means analyses.

Discriminant analysis requires cluster numbers to be used as grouping variables (g). It calculates linear discriminant functions (LDF) that best discriminates between the groups based on a combination of the independent variables. A LDF is a linear composite of the *p* outcome variables (Huberty and Hussein, 2003). The number of functions is the lesser of (g - 1). Hence, with four groups in each half-sample, we expect three LDFs. As an important output for interpretation, SPSS provides the proportion of variance in the dependent variable accounted for by predictor variables of the LDF.

The cumulative proportion of variance for two LDFs for our half-samples ranged from 90% to 97%; indicating that at most two LDFs should be retained (Huberty et al., 1997).

In addition, the (canonical) structure matrix (structure *rs*) of each half-sample consisting of correlations between LDF scores and scales scores were assessed. We conducted two correlations analyses for each half-sample pair and LDF based on the structure rs. For example, we analysed structure matrix of first LDF of first half-sample with the structure matrix of first LDF of second half-sample. "*If such a correlation between two sets of structure rs is high, then variables in one half-sample that form the basis for that structure would be the same variables that form the basis in the other half-sample*" (Huberty et al., 1997). The results are reported in Table 15.

Table 15: Correlations Between Corresponding Structure rs

	Proportion of Variance					
	Half-Sample Pair					
	1		2		3	
LDF	Proportion of variance	m	Proportion of variance	m	Proportion of variance	m
1st	0.97	65	0.90	67	0.90	63
2nd	0.91	61	0.93	59	0.90	63
total		126		126		126

All six of the correlations are judged to be "high" and demonstrate that the separation (in two dimensions) of the clusters in one half-sample in a pair is comparable to the separation in the other half-sample (Huberty et al., 1997). Furthermore, the inspection of the Box M criterion for the matrix homogeneity test revealed that correlation analyses of canonical structures of the two half-samples seemed to be reasonable. Solely, one non-significant Box M value ($p > .1$) was identified (Appendix 34).

As an another form of cluster validation, we compared the cluster structure of each pair of half-samples (A and B) by using the cluster means of subsample A as "seeds" to cluster observations of subsample B and vice versa (based upon K-Means cluster solution).

A k ^{x} k table of “hits” and “misses” where k denotes the number of cluster matches was developed. The tables for each of the three pairs were used to calculate the proportions of total-group hits that were better than what may be expected by chance. (Huberty et al., 1997; Ketchen and Shook, 1996). Based on a set of prior probabilities used, we calculated expected hit rates for each pair and the “improvement-over-chance” index (I). The index indicates the proportion of classification errors that is less than that made if classification were done by chance (Huberty and Lowman, 2000).

A summary of observed hit rates for the cluster matches in the three pairs of half-samples is depicted in Table 16. The results demonstrate that the cross-typology clustering was accomplished with a high level of consistency. Moreover, all across-cluster hit rates are higher than the corresponding hit rates expected by change. The six values of the improvement-over-chance index (I) ranged from 67.7 to 96.7. “*Thus, there would be at least 67.7% fewer classification errors made using the proposed cross-typology clustering than if chance classification were used*” (Huberty et al., 1997).

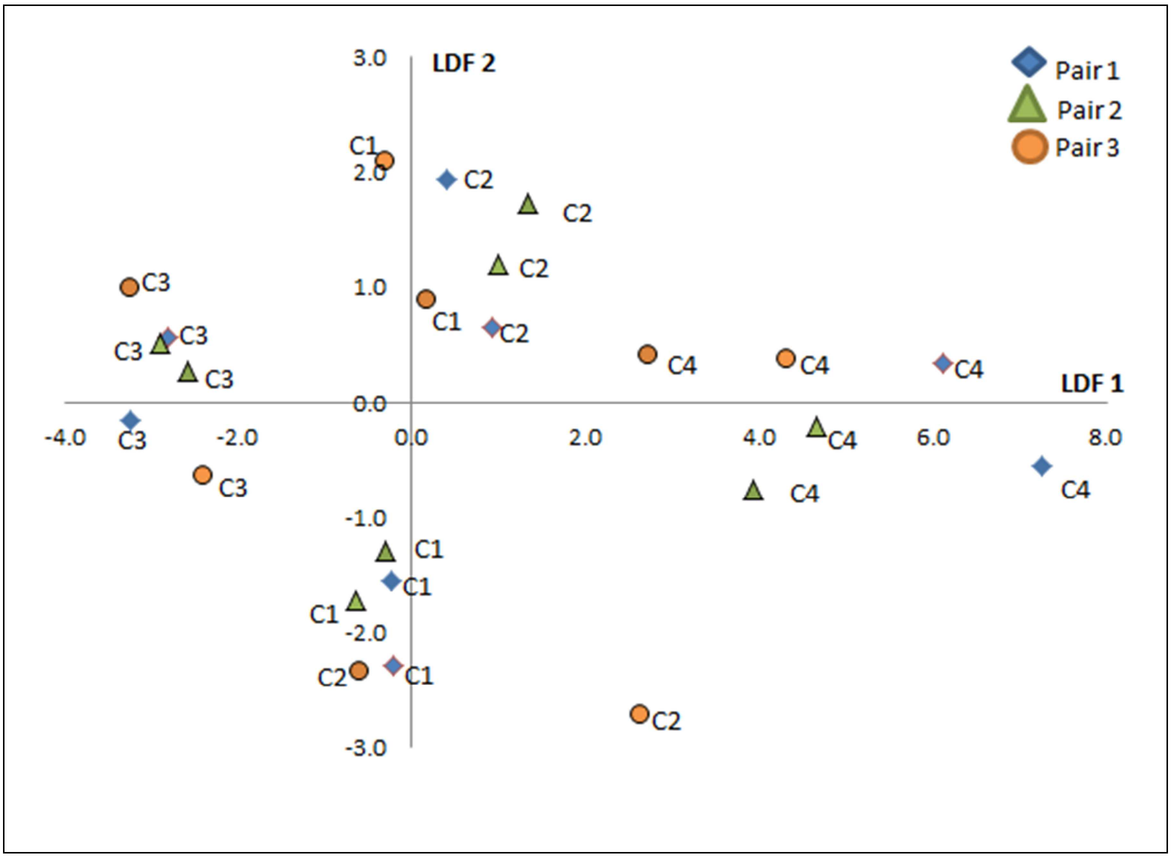
Table 16: Hit Rates for Cross-Typology Clustering

	Half-Sample Pair					
	1		2		3	
Cluster Match	A -> B	B -> A	A -> B	B -> A	A -> B	B -> A
1	95.7%	89.5%	85.0%	94.4%	69.2%	100.0%
2	90.9%	100.0%	100.0%	100.0%	50.0%	33.3%
3	85.7%	100.0%	95.2%	100.0%	69.6%	100.0%
4	100.0%	75.0%	90.0%	94.1%	100.0%	57.9%
total (H0)	93.1%	91.1%	92.6%	97.1%	72.2%	72.8%
level of consistency =		86.5%				

As a third method of comparing cluster typologies of the matched clusters of the two half-samples within each pair, we plotted cluster centroids of cluster matches in the space of the two leading linear discriminant functions (LDFs) (Huberty et al., 1997). We focused on the first two LDFs to plot centroids of cluster matches since the proportion of variance reflected that the first two LDFs account for 90 – 97% of variance. We plotted them for each half-sample in a two-dimensional LDF space. It was judged from the plot that the LDF centroids for the matched clusters of each pair were in close proximity (Figure 23).

The three types of comparisons lend some support for concluding that there exists a cluster typology underlying the data set. Moreover, the results of the comparisons indicate that the four-cluster solution appears to be valid. Hence, the four clusters are analysed further with regard to their characteristics.

Figure 23: Plots of Centroids in LDF Space of Matched Clusters for all Half-Samples



6.4.5 Cluster Typology

Profiling the identified cluster contributes to the understanding of a collection of analysis units, which in this research was a sample of service firms involving customers in NSD. Contributions to research may include questions: In what sense(s) are the clusters different? To address the common question that pertains to the identified cluster structure, linear discriminant functions of the whole data can be examined (Huberty et al., 1997). We ran a discriminant analysis with the types of management practices as the dependent variables for the whole data set (n = 126). The object is to determine the linear combination of independent variables, i.e. the predictors (proxy variables of cluster analysis), which best discriminates among the groups. This will show which variables contributed the most to definition of the clusters. The assessment of the discriminant model is based on canonical correlations R_c. It is a measure of association between the groups formed by the dependent and the given discriminant function, and relates to the significance of the functions (Hair et al., 2006). According to Wilks' Lambda[22], the three functions are significant (Table 17). Moreover, the goodness-of-fit for our discriminant model is statistically significant. Hence, the null hypothesis can be rejected. As illustrated in Table 17, each of the three resulting canonical correlations (R_{c1} = .92; R_{c2} = .70; R_{c3} = .57) are significant ($p \leq .001$). Furthermore, the average or mean squared canonical correlation (MSCC) indicates that 55% of the variance in the clusters is explained by the cluster variate (Alpert and Peterson, 1972).

22 The Wilks' lambda represents the separate or univariate effects of each variable, not considering multicollinearity among independent variables. It indicates each variable's ability to discriminate among the groups, but only separately (Hair et al., 2006, 327).

Table 17: Results of Discriminant Analysis

Result of Discriminant Analysis of 4-Cluster Solution (Ward-Method)

Canonical Function Correlation	Wilks Lambda, Tests of Function, (Significance)	Eigenvalue or Root	Canonical Correlation Rc	Significance of Canonical Correlation	Squared Canonical Correlation	Average Squared Canonical Correlation
1	.054, 1 through 3, (.000)	5,387	0,918	0,000	0,8427	
2	.342, 1 through 2 (.000)	0,983	0,704	0,000	0,4956	55%
3	.679, 3 (.000)	0,473	0,567	0,000	0,3215	

The interpretation of discriminant functions is based on (1) discriminant loadings and (2) discriminant weights. The discriminant loadings, also called structure correlations, measure the simple linear correlation between each independent variable and the discriminant function and reflect the variance that the independent variables share with the discriminant function. Variables exhibiting discriminant loadings of > |.40| are considered substantive discriminators. Analogous to interpreting beta weights in regression analysis, discriminant weights (discriminant coefficients) represent the relative contribution of its associated variable to that function and indicate its relevance in determining a relationship between variables; here, the relative strength of the relationship between the set of customer involvement characteristics (predictors) and the four customer involvement management practices (Hair et al., 2006).

Table 18: Loadings of Discriminant Functions

Predictor Set	Canonical Loadings Function 1	2	3	Canonical Coefficients Function 1	2	3
1. Idea Generation	0.392	**-0.409**	0.171	0.373	**-0.492**	**0.444**
2. Concept Development	**0.428**	0.078	-0.085	0.281	**0.609**	-0.041
3. Business Analysis	0.328	0.283	**0.413**	0.293	0.329	**0.570**
4. Development & Testing	**0.432**	**0.476**	-0.089	0.306	0.357	0.180
5. Implementation & Launch	0.300	**0.463**	-0.206	0.244	**0.506**	0.039
6. Diversity of Methods	**0.634**	-0.085	**-0.667**	**0.410**	**-0.521**	**-0.840**
7. Early Customer Involvement	0.284	**-0.429**	**0.425**	0.358	**-0.476**	0.352
8. Late Customer Involvement	0.230	-0.073	0.122	0.309	-0.073	-0.003

Note: **Bold** numbers indicate high loadings (weights) in canonical functions of >|0.40|

In our model (Table 18), the first discriminant function indicates a differentiation by the number of methods used in (1) concept development and (2) development & testing phase as well as (3) diversity of methods. These firms integrate customers to obtain customer feedback on their ideas and concepts. Additionally, they do not use various methods[23] to obtain multiple perspectives on customers. Firms scoring high on these predictors seek to spread the risk of developing customer-oriented new services during the NSD process, because they involve customer in early and late NSD stages. Hence, this dimension could be described as “consistent reassurance”. According to the eigenvalue (characteristic root), this dimension is the most important one and accounts for the greatest amount of variance (Table 17).

Service firms scoring high on the second discriminant function avoid integrating customers as idea generators. The negative values of the two variables, (1) number of

[23] High score of this variable indicates a low variety in methods used throughout the NSD process.

methods used in idea generation phase, and (2) customer integration in early phases support this assumption. Here, customers are supposed to play a major role in development & testing and implementation & launch phases, e.g. for acceptance testing. We call this dimension “justification of decisions” referring to the symbolic use of market research (Björkman, 2006; Ganeshasundaram and Henley, 2006; Menon and Varadarajan, 1992).

The third discriminant function is predicted by three variables, that is, (1) number of methods used in business analysis phase, (2) customer involvement in early NSD phases, and (3) diversity of methods. The positive and negative signs of the variables indicate opposite patterns between groups (Hair et al., 2006). Thus, we conclude that firms working with customers in early NSD phases and using multiple methods in business analysis at the expense of the diversity of methods. Instead of creating multiple perspectives of customer value through the application of various methods, they attempt to generate accurate estimations on project payoffs, approved by customers. Thus, this function captures “validation of estimated NSD results”, which is traded off against diversity of methods used. Overall, these three dimensions point to the main purpose of customer involvement in NSD.

The interpretation of discriminant loadings is confirmed by the discriminant weights of the function. According to Table 18, the most influential discriminant weights are: (1) number of methods used in idea generation, (2) number of methods used in concept development phase, (3) number of methods used in business analysis phase, (4) number of methods used in the implementation & launch stage, (5) diversity of methods, and (6) customer involvement in early NSD stages. They make the greatest contribution in discriminating between the groups and profile the characteristics of the groups based on the group means.

6.4.6 Jackknife Cross-Validation of Cluster Typology

To validate our model further we compute the misclassification rate using a Jackknife discriminant analysis estimating n – 1 sub-samples, out of n cases (Lachenbruch and Mickey, 1968). A discriminant function is calculated for each subsample and then the predicted group membership of the eliminated observation is made with the discriminant function based on the remaining cases (Crask and Perreault, 1977; Hair et al., 2006). This approach results in a classification matrix based on the predictions of the group membership of each sub-sample and calculates a hit ratio, the percentage of objects (here, service firms) correctly assigned to classes (strategic groups) by the discriminant function.

The misclassification rate of 9% suggests that the predictors do a good job of classifying the four types of customer involvement management practices (Table 19).

Table 19: Jackknife Cross-Validation of Four-Cluster Solution

From Cluster: / Assigned to Cluster:	**1** Early Involvement	**2** Minimalist	**3** Balanced Involvement	**4** Maximizer	Total
1. Early Involvement	14 (93%)		1 (7%)		15 (100%)
2. Minimizer		38 (97%)	1 (3%)		39 (100%)
3. Balanced Involvement	3 (6%)	2 (4%)	43 (86%)	2 (4%)	50 (100%)
4. Maximizer	2 (9%)		2 (9%)	18 (82%)	22 (100%)
Missclassification rate	2%	3%	14%	18%	**9%**

6.4.7 Characterizing Groups of Customer-Involvement Management Practices in NSD

In this section, we characterize the groups by profiling their customer involvement approaches depicted in Figure 21 and Figure 22. Later we discuss how the groups differ in resource-based attributes, such as market-driven NSD and customer orientation.

Appendix 36 shows the values of proxy variables in our cluster solution and provides valuable insights about the differences in firms with regard to their strategies of customer involvement in NSD.

Early Involvement Strategist. This group, representing 12% of the sample, tends to involve customers in the very beginning of the innovation process. They work very intensively with customers in the front-end of NSD and apply numerous methods in these phases to “make it right the first time”. As they are inclined to employ same methods in multiple NSD phases, the early involvement strategists seek to create ideas and concepts widely accepted by customers rather than initiating cognitive conflicts espoused by diverse methods.

Minimalist. The group labelled minimalists, with 31% of the overall sample, are characterized by keeping the number of methods used throughout NSD to a minimum and attaching little value to customer collaboration. However, the minimalists tend to use diverse methods of customer involvement giving rise to developing multiple perspectives on customers. The group is significant different to the other groups.

Balanced Involvement Strategist. Comprising of 40% of the sample, the group labelled “balanced involvement strategists” exhibit a similar pattern as the minimalists for customer involvement in NSD stages. The group uses customer involvement methods throughout the service innovation process, but strikes a balance between the minimalists' and maximizers' strategy in terms of number of customer involvement methods. Since they use related methods in the service innovation process, they are supposed to validate their ideas and concepts in lieu of creating multiple views on customer value.

Maximizer. The maximizers, consisting of 17% of the total firms, aim for using a high number of methods throughout the service innovation process. Contrary to any other strategic group, they use numerous methods of customer involvement to analyse business success; a rather delicate phase in NSD since it incorporates the estimations of payoffs and investments to be made. The maximizers work intensively with customers while they innovate and do not vary methods across the different NSD phases. Thus, similar to the balanced involvement strategists, they tend to validate their ideas and concepts on a broad basis.

6.4.8 Impact of Customer Involvement Practices

While the impact of customer involvement in NSD on new service performance has long been studied (e.g. Martin and Horne, 1995), the influence of key customer involvement practices on customer knowledge creation has only been speculated. Since customer knowledge creation is seen as the key success factor of the concept of customer involvement in NSD, it shall be deemed important to examine the identified strategic groups in this research context.

To investigate how customer knowledge creation differs among the groups of firms, we performed multiple ANOVA-tests. Scrutiny of Table 20 reveals striking empirical differences in the type of knowledge generated of strategic groups.

Table 20: Results of Four Groups pertaining to TKA, EKA and SCM

Characteristics of Strategic Groups
Strategic Customer Involvement Groups' Descriptive Statistics

	Group 1 Early Involvement Strategist (n = 15)	Group 2 Minimalist (n = 39)	Group 3 Balanced Involvement Strategist (n = 50)	Group 4 Maximizer (n = 22)	F-Statistic
Customer Knowledge Creation					
Tacit Customer Knowledge (TKA01 - TKA05)					
Cluster Mean	5.640	4.764	5.052	5.536	3,202**
Standard Error	0.244	0.214	0.158	0.228	
Significant Different to Group (a)	2	1, 4	(n.s.)	2	
Explicit Customer Knowledge (EKA01 - EKA05)					
Cluster Mean	5.017	3.474	3.890	4.955	7,417***
Standard Error	0.273	0.240	0.206	0.323	
Significant Different to Group (a)	2, 3	1, 4	1, 4	2, 3	
Project Change (PROCH01, PROCH03 - PROCH04)					
Cluster Mean	3.889	2.438	3.273	3.985	7,355***
Standard Error	0.420	0.226	0.181	0.323	
Significant Different to Group (a)	2	1, 3, 4	2	2	

Significance: *** p<.01; ** p<.05; *p<0.1; (n.s.) = not significant
(a) Indicates the group numbers from which this group was significantly different at p<.1 by the Hochberg posthoc-comparison (Field, 2006)

Overall, early involvement strategists and customer involvement maximizers attain higher scores on increase in tacit customer knowledge, increase in explicit customer knowledge, and service concept adaptations due to new ideas from customers. Hence, these two groups take better advantage of generating customer knowledge through customer involvement. It is worth noting that these two groups achieve a significantly high level of tacit customer knowledge, which is an important new service success factor.

Their strategies are characterised by using numerous research methods in the idea generation and concept development phase as well as by integrating customers intensively in early NSD stages (Appendix 36). Thus, we assume leveraging tacit customer knowledge stock is associated with the firm's tendency to use multiple, but not diverse methods in these NSD phases[24] and customer involvement throughout NSD. The use of

24 In these two phases, customers should (1) state their needs, problems and solution, (2) criticize existing service, (3) identify gaps in the market, (4) provide a wish list of service requirements, (5) state new service adoption

related customer involvement methods in these phases may enhance the NSD team's perception on the validity of its new service concepts developed. Thus, they gain confidence that the concepts fit to the market needs. Edmondson (1999) accentuates that by validating their assumptions, the team members improve their collective understanding of customers during NPD. Moreover, on the individual level, each team member enhances its psychological safety, the personal risk of making errors and being exposed to negative consequences, e.g. seen as being incompetent. She adds that the team members' safety feeling is a crucial factor to cope with risk and uncertainty, on the individual and group level. The two groups also exhibit a significantly different learning behaviour towards explicit customer knowledge generation. Explicit customer knowledge does not affect success directly; however, it plays a pivotal role in detecting new insights from customers. A fact that one area documents, say in a customer satisfaction report, is more likely to be identified than one that is not documented (Galunic and Rodan, 1998). It seems the two groups make use of extensive reports and facts about customers to disclose new customer needs. This assumption is substantiated by the number of say-methods used, which is significantly different to the minimalist and the balanced involvement strategist (Table 21).

Another characteristic of the maximizer and early involvement strategist that differentiates their customer knowledge creation behaviour from other customer involvement practices is associated with their high scores on service concept adaptations, the new

criteria, (6) suggest rough sales guides, market size and, desired service features, (7) react to the concepts, (8) state preferences and purchase intents of all the concepts, and (9) share beliefs about go/kill decisions (Alam and Perry, 2002).

insights brought up by customers. Both strategists tend to modify their NSD project due to new customer insights. A pattern they have in common with the balanced strategists.

Table 21: Usage and Usefulness of Customer Involvement Methods

Characteristics of Strategic Groups

Strategic Customer Involvement Groups' Descriptive Statistics

	Group 1 Early Involvement Strategist (n = 15)	Group 2 Minimalist (n = 39)	Group 3 Balanced Involvement Strategist (n = 50)	Group 4 Maximizer (n = 22)	F-Statistic
Characteristics of Methods Used (n = 116)					
Average Degree of Activeness (b)					
Cluster Mean	3.514	3.253	3.434	3.478	2,617*
Standard Error	0.026	0.125	0.024	0.022	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	
Creativity (c)					
SAY Methods					
Cluster Mean	6.400	2.385	4.580	7.364	28,217***
Standard Error	0.646	0.395	0.290	0.370	
Significant Different to Group (a)	2, 3	1, 3, 4	1, 2, 4	2, 3	
DO Methods					
Cluster Mean	2.333	1.231	2.340	3.091	8,575***
Standard Error	0.361	0.294	0.191	0.354	
Significant Different to Group (a)	2	1, 3, 4	2	2	
MAKE Methods					
Cluster Mean	1.067	0.282	0.540	1.227	6,489***
Standard Error	0.248	0.122	0.132	0.218	
Significant Different to Group (a)	2	1, 4	4	2, 3	
Usefulness (n = 119)					
Cluster Mean	4.074	3.932	3.936	3.972	0,205 (n.s.)
Standard Error	0.158	0.130	0.905	0.104	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	

Significance: *** p<.01; ** p<.05; *p<0.1; (n.s.) = not significant

(a) Indicates the group numbers from which this group was significantly different at p<.1 by the Hochberg posthoc-comparison (Field, 2006)

(b) Total degree of activeness of methods/total number of methods used

(c) Indicates the total number of methods used in terms of user creativity

It is worth noting that the three groups deploy do-methods of customer involvement to a high extent (Table 21). Service concept adaptations refer to the act of “unlearning” (Akgün et al., 2006a). Unlearning, an attitude by which organisations go about learning new things catalyses the change and adoption process (Klein, 1989).

Since well-established mind-sets, routines, and knowledge can act as a source of rigidity, team unlearning is necessary to tolerate changes in markets. It helps to accommodate new knowledge about evolving customer needs and enable team members to incorporate the latest user needs (Thomke and Reinertsen, 1998).

Furthermore, to test the recommendations of researchers to use proactive methods (recommendations of qualitative and anecdotic research in this field e.g. Kristensson, 2006; Kristensson et al., 2007), we calculated an overall ratio representing the level of activeness of entire NSD process (A_{NSD}); i.e. a firm's market-oriented behaviour with regard to involvement methods to unveil customer needs. The degree of activeness of methods was validated by academic experts (Appendix 28)[25]:

Equation 7: Level of Activeness in NSD

$$A_{NSD} = \sum_{i=1}^{n} m_i \times a_i / M$$

m_i = frequency of single method used
a_i = degree of activeness of single method
M = total number of methods used

The results show no differences between the four groups in usage of proactive market-oriented methods. Thus, proactiveness of research methods should be not viewed as an important characteristic of methods leading to NSD success. Instead of that, marketing research should focus on the method's contribution to learning.

As aforementioned, we did not expect a direct effect of customer involvement on NSD success and sustainable advantage. According to our results, all four groups exhibit high levels of new service performance and show no significant differences on market success, project success and sustainable competitive advantage.

25 We included the list of methods in our expert survey. The experts were asked to rate the degree of activeness of each method on a five-point likert scale (1 = clearly reactive, 2 = fairly reactive, 3 = neither proactive nor reactive, 4 = fairly proactive, 5 = clearly proactive). Definitions of proactive and reactive market orientation have been provided to the experts.

Table 22: New Service Outcomes

	Group 1 Early Involvement Strategist (n = 15)	Group 2 Minimzer (n = 39)	Group 3 Balanced Involvement Strategist (n = 50)	Group 4 Maximizer (n = 22)	F-Statistic
	Customer Involvement Strategies and Success				
Success					
Market Success (SUC02 - SUC04, SUC09)					
Cluster Mean	5,167	5,167	4,815	5,026	1,474 (n.s.)
Standard Error	0,209	0,153	0,851	0,918	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	
Project Success (SUC05 - SUC08)					
Cluster Mean	4,983	5,039	4,850	4,996	0,668 (n.s.)
Standard Error	0,351	0,181	1,150	1,154	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	
Sustainable Competitive Advantage (SCA01 - SCA04)					
Cluster Mean	5,450	5,032	5,205	5,236	1,131 (n.s.)
Standard Error	0,223	0,195	0,142	1,110	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	

Significance: *** p<.01; ** p<.05; *p<0.1; (n.s.) = not significant
(a) Indicates the group numbers from which this group was significantly different at p<.1 by the Hochberg posthoc-comparison (Field, 2006)

Since previous research reveals that level and methods of customer involvement vary pertaining to the degree of project newness (e.g. Callahan and Lasry, 2004), environmental turbulences (e.g. Bogner and Barr, 2000) and corporate culture (e.g. Narver et al., 2004), we extended our analysis with regard to these characteristics. The first two attributes are associated with the risk of market failure, whereas the latter is anchored in the concept of market orientation. Appendix 37 summarizes the results and reflects that types of customer involvement practices solely vary in terms of one cultural aspect, that is, customer involvement orientation. Early involvement strategists and maximizers differ significantly from other groups. Surprisingly, all four groups perceive themselves as considerably customer-oriented.

In summary, our analysis demonstrates that the four customer involvement patterns lead to different knowledge outcomes. We showed that the early involvement strategist and the maximizer work with users effectively to create tacit and explicit knowledge about customers. Furthermore, the two groups of firms and the balanced customer involvement strategists have a positive attitude towards unlearning and adapt customers' ideas to fit their new services to the market. We conclude that timing of customer involvement, the use of related methods throughout NSD, and the deployment of say- and do-methods places firms in the position to benefit from customer involvement significantly. Our findings and research implications are further discussed in chapter 7.

7 Discussion and Managerial Implications of Research

This research refines and extends our comprehension of how resources drive innovation and sustainable competitive advantage. Like knowledge, skills, core competences and processes, the customer is an operant resource of the firm that creates an effect on operand resources, e.g. physical goods or processes. By involving them in the NSD process, customers become coproducers of new service development projects. Consequently, customer value is generated through beneficial interactions with this operant resource (Lusch et al., 2007). This shift in marketing paradigm supersedes the traditional view of designing services for users. The relational exchange of knowledge of skills between customers and firms are the focus of value creation, particularly in new service development, one of organisation's core processes of generating future growth.

However, customer involvement does not simply create innovative service offerings per se but enables these to be created via the generation of tacit and explicit customer knowledge. By studying the generation of both types of knowledge, the study addresses their distinct effects on development outcomes. Building on the knowledge-based theory of the firm, the study results emphasize the importance of managing knowledge as both, stock and process in order to improve NSD performance.

Furthermore, our research points to the need of differentiating customer involvement in relation to inhibiting and amplifying factors on the firm and project level, an aspect, which has not been studied before. We specify these findings in the following subchapters.

7.1 Discussion

7.1.1 Customer Involvement and Its Role in Successful NSD

Although researchers in the realm of Services Marketing have investigated innovating with customers for many years, our study of customer involvement in NSD broadens the general understanding of this topic. Most studies of customer involvement in NSD typically focus on one dimension of customer involvement (e.g. Magnusson et al., 2003; Matthing et al., 2004). Studying customer involvement as a multi-faceted concept extends understanding of its role in relation to customer knowledge creation and new service success.

First, integrating customers in terms of richness and reach (level) is vital for generating new customer knowledge in the service innovation process. Due to intensive customer integration, firms achieve a higher level of understanding to response to differences between the espoused versus actual way of doing things (Sinkula, 1994). Our alternative conceptualisation of the construct sheds new light on how customer involvement can be managed and measured in NSD. The lack of a relationship between level of customer involvement and new service outcomes echoes the opposed attitudes on the usefulness of customers in NSD. It has been argued that their contribution can be either positive or negative.

However, these contentions might be inconclusive, because the usefulness of customers has not been measured on a cognitive level. On the one hand, customers positively contribute to the firm's knowledge about buyers. On the other hand, customers are capable of creating new service ideas. However, whether their ideas are integrated into the new service concept or not is a decision that is beyond their scope of influence. The NSD team evaluates the external view of customers and only accepts customers' ideas when they are perceived as valuable, i.e. the market fit of the new service concept is improved. Researchers refer this dilemma to the symbolic, instrumental and conceptual use of market research (Björkman, 2006; Ganeshasundaram and Henley, 2006; Menon and Varadarajan, 1992).

Second, because NSD teams use numerous methods of customer involvement they are able to create a broader understanding about customers. Earlier it was posited that specific modes of customer involvement are beneficial, such as techniques related to social interaction (e.g. Sawhney et al., 2005). The success of these techniqueshas been explained by their degree of activeness; i.e. its ability to unearth latent future customer needs in lieu of present expressed customer needs. Our results suggest that this approach does not expound how knowledge generation is facilitated. It appears that the inherent learning focus of methods, i.e. creativity, sheds more light on how customer intelligence finds its way to successful new services (Sanders and William, 2003). Incorporating numerous methods of customer integration enables NSD teams to obtain either multiple perspectives on customers or approval of their preconceptions about customer needs. The latter is seen as an important ingredient to achieve a higher degree of safety and reduce risk involved in NSD. A nuanced understanding of the deployment of customer involvement techniques is required to explain how knowledge redundancy, the common understanding of a subject area shared by organisational members engaged in communication, is achieved (Huang and Newell, 2003; Nonaka and Takeuchi, 1995). In our research, this refers to the overlap of customer information and knowledge in the mind of team members. It is the foundation of creating common sense within the NSD team and speeds up the knowledge-creation process. Particularly in the phase of concept development when it is critical to articulate images rooted in the tacit knowledge stock of individuals, an overlap is beneficial (Nonaka and Takeuchi, 1995, 80). For example, to develop a new electronic banking service in the financial market, it is crucial that each team member of the financial intermediate has to know how and when the customer should use this new service. However, each individual has a preferred learning style, i.e. convergent, divergent, assimilative and accommodative. Learning styles emphasize the preference for some modes of learning over others (Smulders, 2004 referring to Kolb, 1976). In the example given, the diverger, who tends to view situations from many perspectives, may prefer brainstorming sessions with customers to generate new ideas about the functions and design of the new service, whereas the converger who needs practical application of ideas may prefer rapid prototyping with customers to understand how the concept reflects the needs of the buyers. Combining these methods of involvement addresses more than one learning style and therefore, enables sharing the same understanding among team members.

Third, this study offers new insights on the role of stages of customer involvement. Existing literature has already addressed the importance of the front-end phases (e.g. Alam, 2006a). However, it does not point out its relative significance with regard to methods of involvement. Contrary to the tenet of previous research stating that customers act as a source of new ideas (e.g. Kristensson et al., 2004; Kristensson et al., 2002), customer involvement is valuable for new knowledge generation, when managed as an organised business activity aligned to the company’s innovation strategy (Table 20). Early involvement and maximising the work with customers throughout NSD are seen as management approaches that benefit from learning with customers. They use multiple related methods particularly in the early NSD stages, that is, the idea generation and concept development stage and consequently, reduce uncertainty about customer needs. Integrating customers in the business analysis phase appears to have no impact on customer knowledge creation. Both strategies as well as the balanced customer involvement approach are relevant when listening to the ideas of customers especially when being viewed as an opportunity to learn. Firms pursuing one of these practices show a strong tendency to modify new service concepts due to new insights from customers in order to achieve long-term competitive advantage.

Fourth, it is surprising to find that NSD firms still rely on traditional market research methods and perceive them as very useful. The most useful methods of customer involvement are modes that contain explicit information on customers, namely customer complaints & feedback, surveys and service interaction reports, implying a passive role of customers in NSD (Sandén et al., 2006). However, the study proves that firms do not rely on a single method to gain knowledge about customers. Hence, the employment of traditional research techniques needs to been seen in a broader context, contrary to prior research in service innovation.

On average, firms apply thirteen methods throughout NSD that are related to new service development phases. Methods like beta-testing and transactional customer data analysis, foster positive new service outcomes when applied in the appropriate phase of NSD. The combination of methods in NSD phases still needs further investigation. However, as the study demonstrates, the facets of customer involvement are contextually interwoven.

7.1.2 Customer Knowledge – A Key Success Factor in NSD

In this study, we demonstrated that customer involvement does not lead to new service development success. Our findings show that the increase in customer knowledge stock is the key success factor in NSD. Moreover, whilst previous research has investigated the importance of customer knowledge for innovation, no studies have looked at the relative importance of different types of intelligence. The results show salient differences in the roles of tacit and explicit customer knowledge in NSD. Furthermore, our study provides further empirical support that NSD should be viewed as a learning process (Hoe, 2008).

Tacit Customer Knowledge Stock and Its Function in Successful NSD

The level of customer involvement in NSD enhances a firm's stock of tacit customer knowledge. This knowledge is difficult to codify and thus it is likely to be intricate to detect and to transfer. Its combination with other knowledge is complicated (Galunic and Rodan, 1998). The inherent nature of tacit knowledge is its strength and its weakness causing organisational ambixterity. Organisational ambixterity signifies a firm's ability to manage the tension between exploiting current knowledge and exploring new domains with equal dexterity (Lubatkin et al., 2006). First, the positive and strong relationship between an increase in tacit customer knowledge stock and new service outcomes reinforces the imperative to harness this type of intelligence possessed by individuals and teams (Mascitelli, 2000). Rationales of this imperative are concerned with the uniqueness of this type of knowledge. Uniqueness of tacit knowledge evolves from processes embedded in a firm's core capabilities - part of its entire knowledge set - that differentiates organisations strategically (Leonard-Barton, 1992; Teece et al, 1997). The first process is associated with the act of sharing tacit knowledge within the team. Each individual's tacit knowledge is personal and unique, and gained through a combination of formal education and work experience in his/her speciality. Much of the wisdom, embodied in the minds of experts can be absorbed by others through the time-honoured social relationships of collaboration (Mascitelli, 2000). Sharing individual experiences within the team and collaborative experiences and interpretations of events composes the collective tacit knowledge stock. Because of people's distinctive experiences and interpretations, as well as their idiosyncratic way of sharing tacit knowledge, the entire firm's knowledge stock becomes unique. The second process of generating unique tacit knowledge is incorporated in the learning-by-doing approach. Experiential learning in the form of learning-by-doing can involve multiple, distinct practices, implying manifold options of creating new and combining knowledge structures. Each option is in a sense unique. Since the knowledge created through these processes is not visible to outside observers, e.g. competitors, it makes it very difficult to imitate (Cavusgil, et al., 2003; Mascitelli, 2000). Even though we have not measured uniqueness of tacit knowledge, we consider tacit customer knowledge as the wellspring of innovations which leads to sustainable competitive advantage as outlined by multiple researchers (e.g. Barney, 1991; Day, 1996b; Kogut and Zander, 1992; Leonard and Sensiper, 1998; Marsh and Stock, 2006; Teece et al., 1997). Our study confirms this notion, since we found a positive relationship of increase in tacit customer knowledge stock and sustainable competitive advantage.

However, as demonstrated in our study, prior tacit customer knowledge stock could inhibit beneficial learning effects. Previous research that has focused on demands of customer knowledge without stressing the imperative of "learning to unlearn" (Akgün et al., 2006a; Mcdonald and Madhavaram, 2007; Nonaka and Takeuchi, 1995) has resulted in a perhaps overly optimistic view on dealing with tacit customer knowledge in service innovation. Organisations relying on routines that have proven to be successful in the past can become calloused to new ideas (Leonard-Barton, 1992). This is likely to be true in the view of new ideas brought up by customers, which are incongruent to the knowledge possessed by the NSD team. We demonstrated this effect with regard to prior and increase in tacit customer knowledge. First, prior tacit customer knowledge negatively affects customer involvement in early and late NSD stages and second, increase in tacit customer knowledge stock does not influence service concept adaptations.

Our findings suggest that the different functions of tacit customer knowledge may be more viable than previous approaches to customer knowledge creation. Moreover, we demonstrated that the role of tacit knowledge is different to explicit knowledge in the context of service innovation.

Explicit Customer Knowledge Stock Reduces Uncertainty

Service concept adaptations are driven solely by the generation of new explicit customer knowledge. Product designers are known to have a low tolerance for ambiguity and require objective, reliable information (Griffin and Hauser, 1996) and they value written communication more than the less precise and technical nature of verbal communication (Antioco et al., 2008). It appears that NSD teams find it easier to react to explicit knowledge than tacit knowledge. Explicit knowledge functions as a means to reduce the NSD team's perceived uncertainty. It is fact and in its most advanced state, it is contained in codified theory, which does not only explain why things work, but enables the prediction of the outcome of novel phenomena (Hall and Adriani, 2003). When explicit knowledge "confirms" new ideas of customers, the NSD team members feel more secure and capable of changing their initial plans. Nonaka and Von Krogh (2009) describe this behaviour as follows: "*When decision makers gather and process information about the organization's environment, they can achieve more accurate or "true" representations and make better decisions*". Thus, the NSD teams' perceptions of negative consequences of changes are minimized (Edmondson, 1999). In addition, since it increases the probability of detecting the value of new knowledge and information flows (Cohen and Levinthal, 1990), fact knowledge is seen as a useful asset to be exploited when preexisting to any learning initiatives.

The Value of New Insights Provided By Customers

We identified that service concept adaptations initiated by customers produce mixed results. In support of previous research, we found that service concept adaptations are not related to market success (Dvir and Lechler, 2004). However, service modifications affect new service performance in the longer term. It may be the case that by involving enthusiasts and innovative users in NSD, firms risk developing service offerings that only appeal to a niche market and may not "take off" in the mainstream market (Franke and Shah, 2003). It has been argued that innovative users, such as lead users, are familiar with conditions lying in the future for most others in the market (Von Hippel, 1986). Hence, involving them may lead to new service concepts that create sustainable competitive advantage in the future, but do not succeed in the existing mass market.

Furthermore, new insights due to integrating customers in NSD may cause delays and bust project budgets. These findings are contrary to the pre-eminent opinion about the benefit of customer involvement, that is, reduced time-to-market (Alam, 2002). It could be argued that the recombination of customer knowledge due to new insights provided by customers, i.e. knowledge transfer, is associated with an increase in efforts and costs (Galunic and Rodan, 1998).

New insights provided by customers moderate the relationship of increase in tacit customer knowledge stock and the two outcome variables, market success and sustainable competitive advantage. The findings imply that the application of new service concept changes strengthens the process of transforming the new tacit customer knowledge into novel services that are successful in the market in the short and long term.

The path of managing knowledge stock and processes from idea generation to application of market intelligence is dynamic, including iterative acts of evaluating and integrating. It is an integrative problem-solving process (Brown and Eisenhardt, 1995; Eisenhardt and Martin, 2000; Marsh and Stock, 2006) associated with a firm's combinative capabilities (Kogut and Zander, 1992). These capabilities enable the company to translate its knowledge into useful actions (Iansiti and Clark, 1994) and strengthen the organisational and strategic routines by which it achieves new resource configurations to compete in changing environments (Eisenhardt and Martin, 2000; Marsh and Stock, 2006); a crucial resource when working with customers in NSD.

Surprisingly, service concept adaptations do not affect the relationship of new tacit insights on customers and project success. Hence, changes in new service concepts do not amplify the process of developing the appropriate actions to meet project objectives. A possible explanation for our finding may be gleaned from the work of Teece (1998), who argues that seizing market opportunities and generating sustainable competitive advantage frequently involves identifying the relevant complementary assets, such as outside knowledge, needed to support the business. Hence, we conclude that the integration of customers' ideas is efficient when external-oriented NSD objectives needs to be achieved. It appears that managing internal routines, such as meeting project budget requirements and deadlines, is based upon capabilities and knowledge of the NSD team. Moorman and Miner (1998) argue that developers rely on their own knowledge when a project or action phase represents familiar territory, and the necessary actions are part of the firm's longstanding repertoire. This might be the case if R&D, production and marketing tasks need to be coordinated to achieve pre-set project outcomes.

7.1.3 Cultural Antecedents of Customer Involvement in NSD

Considerable research on marketing emphasizes that new product and service development is centred in the concept of market orientation (e.g. Langerak et al., 2007), because firms should aim for creating customer value while innovating. To this end, organisations are called upon to integrate customers in their innovation business activities (Kok et al., 2003).

Contrary to previous research, our first basic finding is that market-driven service firms, possessing market-sensing capabilities, work intensively with customers in the early phases of NSD, since identified needs in the beginning of innovation initiatives are required to generate attributes for desired new services during course of project (Alam, 2006a). Prior research emphasizes customer integration throughout NSD to design customer-centric new services (e.g. Alam, 2002; Alam and Perry, 2002). However, this view may have overlooked that firms require distinct information in early and late NSD phases (Kok et al., 2003). Late stages of NSD, i.e. service development & testing and implementation phases, are characterized by the dominance of internal information to (1) coordinate the service delivery system, (2) implement the operations plan, and (3) introduce of the communication strategy as well as (4) organize the new service launch (Edvardsson and Olsson, 1996; Johne and Storey, 1998). Researchers also stress that market information needs decline over the course of innovation projects due to inherent types of uncertainty involved in decision-making. Early NSD stages are associated with the highest number and different types of information being used to reduce uncertainty about customer needs, a company's capabilities and market segments (Zahay et al., 2004). In their study about software development, MacGormack and Verganti (2003) have found that firms cope with this type of uncertainty by integrating early marketing feedback. By involving customers at the outset of NSD, the project is geared towards avoiding the pitfall of reacting to new information about markets in later new service development stages (MacGormack and Verganti, 2003). As a result of handling customer input in the front-end and back-end of NSD differently, decision making in the innovation processes of organisations becomes more effective (Zahay et al., 2004).

Furthermore, market-driven behaviour in innovation projects, referring to discovering and satisfying current stated customer needs (Kok et al., 2003; Narver et al., 2004), generally implies listening to customers who can easily articulate their needs with regard to incremental changes of existing services (Bennett and Cooper, 1979; Christensen and Bower, 1996). Unearthing customer needs in a structural information gathering setting as with incremental innovations takes place at the outset of new service development projects (Reid and de Brentani, 2004), whereas discontinuous innovations tend to be generated internally, because they are often driven by the desire to apply a particular technology unknown to customers (Veryzer, 1998).

In summary, our findings support these more recent arguments of scholars since higher levels of market-driven NSD leads to higher customer integration in the front-end of

NSD, while no significant effect of innovativeness on customer involvement in early NSD has been identified (see section 7.1.4).

The second, cognitive dimension of market orientation refers to the capabilities of being closely linked to the customer, a fundamental element of the firm's degree of customer orientation (Nägele, 2006). Discussions about customer orientation emphasizes that customer-oriented businesses are perceived as having better quality physical goods and employee performance (Brady and Cronin, 2001). These characteristics are associated with a firm's (1) active encouragement of customers to comment on and complaint about existing services, (2) strong after-sales service emphasis, (3) regular evaluation of ways to create superior product and service value, and (4) regular measurement of customer satisfaction levels (Gray et al., 1996). By continuously collecting and acting on customer satisfaction and feedback reports during service delivery, customer-oriented firms create pronounced capabilities to create new services that satisfy expressed customer needs. As a corollary, customer-centric firms do not need to work with customers intensively in early NSD stages. They also have learnt from the past how to implement customer needs within the organisation and possess superior capabilities of putting together actionable schedules of activities required for new service implementation (Nwankwo, 1995). Slater and Narver (1998) mention retail banking as one industry that has widely adopted this philosophy with good results (e.g. Timewell, 1994). Many successful banks have developed customer information files from data that are routinely collected in a bank's various production systems to improve their marketing efforts (*Bank Management*, 1996).

It seems that these capabilities are uncoupled from any customer interaction, which differs from recent concepts (e.g. Alam, 2002; Nägele, 2006). However, the paradox of developing valuable new services without integrating customers is not new. Previous research has stressed the need of tight-loose coupling with customers (Danneels, 2003). According to the concept of loosely and tightly coupled systems (Orton and Weick, 1990; Weick, 1976), a tight linkage with customers leads to better understanding of customers' needs, closer tailoring of products and services, higher customer satisfaction, easier forecasting of demand, and closer relationships. Loose coupling with customers, on the other hand, is necessary to remain flexible, and to keep an open eye to opportunities and threats. A continuous customer relationship affects learning within the organisation and forms managers' mental models about customers (Danneels, 2003; Lyles and Schwenk, 1992). While service provision could be tightly linked to customers, because it is necessary to serve current customers well, innovative initiatives should be only loosely attached to mental models developed through customer interaction. In innovation projects, encouraging loose coupling to existing customers helps broaden the range of attention and market scanning which in turn leads to the identification of market opportunities and unserved markets (Danneels, 2003; Hamel and Prahalad, 1991).

In summary, the intuitive assumptions about the positive effects of the behavioural and cognitive elements of firms' market orientation culture - market-driven NSD and customer orientation - on customer involvement in NSD have not been confirmed by our study. A similar paradox has been found in Moorman's study (1995). The researcher empirically proves that cultural antecedents are limited in their ability to predict marketing information acquisition and reaffirms the need of a proper balance between internal and external orientation in innovation as suggested by Day (1994a).

In addition, Moorman (1995) states that different aspects of a culture can be evoked when certain organisational or environmental needs arise. In this context, a firm's culture of market orientation may only partially constitute the level of customer integration in NSD. Hence, researchers emphasize the link of market orientation to knowledge management (Marsh and Stock, 2006), learning orientation (Baker and Sinkula, 2007; Day, 1994b; Slater and Narver, 1995) and innovativeness (Hurley and Hult, 1998; Matear et al., 2002).

7.1.4 Innovativeness and Customer Involvement in NSD

The credo of "listening to the voice of customers" has been criticised in the innovation literature when firms develop very new services or products. "*The problem is customers' ability to guide the development of new products and services is limited by their experience and their ability to imagine and describe possible innovations*" (Leonard and Rayport, 1997). Customers cannot imagine alternatives or future functions of utilized services (Campbell and Cooper, 1999; Enkel et al, 2005; Ettlie, 1986; Gales and Mansour-Cole, 1991; Leonard, 2002). Thus, innovation activities are constrained, but not determined, by existing mental models of customers (Danneels, 2003).

Our findings seem to confirm the pre-eminent notion about customers' limited creativity and their inability to invent very new service ideas, because firms avoid integrating them in the front-end of the development process of radical new services. However, we found that customers are involved in the back-end of NSD when the service is very new. The results are similar to those of Callahan and Lasry (2004) and Veryzer (1998) in the field of NPD. Veryzer (1998) finds that firms tend to conduct relatively little formal research in the concept generation and design phase and restrict the amount of research in the technical development and design phases. The author asserts that the first true opportunity to assess customer reaction to the product, its benefits and capabilities is within the prototype phase at the end of NPD. Customer research is increased in the commercialization phase to refine design and clarify marketing issues. The researcher notes that product ideas originate from within the firms rather than coming from customer input.

Callahan and Lasry (2004) confirm this notion and reveal in their study that the importance of customer input and intensity of customer involvement increases at the back-end of NPD when the product is very new to the market.

A possible explanation for our results can also be gleaned from the work of Lynn et al. (1996) who argue that the management of discontinuous innovation poses a unique set of challenges: (1) long investment-intensive process, (2) unpleasant surprises, (3) high uncertainty, because the market is ill-defined and technology is evolving, and (4) the question of timing with regard to technology and market development. In their research, they reveal that because of these challenges, successful companies tend to have a less formal NPD process, but learn and probe throughout the act of innovation. Firms learn from the probes and probe again. The initial product is not the culmination of the development process, but rather the first step. Hence, the NSD firm skips the first phases in innovation and focus on the back-end of the process.

Furthermore, users may not be aware of the advantages of the new service and its features when the new service is within a fuzzy design stage. By integrating customers at the end of NSD, firms can test the acceptance of very new services upon launch. In his research on radical new IT services, Davis (1989) emphasizes that practitioners generally evaluate systems not only to predict acceptability but also to diagnose the reasons underlying lack of acceptance, and to formulate interventions to improve user acceptance. Testing acceptability of the new service containing most of its features is crucial to commercialize the new service successfully, since negative attitudes of early adopters in the post-purchase phase aroused by the company's failure to meet their expectations may impede service adoption (Chiesa and Frattini, 2011).

In addition this, it could be argued that incremental service development – as a result of being market driven - requires high customer involvement, whereas innovative projects call for low customer involvement in early NSD stages; an imperative which has been addressed in previous research (e.g. O'Connor, 1998) and can be also concluded from our research findings.

These findings have some important managerial implications.

7.2 Managerial Implications

The argument that customer involvement in NSD enhances new service success has gained wide acceptance among practitioners. It has been previously argued that market orientation drives firm performance. However, our study stresses the need to extend this view since it does not centre on the main success factors and their interrelations.

Our research demonstrates that customer involvement is positively related to the generation of new customer knowledge. Numerous managerial implications could be derived from our findings.

First, we suggest that firms should adopt the learning perspective to manage knowledge in NSD effectively. For years, firms have applied the perspective of the stage-gate process to manage decisions in new service development. Today, NSD organisations must focus on combining external and internal knowledge resources in order to create successful outcomes. By doing so, firms go beyond the traditional view of marketing research insomuch that new services are not designed for, but co-created with customers. The learning perspective helps companies to choose methods of customer involvement that coincide with the prevalent learning styles of NSD team members. Hence, learning becomes more efficient in terms of knowledge and information to be acquired from customers. Marketing managers are fervent adherents of the market-orientation tenet with respect to acquiring broad and comprehensive knowledge about customers. This notion is justified insofar as new explicit customer knowledge strengthens the firm's belief in ideas of customer. Collecting representative information to justify future investments in new services are common practices in innovation. However, in order to avoid ineffective market research and unreasonable research expenses, managers may plan customer involvement carefully in relation to questions to be answered by customers.

In addition, managers should pay more attention to the tacit dimension of new customer knowledge since this is what triggers new service success. Tied to senses, experiences, skills and, intuitions created through experience, tacit knowledge must be freely shared among project team members to improve effective actions in the team. Moreover, firms need to build an environment for tacit knowledge sharing that is mainly associated with the freedom for the NSD team to express their creative ideas without being seen as incompetent. This can be achieved by continuous practices in learning reflection sessions and guidance by a knowledge facilitator or challenger who is in charge of questioning rigid and existing practices of knowledge creation. Furthermore, NSD management has to define its role in this context. NSD executives should act as knowledge activists, responsible for energising and connecting knowledge-creation efforts. It is their task to campaign for establishing the necessary acceptance of knowledge creation processes throughout the company.

Furthermore, our study calls on managers to consider the prior customer knowledge stock incorporated in systems, procedures and people. Prior customer knowledge helps to avoid unfavourable cost-and-benefit relations of customer integration. The search of information tends to be more focused when prior knowledge about customer preferences and behaviour is included in the learning process of the NSD team. Moreover, fact knowledge is crucial in order to detect the value of new information. For example, a written customer complaint might clearly indicate weaknesses of service processes that cause dissatisfaction. Cause and effect becomes obvious.

However, relying on existing knowledge stocks has its downside. There is an inherent risk of ignoring new information and knowledge from customers because of pre-existing rigid routines and beliefs existent in the prior tacit customer knowledge stock. Firms tend to focues on what has been learnt from the past, contributing to the prosperity of the business. However, successful routes of action in the past may not be appropriate to compete in the future. Unlearning by questioning what and how things have been done give ways to new ideas and creative destruction. Hence, NSD project managers have to deal with the tacit dimension of customer knowledge in an ambidextrous manner.

Second, managers should be aware of the ancillary role of explicit knowledge. Managers tend to rely on facts and analysis reports, supposed to represent "reality", while tacit knowledge implies intuitions. However, as the study demonstrated, fact knowledge has a different role in the service innovation context. The continuous search for information attesting to what is known and unknown gives rise to extra research costs. However, these costs can be avoided, since the major purpose of explicit knowledge is to improve psychological safety. Establishing an environment to combine explicit and tacit customer knowledge incorporating "sense-making team sessions" may enhance individuals' and groups' perceptions of being understood; this in turn improves psychological safety and innovative behaviour. The latter is associated with the willingness to experiment, learn, and take risks - a cultural asset that is important particularly when dealing with very innovative services.

In conjunction with this cultural characteristic, managers need to cope with a paradoxical view on customer orientation (tight-loose coupling) and the ambidexterity related to it. A tight customer relationship is useful in service delivery since it positively affects customer loyalty and satisfaction. Furthermore, it may enhance information sharing while the service is delivered. Customer feedback is an important source of new service ideas, particularly in the context of incremental service changes. In a radical new service environment, the situation is different. A culture of entrepreneurship and innovation, the opportunity to probe and learn should guide NSD strategy, leadership and resource allocation. Overall, a balanced approach of NSD considering both, development of incremental and very new services may be pursued to manage risk in innovation.

Third, we draw managers' attention to the necessity of managing customer involvement in NSD by its distinct facets. Managers responsible for new service development must recognize the critical role of customer involvement in the knowledge generation context. Our study reinforces the need to use multiple methods and involve customers in early NSD stages to create higher levels of customer knowledge stock. However, from a cost-benefit view, firms should aim for an early involvement strategy in lieu of maximising strategy. Maximizers are driven by their belief that customer involvement pays off. As the study shows, this applies solely to specific conditions. On no account should customer involvement in NSD be seen as a short-term investment, however. Knowledge and information from customers contribute significantly to the achievement of long-term competitive advantages.

In this chapter, we outlined managerial implications mainly associated with the emphasis to view NSD as a learning process and the urgency of managing assets and resources according to this view. Customer involvement should be broken down to its inherent dimensions to be managed effectively. However, without seeing customer involvement in NSD as a long-term investment, managers will fail to recognize its value.

8 Limitations and Suggestions for Future Research

In spite of the advantages associated with the current measures of customer knowledge creation and customer involvement in NSD articulated previously, they could be improved on in further research.

First, our research designs are not without methodological concerns, since we used the single-informant approach to measure customer involvement in NSD. Despite these concerns, future studies might profit from seeking multiple informants to enhance the validity of the constructs measuring customer involvement in new service development projects.

In addition, that our informants assess new service development projects after their completion raises the potential of a retrospective justification bias. This would occur if informants, knowing the outcome of the projects, tended to give responses for the independent variables consistent with their knowledge of the outcome. Even though we split the survey into three parts, making respondents focus on the particular section of the survey in lieu of the congruence of their assessments, we cannot dispel concerns of method bias. Future research should collect data from multiple respondents to minimize the risk of bias.

Second, we received respondents from nine different countries and more than seven service industries. Compared to the sample size of 131 respondents, the scope of businesses and nationalities included in survey is broad, giving rise to cross-industry bias. Future research should confine the number of sectors researched. Furthermore, we identified significant differences between types of services firms with regard to customer involvement in NSD. While prevalent studies reveal insights on the types of markets served – B2B versus B2C markets – future research should focus on providing explanations on categories of service firms.

Despite this limitation, the study can be viewed as being applicable to particular services industries.

Third, there are some limitations to the operationalization of our latent constructs. Despite the robust scale of prior tacit customer knowledge conceptualized in our first analysis, the construct of five measures did not meet the .50 threshold for AVE in the second analysis, suggesting the need for further scale development. Similar suggestions apply to the construct of customer orientation.

As outlined in chapter 5.2.3, we tested our new scales on customer involvement on the types of relationship between measurement items and construct. The analysis showed mixed results concerning the formative or reflective conceptualisation of the constructs. Although we found theoretical and empirical support of a reflective relationship, we could not apply further tests, e.g. vanishing tetrads, which would eliminate the concerns on the conceptualisation of the constructs.

Fourth, it has been argued that tacit customer knowledge is unique and helps firms to create sustainable competitive advantage. However, uniqueness has not been measured in the construct of increase in tacit customer knowledge stock to test its relationship to sustainable competitive advantage. Our exclusive focus on dimensions of tacit knowledge according to Nonaka and Takeuchi (1995) is therefore a limitation. A more explicit incorporation of the unique nature of tacit knowledge along the dimensions used in this research may provide a better understanding of its role in NSD.

Fifth, the results of our research indicate that various customer involvement approaches are beneficial for service innovation. Future empirical studies could examine the relative contribution of customer knowledge developed to new service success. In this particular context, researchers should investigate the organisational and project-related characteristics of customer-involvement management approaches. It could be argued that due to the small sample size, minor but important effect sizes have not been detected. Moreover, customer involvement seems to be incorporated in innovation orientation rather than being anchored in the concept of market orientation. Both markets and technology drive innovations. The interplay of these two drivers may relativize customer involvement in a broader learning setting. In addition, non-parametric tests on methods of customer involvement demonstrated that some modes are related to positive new service outcomes, e.g. beta testing. Prevalent literature is silent on the cause-effect relationship, which was also beyond of our scope of research.

Finally, we choose an exploratory approach to investigate customer involvement in NSD. Future research should test the models in a confirmatory setting to reassure cause and relationships of constructs.

9 Overall Conclusions

In conclusion, we have studied the influence of customer involvement in NSD on new service performance, i.e. NSD success and competitive advantage. The overall picture that emerges from our results is that customer involvement contributes to knowledge increase, which affects innovation success, but is not a success factor per se. We also shed light on several options to structure and organise customer involvement since we included the four major facets of customer involvement: methods, level, stages and objectives. This study challenges the pre-eminent notions and general recommendations in the literature. We believe that by describing the differential effects of the dimensions of customer knowledge and service concept adaptations due to new insights from customers, this study illuminates in a more systematic way how NSD performance can be achieved. In addition, by linking customer involvement to antecedent constructs, we identified important decision parameters leveraging customer involvement in distinct NSD phases.

Finally, we tap into distinct types of customer-involvement management practices related to the effective work with customers to develop successful new services. We conclude that more than one approach yields a high level of tacit customer knowledge, the key success factor in NSD. The approach of “maximizers” is viewed as less effective than the early customer-involvement management practice.

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Appendix 1: Customer Activities at Stages in New Service Development Stages

Development Stages	Activities performed by the customers									
	Describe	List	Review	Apply/ Test/ Develop/ Act	Evaluate/ Compare/ Examine	Rate	Suggest	Analyse	Synthesize	Quantified Contribution
1. Idea Generation	x	x			x		x	x	x	6
2. Idea Screening			x		x	x	x			4
3. Business Analysis			x							1
4. Formation of cross functional team							x			1
5. Service/ process/system design			x	x	x		x		x	5
6. Personnel training				x			x			2
7. Service testing + 8. pilot run				x	x					2
9. Test marketing			x	x	x					3
10. Commercialization				x						1
Quantified Contribution	1	1	4	5	5	1	5	1	1	
Level of knowledge outcome (Bloom et al.,1956)	Surface	Surface	Deep	Surface	Deep	Surface	Deep	Deep	Deep	

(Adapted from Alam, 2006b)

Appendix 2: Research on Customer Involvement in New Service Development

Authors	Research focus	Research methods	Sample	Industries	Findings	Limitations
Alam (2002)	Key elements of user involvement	Interview	12 service firms; 48 new service projects	Financial Services; Australia	Identification of six objectives of user involvement: - developing services may facilitate match of customer needs and wants - reducing overall development time - facilitating user education about use and attributes of new service - supporting rapid diffusion of innovation - strengthening of public relations - maintaining a long-term relationship with users. User involvement can take place in 10 stages of development process. Most important stages of user involvement are service design, service testing and pilot run. - Intensity of involvement varies at all stages. Idea generation and screening are stages of most intensive involvement. - Dominant methods of involvement are in-depth interviews, user visit and team meetings. - Users contribute to all stages of development process, but contribution varies across stages. Most activities are performed at the idea generation and screening stages.	- Focus on B2B financial services in Australia - Small sample size - Use of retrospective data - Managers were free to choose a project - Research did not measure success

Appendix 2: Research on Customer Involvement in New Service Development (contd.)

Authors	Research focus	Research methods	Sample	Industries	Findings	Limitations
Alam and Perry (2002)	Stages of involvement and customer input obtained	Case study base on in-depth interviews	12 firms	Financial service industry in Australia	- Customers can provide input to NSD within 10 stages of involvement - Stages of involvement have different levels of importance - Firms involve customers proactively	- Focus on B2B financial services in Australia - Small sample size
Alam (2006a)	Modes of customer interaction at early NSD stages	Interviews	52 NSD managers of 26 firms	Financial services, North East USA	- Methods of involvement: brainstorming, focus groups, experiments, interviews, events, lead user method; meetings with NSD team - Problems of interaction - Results of interaction should reveal outcomes of NSD.	- Research did not measure success - Focus on service portfolio - Small sample size
Bamforth and Brookes (2002)	Methods of involvement	Case studies	5 companies varying in size	B2C; rehabilitation industry, UK	- Recommending seven techniques: market research identifier, knowledge source matrix, theme and characteristic tool for market research, requirement clarification tool, relationship matrix, product design specification form, concept footprint	- Restricted to rehabilitation industry in UK - Small sample size
Blazevic and Lievens (2008)	Roles of customers in knowledge co-production	Interviews, Observations, documentation review	Three electronic interaction channels of one leading global computer firm	Computer industry	- Three roles of customers: passive user, active informer and bidirectional creator - Customer co-produced knowledge helps companies identify problem areas	- Restricted to computer industry

Appendix 2: Research on Customer Involvement in New Service Development (contd.)

Authors	Research focus	Research methods	Sample	Industries	Findings	Limitations
Callahan and Lasry (2004)	Degree of customer involvement in NPD related to product newness	Interview and survey	128 of 537 firms from CTI magazine directory of firms for 1998-99	Computer telephony equipment manufacturers and software developers	- Importance of customer input (involvement expressed by different market research methods) increases with product newness in the market to a certain level and then decreases for very new products. It does not decrease for technological newness. - Market research intensity relates to the importance of customer input - Market and technological newness do not relate to market research methods	- Restricted to industries
Carbonell et al. (2009)	Antecedents and outcomes of customer involvement in NSD	Survey	807 service industries in Spain ; n=102	Various sector	- Customer involvement positively affects technical quality and innovation speed - Technological uncertainty is an antecedent of customer involvement - Stages of involvement have no effect on success outcomes	- Restricted to services in Spain - Analysis based on perceptual data - Single informant research - Single Harman-test: first factor accounted for 26,5% of variance - Scale items were averaged prior to path analysis - Small sample size
Cermak and File (1994)	Customer participation, repurchase, quality and customer satisfaction	Survey	476 individuals who established charitable trusts > USD 1 million in 1989	Charities in four US cities; B2C	- Participation is positively associated with service quality and customer satisfaction - Levels of customer participation are higher in new than in established relationships	- Restricted to non-profit organisations in US

Appendix 2: Research on Customer Involvement in New Service Development (contd.)

Authors	Research focus	Research methods	Sample	Industries	Findings	Limitations
Griffin and Hauser (1993)	Efficiency of market research techniques	Interviews	25 US companies and 30 potential customers	B2C; Industry of portable food-carrying and storing devices	- One-to-one interviews are more cost-effective than focus groups - No single "best" measure to predict how customers will react to product concepts - Exciting needs lead to breakthrough products, but require other techniques e.g. lead user method.	- Focus on incremental service changes - Restricted to industry and US
Gustafsson et al. (1999)	Customer-oriented process design	Case study	1 firm	B2C; airline industry, Scandinavia	- Video observation of customers increase understanding about customer-oriented service process design	- Restricted to airline industry and Scandinavia - Focus on one involvement method
Jeppesen (2005)	Implications of shifting design activities to consumers	Case study	One firm; 30% of data from 94 out of 262 PC games	B2C; computer game industry	- Shifting design activities to users by providing toolkits increases online support activities and costs of firm - Virtual consumer communities reduce a firm's resources for online support	- Restricted to computer game industry - Focus on one customer involvement method
Jeppesen and Frederiksen (2006)	User characteristics for innovative NPD and integration of online community	Interview, log file analysis, survey	1 firm	B2C; music industry	- Innovative users are hobbyists, willing to share knowledge and responsive to firm recognition - By analysing C2C interaction customer expert knowledge can be harnessed	- Restricted to music industry - Small sample size - Focus on one customer involvement method
Jeppesen and Molin (2003)	Involvement of virtual consumer communities in NSD	Log-file analysis and interviews	N.A.	B2C, Computer Game industry	- Behavioural aspects of consumer participation - Antecedents to involvement - Consumer learning levels: low = solution orientation; high level = radical innovation	- Restricted to computer game industry - Focus on one customer involvement method

Appendix 2: Research on Customer Involvement in New Service Development (contd.)

Authors	Research focus	Research methods	Sample	Industries	Findings	Limitations
Jeppesen and Laursen (2009)	Characteristics and contribution of lead users in online communities	Survey, Web logs	705 online community members of one firm	Music software industry	- Lead users are willingness to share their knowledge and act as boundary-spanners - Peer recognition is most important for lead users as benefit - Lead users are important for innovation	- Restricted to music industry - Focus on lead users
Kristensson et al. (2004)	Identification of user characteristics leading to distinct ideas	Quasi-experiment	Three-groups of different level of users and product knowledge (12 – 19 participants)	Mobile phone industry in Sweden	- Ordinary users generate more original and valuable ideas than professional users - Professional developers and advanced users produced the most realisable ideas	- Judgement of results were subject to fast moving technology in industry - Little external validity - Little control over motivational aspects - Restricted to Swedish mobile phone industry
Kristensson et al. (2007)	Key strategies for successful customer involvement in NSD	Case study	One firm	Telecommunication industry in Sweden	- Need situation of user is crucial for creating new solutions - Changing roles of users during a day affect their perception of value of a service - Analytical tools assist in enhancing the effectiveness of user involvement - User develop ideas that promise them an apparent benefit - Limited expertise of users is not a barrier to useful creative thinking - Involvement of a heterogeneous group of users ensure a diversity of ideas	- Restricted to Swedish telecommunication industry - Focus on user as information provider

Appendix 2: Research on Customer Involvement in New Service Development (contd.)

Authors	Research focus	Research methods	Sample	Industries	Findings	Limitations
Magnusson et al. (2003)	Contribution of users to NSD	Experiment	12 professional service developers & 19 ordinary users & 20 advanced users	Telecom services in Sweden	- Involved users create more original ideas with higher perceived user value - User ideas are less producible - Results depend on methods of customer involvement	- Focus on SMS services - Restricted to Sweden - Laboratory settings
Martin and Horne (1995)	Measuring customer input within NSD stages	Interviews, group discussions and survey	Interviews: 80 executives Group discussions: 25 groups with 378 executives from 241 firms Survey: Convenience sample of 475	Different US-based companies offering services	- Overt direct participation of customer result in more successful service innovation - Most successful firms use more customer information throughout the NSD process	- Restricted to US service firms - Respondents were free to choose projects
Matthing et al. (2006)	Identification of innovative users	Telephone survey Field experiment	Survey: 1,004 users Experiment: 52 participants	N.A.; Sweden	- Technology readiness (TR) is a useful tool for identifying innovative users - Users with a high TR are highly creative	- Small sample size of experiment - Results skewed towards TR users - Restricted to Sweden

Appendix 2: Research on Customer Involvement in New Service Development (contd.)

Authors	Research focus	Research methods	Sample	Industries	Findings	Limitations
Matthing et al. (2004)	Innovativeness of customer	Experiment, and interview	1 firm, 86 participants	B2C; telecommunication service provider in Sweden	- Customer ideas are more innovative - Ideas of customers have been developed at unexpected times and in their natural environment - Staff incentives enforce collaboration	- Restricted to Swedish end-user mobile phone services - Focus on one integration method
Morrison et al. (2000)	Characteristics of innovative users	Mail survey	464 libraries selected by stratified random sampling (=56,5% of staff employed) 166 key informants identified and participated; 73% return rate (= 122)	B2B, libraries, Australia	- Barriers of user innovation are o Lack of in-house technical skills (e.g. inability to penetrate a close system) o Lack of external resources (money, etc.) o Lack of incentives (policies of user company) o Users share information of own system modifications among each other	- Restricted to one industry in Australia
Olson and Bakke (2001)	Implementation and follow-up on the lead user method	Longitudinal case study	N.A.	B2B; IT-industry, Norway	- Lead user method resulted in profitable products & services - Time pressure, personnel turnover, limited pressure to continue due to already excellent performance, and that engineers saw it as not prestigious enough to work with customers, led to implementation failure	- Restricted to IT-industry in Norway - Focus on lead user method
Sandström et al. (2009)	Increase understanding about service experience	Experiment	17 individuals	B2C, Mobile phone services; Sweden	- User-created service idea can supplement company-developed ideas - Emotional aspects are of equal importance as functional aspects	- Little external validity - Laboratory setting - User-developed service ideas were similar to-existing services on the market

Appendix 2: Research on Customer Involvement in New Service Development (contd.)

Authors	Research focus	Research methods	Sample	Industries	Findings	Limitations
Thomke (2003)	Service experiments conducted live with real customers	Case study	1 firm	B2C; financial services industry, USA	- Experiments with new services are most useful when they are conducted live with real customers engaged in real transactions	- Restricted to financial services industry in USA
Urban and v. Hippel (1988)	Characteristics of lead users and success of lead user concept	Survey	50 lead users	B2B, PC-CAD-Systems	- Lead and non-lead users preferences are similar. - Success in the wider market place of lead users' product specification can be presumed	- Restricted to CAD-industry - Small sample size - Focus on lead user method
Wikström (1996)	Customer as co-producer	Case study, interviews and survey	3 firms	B2C; B2B, multiple industries, Sweden	- Programmed procedures for interacting with customers restricts learning	- Restricted to Sweden - Small sample size
Voss (1985)	Role of user in innovation process and degree of involvement	Interviews and survey	17 personal interviews with suppliers and users 115 questionnaires to 63 suppliers (response rate = 40%)	Software industry, B2B; UK	- Extensive user involvement in the innovation process with significant participation in every stage. - Innovative users do not necessarily have technical expertise. - Suppliers with knowledge of the user's industry are more proactive in innovating than firms without knowledge.	- Restricted to software industry in UK

Appendix 3: Questionnaire Items to Measure Customer Involvement

Note: The word "customer" refers to clients, buyers, consumers, accounts, shoppers who make use of your service. Unless mentioned otherwise, questions are to be answered on a seven-point scale where 1 = "strongly disagree" and 7 = "strongly agree". Please tick the appropriate box on the scale provided against the question.

Questionnaire Items to Measure Market Orientation, Organisational Resources and Attitude towards Customer Involvement in NSD

Customer Orientation (CUO)

CUO01 and CUO02 adapted from Gray et al. (1996)

1. In our company/SBU, we have a strong commitment to our customers. (CUO01)
2. In our company/SBU, we are always looking at new ways to create customer value in our services. (CUO02)
3. In our company/SBU, we consciously seek to acquire extensive customer knowledge. (CUO03)

Organizational Slack (ORG)

All items adapted from De Luca and Atuahene-Gima (2007)

1. In our company/SBU we have uncommitted resources that can be allocated to our new services development initiatives if needed. (ORG01)
2. In our company/SBU, we have substantial resources available to fund our new services development initiatives. (ORG02)
3. In our company/SBU, we have no problems obtaining resources at short notice to support new services development initiatives. (ORG03)

Market-driven New Service Development (MAO) (1 = very poor, 7 = very good)

All items adapted from Narver et al. (2004)

1. Please rate how good your company/SBU is in anticipating changes in the market place that affect your customers' needs. (MOA01)
2. Please rate how good your company/SBU is in discovering customer needs of which they are unaware. (MOA02)
3. Please rate how good your company/SBU is in incorporating solutions to unarticulated customer needs in your services. (MOA03)
4. Please rate how good your company/SBU is in transforming customer satisfaction results into new services. (MOP01)
5. Please rate how good your company/SBU is in responding to customer requests for services improvements. (MOP02)
6. Please rate how good your company/SBU is developing new services that reflect your current customer's needs. (MOP03)

Customer Involvement Beliefs / Orientation (CUB)

All items developed from Ramani and Kumar (2008)

1. Our company/SBU believes that customers should be involved in new service development projects. (CUB01)
2. Our company/SBU believes that customer involvement in new service development projects pays off. (CUB02)
3. Our company/SBU is open to ideas from customers about new services. (CUB03)

4. Our company/SBU encourages customers to participate interactively in designing services. (CUB04)

Innovativeness (INN) (1 = strongly disagree, 5 = strongly agree)

All items adapted from McGrath (2001)

Please read the following statements about the type of your project.

1. The service developed was new to the company. (INN01)
2. The service developed was new to the industry. (INN02)
3. The customer needs served were new to the company. (INN03)
4. The target customers of this service were new to the company. (INN04)

Level of Stock of Tacit Customer Knowledge prior to Project (TKP)

All items derived from Nonaka and Takeuchi (1995) & Kyriakopoulos and De Ruyter (2004)

1. At the start of this project, we had a good understanding of our target customers. (TKP01)
2. At the start of this project, we had a deep feeling of how customers use our service. (TKP02)
3. At the start of this project, we had a strong expertise in generating customer value. (TKP03)
4. At the start of this project, we had a rich intuition of customer needs. (TKP04)
5. At the start of this project, we had a good feeling of the needs of customers of which they were unaware. (TKP05)

Level of Stock of Explicit Customer Knowledge prior to Project (EKP)

All items derived from Nonaka and Takeuchi (1995) & Kyriakopoulos and De Ruyter (2004)

1. At the start of this project, we had detailed information about our customer segments. (EKP01)
2. At the start of this project, access to extensive market research reports. (EKP02)
3. At the start of this project, formal reports on customer purchase behaviour. (EKP03)
4. At the start of this project, detailed data on our target customer preferences. (EKP04)

Level of Customer Involvement (CUI)

Derived from the results of our expert survey

Please read the following statements about how customers were involved in your new service development project.

1. There was a wide variety of customer involvement methods applied in this project. (BCI01)
2. Frequency of contact between customers and our new service development team was high. (DCI01)
3. A diverse range of customers was involved in this project. (BCI02)
4. Different customers were involved in different project stages. (BCI03)
5. Customers were involved at every stage of the project. (DCI02)
6. Customers were deeply involved in this project. (DCI03)
7. Customers were actively engaged with this project. (DCI04)

Level of Customer Involvement in NSD Stages (CIS)

Derived from the results of our expert survey

1. Customers were richly engaged in the Idea Generation and Screening Phase. (DCI05)
2. Customers were richly engaged in the Concept Development Phase. (DCI06)
3. Customers were richly engaged in the Business Analysis Phase. (DCI07)
4. Customers were richly engaged in the Development and Testing Phase. (DCI08)
5. Customers were richly engaged in the Implementation and Launch Phase. (DCI09)
6. There was a wide scope of customers involved in the Idea Generation Phase. (BCI04)
7. There was a wide scope of customers involved in the Concept Development Phase. (BCI05)
8. There was a wide scope of customers involved in the Business Analysis Phase. (BCI06)
9. There was a wide scope of customers involved in the Development and Testing Phase. (BCI07)
10. There was a wide scope of customers involved in the Implementation and Launch Phase. (BCI08)

Usefulness of Customer Involvement Methods (CIM)

Please read the following list of customer involvement and research techniques and indicate how useful they were for the overall success of your last completed new service development project. (1 = not at all useful, 5 = very useful, 6 = not used)

1. Beta testing (CIM01)
2. Conjoint analysis (CIM02)
3. Customer co-development meetings (CIM03)
4. Customer complaints and feedback reports (CIM04)
5. Customer surveys (CIM05)
6. Customer service interaction reports (CIM06)
7. Ethnographic methods (CIM07)
8. Experiments (CIM08)
9. Focus groups (CIM09)
10. Games-based learning techniques (CIM10)
11. Lead user technique (CIM11)
12. Open source invention (CIM12)
13. Prototyping (CIM13)
14. Structured or semi-structured interviews (CIM14)
15. Technological forecasting (CIM15)
16. Toolkits for users (CIM16)
17. Transactional customer data analysis (CIM17)
18. Trend Scanning (CIM18)
19. Unstructured interviews (CIM19)
20. Virtual Customer Communities (CIM20)

21. Others (please state) (CIM21)
22. Others (please state) (CIM22)

Customer Involvement Methods in NSD Phases (CIP)

For those methods you used, please tick in which stages of the development process they were employed. Multiple answers are allowed. (1 = Idea Generation and Screening, 2 = Concept Development, 3 = Business Analysis, 4 = Development and Testing, 5 = Implementation and Launch)

CIP01 – CIP22

Increase in Stock of Tacit Customer Knowledge (TKA)

All items developed from Nonaka and Takeuchi (1995) & Kyriakopoulos and De Ruyter (2004)

1. At the end of this project, we had developed a better understanding of our target customers. (TKA01)
2. At the end of this project, we had learnt more about what generates customer value. (TKA02)
3. At the end of this project, we had fine-tuned our intuition of customer needs. (TKA03)
4. At the end of this project, we had discovered additional needs of our customers of which they were unaware. (TKA04)
5. At the end of this project, we had developed a deeper feeling of how customers use our services. (TKA05)

Increase in Stock of Explicit Customer Knowledge (EKA)

All items developed from Nonaka and Takeuchi (1995) & Kyriakopoulos and De Ruyter (2004)

1. At the end of this project, we had collected more detailed information about our customer segments. (EKA01)
2. At the end of this project, we had access to the results of more comprehensive market research reports. (EKA02)
3. At the end of this project, we had learnt more about customer purchase behaviour. (EKA03)
4. At the end of this project, we had updated our information on our target customers' preferences. (EKA04)

Service Concept Adaptations (SCM)

SCM01 and SCM04 derived from Stockstrom & Herstatt (2008), SCM02 adapted from Gupta et al. (1986), SCM03 adapted from Joshi and Sharma (2004)

1. Customer knowledge collected during the project challenged our existing understanding of our customers. (SCM01)
2. Customer knowledge created during this project was fully integrated in the new service. (SCM02)
3. The final service was different to our initial expectations due to the customer knowledge developed during the project. (SCM03)
4. Ideas incorporated into the new service came directly from our customers. (SCM04)

New Service Success (SUC)

Overall Success

1. Based on the objectives for which it was developed, please assess the overall success of the new service. (1 = major failure, 10 = major success) (SUC01) (Van Riel et al., 2004)

Success in terms of Particular Performance Indicators

(1 = very unsuccessful, 4 = neither a success nor failure, 7 = very unsuccessful)

2. The degree of service success in terms of meeting its sales objectives. (SUC02) (Storey and Kelley, 2001)
3. The degree of service success in terms of meeting its financial objectives. (SUC03) (Storey and Easingwood, 1999)
4. The degree of service success in terms of increasing our market share. (SUC04) (Storey and Kelley, 2001)
5. The degree of service success in terms of being developed on budget. (SUC05) (Dvir et al., 2003)
6. The degree of service success in terms of being developed on time. (SUC06) (Dvir et al., 2003)
7. The degree of service success in terms of having a short time to market relative to comparative projects. (SUC07) (Sandén et al., 2006)
8. The degree of service success in terms of being developed without any significant problems post-launch. (SUC08) (Storey and Easingwood, 1999)
9. The degree of service success in terms of producing high levels of customer satisfaction. (SUC09) (Van Riel et al., 2004)

Sustainable Competitive Advantage (SCA)

SCA01 adapted from Van Riel et al., 2004, SCA02 adapted from Storey and Easingwood, 1999 and SC03 adapted from Lievens and Moenaert, 2000. SCA04 derived from the concept of Bharadwaj et al, 1993.

1. The development of this new service yielded knowledge that can help us add substantial value to other services of our company. (SCA01)
2. The development of this new service yielded knowledge that can open up further windows of opportunity for the company. (SCA02)
3. The development of this new service yielded knowledge that has improved our service development capabilities. (SCA03)
4. The development of this new service yielded knowledge that has increased our understanding of the market. (SCA04)

Environment Uncertainty (EUN) adapted from Jaworski and Kohli (1993)

Market Uncertainty (MUN)

1. In our industry, customer needs and service preferences change rapidly. (MUN01)
2. In our industry, it is difficult to predict changes in customer needs and preferences. (MUN02)

Technological Turbulences (TET)

1. In our industry, technology is changing rapidly. (TET01)

Industry sectors (IND)

1. Entertainment services and events
2. Financial intermediation (incl. insurance)
3. Hotels and restaurants
4. Information and Information technology services
5. Telecommunication services
6. Transport (incl. storage), travel and tourism services
7. Other: _____

Firm Size (FIS)

1. Number of employees
2. Number of sales revenue in 2007

Types of Customers Served (CUT)

1. Other Businesses (B2B-Market)
2. Consumers (B2C-Market)
3. Both (B2B and B2C Market)

Appendix 4: Pool of Items Measuring Customer Involvement in NSD

No	Item	Dimension of Measure	Literature	Valid
1.	A large number of customers were involved in the NSD project.	Size and scope of involved customer group improves accuracy of knowledge generated.	Sawhney et al. (2005), Gruner and Homburg (2000)	✓
2.	Different types of customers were involved in the NSD project.	Different types of customers enhance generation of diverse knowledge that requires intensive customer interaction to elicit.	Bonner and Walker (2004)	amended
3.	Customers were involved throughout the NSD project.	Measures level of direct participation of customers in NSD	Martin and Horne (1995)	amended
4.	Customers were deeply involved in NSD project.	Depth of involvement emphasizes on richness of customer interaction	Prandelli et al. (2008)	✓
5.	Customers were involved in the NSD project over a period of time.	Continuous flow of customer information into the project.	Dahlsten (2006)	rejected
6.	Customers were actively engaged with the NSD project.	Continuum ranging between the passive and active participation of customers in NSD	Alam (2002)	rejected
7.	It seemed like customers were highly involved in the NSD project.	Subjective evaluation of management about its work with customers.	Lynch and O'Toole (2004)	rejected
8.	Tasks customers had to perform required a deep level of thoughts	Users' tasks vary in their cognitive demand.	Alam (2002)	rejected
9.	There was a variety of customer involvement techniques applied in this NSD project.	Quantity and mix of methods of involvement enhances knowledge.	Damodaran (1996), Kaulio, 1998	✓
10.	Management's perceived intensity of customer interaction with the NSD team was high.	Subjective evaluation of management about its work with customers.	Gruner and Homburg (2000)	rejected
11.	Level of social interaction between NSD team and customers was high.	Absorbing information requires social interaction.	Sawhney et al. (2005),	rejected
12.	Frequency of customer contact between customers and the NSD team was high.	Continuous flow of customer information into the project.	Gruner and Homburg (2000)	✓
13.	Customers actively sought to be involved in the NSD project.	Continuum ranging between the passive and active participation of customers in NSD	Alam (2002)	amended
14.	Customers were willing to put a large amount of effort into the project.	Substantial contribution to new service development	Damodaran (1996)	rejected
15.	Customers seemed to enjoy being involved in the NSD project.	Nature of customer involvement is voluntary and driven by motivational factors.	Damodaran (1996)	rejected
16.	Customers seemed to be very interested in the NSD project.	Nature of customer involvement is voluntary and driven by motivational factors.	Damodaran (1996)	rejected

Appendix 5: Results of Expert Survey

Representativeness of Statements									
No.	**Statements**	**Median rank**	**Mean rank**	**Variance**	**Standard Deviation**	**Breadth**	**Depth**	**CVR**	**CVI**
1	There was a variety of customer involvement techniques applied in this NSD project.	4,0	**4,2**	0,4	0,6	44,4%	55,6%	**100,0%**	**72%**
2	Different types of customers were involved in the NSD project.	4,0	**4,0**	0,9	0,9	60,0%	40,0%	**77,8%**	
3	Frequency of customer contact between customers and the NSD team was high.	4,0	**3,9**	1,0	1,0	44,4%	55,6%	**75,0%**	
4	A large number of customers were involved in the NSD project.	4,0	**3,7**	1,2	1,1	80,0%	20,0%	**55,6%**	
5	Customers were involved throughout the NSD project.	4,0	**3,7**	1,6	1,3	70,0%	30,0%	**71,4%**	
6	Customers were deeply involved in NSD project.	4,0	**3,7**	1,8	1,3	0,0%	100,0%	**55,6%**	
7	Customers were actively engaged with the NSD project.	3,5	**3,6**	0,9	1,0	30,0%	70,0%	**66,7%**	
8	Customers were willing to put a large amount of effort into the project.	4,0	3,6	1,2	1,1	25,0%	75,0%	**-50,0%**	**56%**
9	Customers were involved in the NSD project over a period of time.	3,5	3,5	1,2	1,1	30,0%	70,0%	**42,9%**	**49%**
10	Tasks customers had to perform required a deep level of thoughts	3,0	3,2	1,5	1,2	20,0%	80,0%	**0,0%**	**40%**
11	Customers actively sought to be involved in the NSD project.	3,5	3,2	2,0	1,4	25,0%	75,0%	**11,1%**	**32%**
12	Customers seemed to enjoy to be involved in the NSD project.	3,0	3,2	1,3	1,1	25,0%	75,0%	**33,3%**	**29%**
13	Level of social interaction between NSD team and customers was high.	3,0	3,1	1,7	1,3	16,7%	83,3%	**33,3%**	**24%**
14	Customers seemed to be very interested in the NSD project.	3,5	3,1	1,7	1,3	14,3%	85,7%	**11,1%**	**19%**
15	Management's (perceived) intensity of customer interaction with the NSD team was high.	3,0	2,9	1,2	1,1	12,5%	87,5%	**-20,0%**	**8%**
16	It seemed like customers were highly involved in the NSD project.	2,4	2,7	0,9	0,9	11,1%	88,9%	**-66,7%**	**6%**

Note: The inclusion of item 8 and above shows that CVI significantly drops below the necessary cut-off point of 70% agreement

$$CVR = \frac{nr - N/2}{N/2}$$ (Lashe, 1975)

$$CVI = \frac{\Sigma\, CVR}{n}$$

Appendix 6: Definitions of Customer Involvement Methods

Beta testing	A beta version is an officially released version of a service, which includes most of the service's functionality. By being tested, problems of configurations can be identified prior to final service development. (Pitta and Franzak, 1996)
Conjoint analysis	Customers select and assess service features of services or service concepts. (Green and Srinivasan, 1978)
Customer co-development meetings	Customer is a team member in a joint development process (e.g. participate development team meetings). (Neale and Corkindale, 1998)
Customer complaints and feedback reports	Customer addresses dissatisfaction and/or feedback about received service.
Customer service interaction reports	The employee documents customer inquiries while service is delivered. (Garcia-Murillo and Annabi, 2002)
Customer surveys	By means of standardized questionnaires and a large sampling unit, representative customer data are collected. The questions may refer to customer characteristics, customer satisfaction and/or specific service features. (Swaddling and Miller, 2003)
Ethnographic methods	Observing customers with the service in a natural environment to learn about their habits, attitudes and dreams. (McFarland, 2001).
Experiment	Two groups are established. The treatment group receives the experimental treatment, whereas the control group does not receive an experimental treatment. Researchers have to control possible effects of rival explanations of a causal finding. The pre-defined dependent variable is measured before and after the experimental manipulation. (Bryman and Bell, 2007)
Focus groups	Group of target customers, which is directed by a moderator. By interacting with each other and emphasising in the questioning on a pre-defined topic, the group develop a common understanding of it. (Bryman and Bell, 2007)
Games-based learning methods	Participatory design of users in a context of a game in which each player has a specific role in creating a new service (e.g. software). Behaviour and decisions are analysed ex post for design purposes. (Connolly et al., 2007)
Interviews (semi-) structured	Way of interviewing in which all respondents are asked the same questions with the aid of a formal interview schedule. (Bryman and Bell, 2007)
Lead User technique	Method for seeking out users that face needs well in advance of the marketplace and using these users to generate ideas for new services. (Von Hippel, 1986)
Open Source Invention	It is an invention that is independent of how and by whom it has been developed. Open source inventions are freely accessible to all, e.g. Linux Server Software. (Von Hippel and Von Krogh, 2003).
Prototyping	Consumer test usability of a sample service and follow testing guidelines. Process of usage is either observed or recorded in order to obtain insights about service features and benefits. (Dolan and Dumas, 1999)
Technological forecasting	Formalized techniques for predicting new processes or services that will be discovered at a certain time. One common technique is DELPHI expert survey. (Gerstenfeld, 1971)
Toolkits for users	Equipment for innovative users provided by a manufacturer. Users are encouraged to design “their own service” and feedback their experiences. (Von Hippel, 2001)
Transactional customer data analysis	Collecting data from numerous customers’ transactions, e.g. website or phone calls, which then are captured and analysed to unveil customer preferences. (Garcia-Murillo and Annabi, 2002)
Trend Scanning	Scanning trends in demographics, values and belief systems of (potential) customers and looking for new opportunities. (Popcorn, 1991)
Unstructured interviews	Way of interviewing in which interviewer typically only has a list of topics or issues that are covered. Its style is very informal and varying phrasing and sequencing. (Bryman and Bell, 2007)
Virtual Customer Communities	Company-endorsed online aggregations of customers who collectively co-produce and consume content about commercial activity that is central to their interest by exchanging informational and social resources. (Wiertz, 2005)

Appendix 7: List of Interviews

Stefanie Arnold, Project Manager, Blumer AG, Luzern, Interview 30/04/2009

Sara Blanchard, Head of Customer Service, CSS Insurance Corp., Luzern, Interview 20/04/2009

Tobias Ebinger, Head of Market Research and Head of Project “Customer Advisory Board”, SBB, Zürich, Interview 16/11/2009

Renato Gunc, Head of Business Development, Postfinance AG, Bern, Interview 05/05/2009

Stefan Hermann, CEO Basenet IT Solutions Corp., Sursee, Interview 12/05/2009

Marcus Meyer, Market Research Manager, Mobilcom Austria Vienna, Interview 04/09/2007

Mag. Wolfgang Rüdiger, Head of Market Research, Bank Austria Creditanstalt, Vienna, Interview 04/09/2007

Appendix 8: Reliability Analysis of Latent Constructs

Construct		Items	Cronbach's alpha	Corrected item-total correlation	Cornbach's alpha if item deleted	Remarks
Customer Orientation	CUO	CUO01	0,795	0,678	0,697	
		CUO02		0,704	0,648	
		CUO03		0,559	0,820	
Organizational Slack	ORG	ORG01	0,851	0,676	0,837	
		ORG02		0,764	0,752	
		ORG03		0,726	0,787	
Market-driven NSD	MAO	MOA01	0,840	0,618	0,814	
		MOA02		0,667	0,803	
		MOA03		0,719	0,793	
		MOP01		0,479	0,842	
		MOP02		0,546	0,828	
		MOP03		0,694	0,799	
Customer Involvement Orientation	CUB	CUB01	0,848	0,751	0,779	
		CUB02		0,776	0,769	
		CUB03		0,581	0,848	
		CUB04		0,662	0,825	
Innovativeness	INN	INN01	0,542	0,416	0,394	
		INN02		0,371	0,430	
		INN03		0,448	0,374	
		INN04		0,116	0,638	
Prior Stock of Tacit Customer Knowledge	TKP	TKP01	0,821	0,643	0,778	
		TKP02		0,516	0,813	
		TKP03		0,630	0,782	
		TKP04		0,750	0,750	
		TKP05		0,553	0,806	
Prior Stock of Explicit Customer Knowledge	EKP	EKP01	0,829	0,616	0,802	
		EKP02		0,572	0,824	
		EKP03		0,689	0,769	
		EKP04		0,763	0,739	
Level of Customer Involvement	CUI	BCI01	0,933	0,810	0,920	
		DCI01		0,851	0,916	
		BCI02		0,674	0,932	
		BCI03		0,687	0,931	
		DCI02		0,761	0,924	
		DCI03		0,873	0,914	
		DCI04		0,834	0,918	
Customer Involvement in Early NSD Stages	CISE	DCI05	0,912	0,717	0,902	
		DCI06		0,757	0,895	
		DCI07		0,706	0,903	
		BCI04		0,798	0,889	
		BCI05		0,818	0,886	
		BCI06		0,736	0,898	
Customer Involvement in Late NSD Stages	CISL	DCI08	0,910	0,801	0,883	
		DCI09		0,804	0,881	
		BCI07		0,830	0,872	
		BCI08		0,757	0,899	
Increase in Stock of Tacit Customer Knowledge	TKA	TKA01	0,866	0,719	0,831	
		TKA02		0,753	0,821	
		TKA03		0,727	0,828	
		TKA04		0,606	0,859	
		TKA05		0,657	0,847	
Increase in Stock of Explicit Customer Knowledge	EKA	EKA01	0,811	0,671	0,742	
		EKA02		0,576	0,792	
		EKA03		0,625	0,765	
		EKA04		0,658	0,752	
Project Change	PROCH	PROCH01	0,711	0,610	0,573	
		PROCH02		0,235	0,783	should be deleted
		PROCH03		0,621	0,566	
		PROCH04		0,550	0,618	
Overall Success		SUC01				single-item construct
Market Success	MAS	SUC02	0,746	0,645	0,623	
		SUC03		0,536	0,689	
		SUC04		0,528	0,693	
		SUC09		0,454	0,734	
Project Success	PROS	SUC05	0,737	0,478	0,704	
		SUC06		0,689	0,573	
		SUC07		0,533	0,675	
		SUC08		0,426	0,731	
Sustainable Competitive Advantage	SCA	SCA01	0,816	0,554	0,806	
		SCA02		0,667	0,760	
		SCA03		0,618	0,779	
		SCA04		0,722	0,726	
Environment Uncentainty	EUN	MUN01	0,805	0,764	0,614	
		MUN02		0,640	0,748	
		TET01		0,565	0,827	
Innovativeness	INN	INN01	0,507	0,389	0,354	
		INN02		0,355	0,381	
		INN03		0,409	0,342	
		INN04		0,082	0,617	should be deleted

Appendix 9: Results of Principal Component Analysis

		Factors																				Remarks
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	18	19	
Constructs & Items	total variance explained	67,80%				71,16%			65,12%				73,70%			66,23%						
Customer Orientation	CUO01	.817																				
	CUO02	.811																				
	CUO03	.744																				
Organizational Slack	ORG01		.766																			
	ORG02		.873																			
	ORG03		.854																			
Market-driven NSD	MOA01			.443	.348																	
	MOA02			.663																		
	MOA03			.724																		Low factor loadings of MOA01 and MOP01
	MOP01			.446	.301																	
	MOP02			.745																		
	MOP03			.678																		
Customer Involvement Orientation	CUB01				.871																	
	CUB02				.874																	CUB03 considerably loads on two constructs
	CUB03			.549	.558																	
	CUB04				.754																	
Innovativeness	INN01					.802																Non-redundant residuals >50%; INN04 loads on separate construct
	INN02					.802																
	INN03					.763																
	INN04						.918															
Prior Stock of Tacit Customer Knowledge	TKP01									.771												
	TKP02									.584												
	TKP03									.765												
	TKP04									.838												
	TKP05									.743												
Prior Stock of Explicit Customer Knowledge	EKP01										.729											
	EKP02										.670											
	EKP03										.823											
	EKP04										.827											
Level of Customer Involvement	BCI01												.742									
	DCI01												.807									
	BCI02												.622									
	BCI03												.655									
	DCI02												.743									
	DCI03												.768									
	DCI04												.753									
Customer Involvement in Early NSD Stages	DCI05													.680								
	DCI06													.611								
	DCI07													.718								
	BCI04													.814								
	BCI05													.741								
	BCI06													.832								
Customer Involvement in Later NSD Stages	BCI07														.826							
	BCI08														.865							
	DCI08														.770							
	DCI09														.834							
Increase in Stock of Tacit Customer Knowledge	TKA01								.806													
	TKA02								.838													
	TKA03								.831													
	TKA04								.694													
	TKA05								.739													
Increase in Stock of Explicit Customer Knowledge	EKA01											.769										
	EKA02											.723										
	EKA03											.684										
	EKA04											.782										
Overall Success	SUC01	single item construct																				
Project Change	PROCH01															.874						
	PROCH02																			.636		PROCH02 considerably loads on a separate construct
	PROCH03															.857						
	PROCH04															.667						
Market Success	SUC02																.828					
	SUC03																.750					
	SUC04																.742					
	SUC09																.524					
Project Success	SUC05																	.781				
	SUC06																	.863				
	SUC07																	.638				
	SUC08																	.581				
Sustainable Competitive Advantage	SCA01																				.836	
	SCA02																				.746	
	SCA03																				.589	
	SCA04																				.705	
Environment Uncentainty	MUN01							.907														
	MUN02							.837														
	TET01							.763														

Appendix 10: Factor Loadings of Manifest Variables of Customer Knowledge Creation Model

Construct		Items	Factor Loading	t-value	sig.
Level of customer involvement	(CUI)	BCI01	.864	29.492	***
		BCI02	.758	16.233	***
		BCI03	.773	16.228	***
		DCI01	.898	41.180	***
		DCI02	.829	28.732	***
		DCI03	.909	48.175	***
		DCI04	.879	40.848	***
Increase in explicit customer knowledge stock	(EKA)	EKA01	.823	22.827	***
		EKA02	.749	14.003	***
		EKA03	.797	14.414	***
		EKA04	.836	23.709	***
Prior explicit customer knowledge stock	(EKP)	EKP01	.728	9.462	***
		EKP02	.790	14.793	***
		EKP03	.847	19.304	***
		EKP04	.842	13.575	***
Environment uncertainty	(EUN)	MUN01	.915	35.014	***
		MUN02	.851	18.492	***
		TET01	.757	10.050	***
Market success	(MAS)	SUC02	.837	14.581	***
		SUC03	.741	9.073	***
		SUC04	.696	7.763	***
		SUC09	.725	8.731	***
Project change	(PROCH)	PROCH01	.831	19.477	***
		PROCH03	.861	29.058	***
		PROCH04	.768	15.145	***
Project success	(PROS)	SUC05	.651	4.143	***
		SUC06	.823	9.613	***
		SUC07	.802	9.333	***
		SUC08	.689	6.349	***
Sustainable competitive advantage	(SCA)	SCA01	.683	9.015	***
		SCA02	.793	17.161	***
		SCA03	.815	18.119	***
		SCA04	.885	29.278	***
Increase in tacit customer knowledge stock	(TKA)	TKA01	.815	23.520	***
		TKA02	.846	25.269	***
		TKA03	.849	17.138	***
		TKA04	.756	14.178	***
		TKA05	.800	17.392	***
Prior tacit customer knowledge stock	(TKP)	TKP01	.640	3.096	***
		TKP02	.500	2.277	**
		TKP03	.705	3.529	***
		TKP04	.826	3.982	***
		TKP05	.902	4.706	***

Significance: *** $p < 0.01$; ** $p < 0.05$; * $p < .1$; (n.s.) = not significant

Appendix 11: Factor Loadings of Manifest Variables of Customer Involvement Antecedents Model

Construct		Items	Factor Loading	t-value	sig.
Customer Involvement in Early NSD Stages	(CISE)	BCI04	.852	27.536	***
		BCI05	.866	23.691	***
		BCI06	.798	19.759	***
		DCI05	.826	25.302	***
		DCI06	.853	24.747	***
		DCI07	.803	20.191	***
Customer Involvement in Late NSD Stages	(CISL)	BCI07	.901	39.063	***
		BCI08	.822	16.169	***
		DCI08	.923	52.298	***
		DCI09	.899	37.359	***
Customer Involvement Orientation	(CUB)	CUB01	.833	13.557	***
		CUB02	.856	15.636	***
		CUB04	.908	32.720	***
Customer Orientation	(CUO)	CUO01	.915	5.598	***
		CUO02	.932	7.500	***
Prior Explicit Customer Knowledge Stock	(EKP)	EKP01	.599	3.353	***
		EKP02	.886	14.197	***
		EKP03	.835	7.277	***
		EKP04	.744	4.048	***
Environment Uncertainty	(EUN)	MUN01	.937	4.739	***
		MUN02	.859	4.251	***
		TET01	.705	3.566	***
Innovativeness	(INN)	INN01	.724	3.983	***
		INN02	.848	5.751	***
		INN03	.667	3.541	***
Market-driven NSD	(MAO)	MAO03	.631	3.354	***
		MOP01	.841	5.159	***
		MOP02	.768	4.538	***
		MOP03	.709	4.228	***
Organisational Slack	(ORG)	ORG01	.857	6.466	***
		ORG02	.919	6.848	***
		ORG03	.815	5.057	***
Prior Tacit Customer Knowledge Stock	(TKP)	TKP01	.828	3.473	***
		TKP04	.902	3.826	***
		TKP05	.457	1.787	**

Significance: *** $p < 0.01$; ** $p < 0.05$; * $p < .1$; (n.s.) = not significant

Appendix 12: Correlations Matrix of Principal Component Analysis

Level of Customer Involvement in NSD (CUI)

No.	Items		BCI01	DCI01	BCI02	BCI03	DCI02	DCI03	DCI04
1	BCI01	Wide Variety of Customer Involvement Methods Applied in Project	1.000	.740	.638	.588	.611	.785	.748
2	DCI01	Frequency of Contact between Customers and NSD Team		1.000	.584	.619	.757	.813	.770
3	BCI02	Diverse Range of Customers			1.000	.687	.491	.557	.535
4	BCI03	Different Customers in Different Project Stages				1.000	.520	.559	.587
5	DCI02	Customers Involved in Every Stage of the Project					1.000	.802	.713
6	DCI03	Customers Were Deeply Involved in the Project						1.000	.858
7	DCI04	Customers Were Actively Engaged with this Project							1.000

Determinant = .002 (greater than necessary value of .00001)
Overall Measure of Sampling Adequancy: .895 (great)
Bartlett's Test of Shericity: 773.457
Significance: .000

Customer Involvement in Early NSD Stages (CISE)

No.	Items		DCI05	DCI06	DCI07	BCI04	BCI05	BCI06
1	DCI05	Richly Engaged in Idea Generation and Screening Phase	1.000	.674	.596	.743	.562	.449
2	DCI06	Richly Engaged in Concept Development Phase		1.000	.641	.579	.753	.533
3	DCI07	Richly Engaged in Business Analysis Phase			1.000	.513	.547	.718
4	BCI04	Wide Scope of Customers in Idea Generation Phase				1.000	.782	.685
5	BCI05	Wide Scope of Customers in Concept Development Phase					1.000	.750
6	BCI06	Wide Scope of Customers in Business Analysis Phase						1.000

Determinant = .006 (greater than necessary value of .00001)
Overall Measure of Sampling Adequacy: .699 (mediocre)
Bartlett's Test of Sphericity: 652.981
Significance: .000

Customer Involvement in Late NSD Stages (CISL)

No	Items		DCI08	DCI09	BCI07	BCI08
1	DCI08	Richly Engaged in Development and Testing Phase	1.000	.840	.756	.580
2	DCI09	Richly Engaged in Implementation and Launch Phase		1.000	.657	.682
3	BCI07	Wide Scope of Customers in Development and Testing Phase			1.000	.807
4	BCI08	Wide Scope of Customers in Implementation and Launch Phase				1.000

Determinant = 0.030 (greater than necessary value of 0.00001)
Overall Measure of Sampling Adequacy: .587 (mediocre)
Bartlett's Test of Sphericity: 447.418
Significance: 0.000

Appendix 13: Results of Harman's One Factor Test

Total Variance Explained

Component		Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	1	14,804	19,739	19,739	14,804	19,739	19,739	9,833	13,110	13,110
	2	7,659	10,212	29,951	7,659	10,212	29,951	4,096	5,461	18,572
	3	4,881	6,509	36,460	4,881	6,509	36,460	3,474	4,632	23,204
	4	3,235	4,313	40,773	3,235	4,313	40,773	3,267	4,355	27,559
	5	3,105	4,140	44,913	3,105	4,140	44,913	3,130	4,173	31,732
	6	2,445	3,260	48,173	2,445	3,260	48,173	3,068	4,090	35,822
	7	2,396	3,195	51,368	2,396	3,195	51,368	3,003	4,004	39,826
	8	2,158	2,878	54,245	2,158	2,878	54,245	2,980	3,973	43,799
	9	1,980	2,640	56,886	1,980	2,640	56,886	2,877	3,836	47,636
	10	1,909	2,545	59,430	1,909	2,545	59,430	2,661	3,549	51,184
	11	1,692	2,255	61,686	1,692	2,255	61,686	2,587	3,449	54,633
	12	1,607	2,143	63,828	1,607	2,143	63,828	2,559	3,412	58,046
	13	1,493	1,990	65,819	1,493	1,990	65,819	2,495	3,326	61,372
	14	1,414	1,885	67,704	1,414	1,885	67,704	2,098	2,797	64,169
	15	1,367	1,823	69,527	1,367	1,823	69,527	2,053	2,737	66,906
	16	1,234	1,645	71,172	1,234	1,645	71,172	2,034	2,712	69,618
	17	1,191	1,588	72,761	1,191	1,588	72,761	1,627	2,169	71,787
	18	1,111	1,482	74,243	1,111	1,482	74,243	1,422	1,895	73,683
	19	1,063	1,417	75,659	1,063	1,417	75,659	1,305	1,740	75,423
	20	1,054	1,405	77,065	1,054	1,405	77,065	1,232	1,642	77,065
	21	,923	1,231	78,296						
	22	,884	1,178	79,474						
	23	,818	1,090	80,564						
	24	,791	1,054	81,619						
	25	,732	,975	82,594						
	26	,716	,954	83,548						
	27	,672	,896	84,444						
	28	,650	,866	85,311						
	29	,627	,836	86,146						
	30	,606	,809	86,955						
	31	,557	,743	87,698						
	32	,522	,695	88,393						
	33	,499	,665	89,058						
	34	,481	,641	89,700						
	35	,440	,587	90,287						
	36	,426	,568	90,855						
	37	,415	,553	91,409						
dimensions	38	,410	,547	91,955						
	39	,384	,512	92,468						
	40	,334	,445	92,913						
	41	,329	,439	93,352						
	42	,319	,426	93,778						
	43	,308	,411	94,188						
	44	,303	,404	94,593						
	45	,285	,380	94,972						
	46	,262	,349	95,321						
	47	,251	,335	95,657						
	48	,240	,319	95,976						
	49	,232	,309	96,285						
	50	,220	,293	96,579						
	51	,208	,278	96,856						
	52	,205	,273	97,129						
	53	,196	,261	97,390						
	54	,166	,221	97,611						
	55	,156	,208	97,819						
	56	,148	,198	98,017						
	57	,143	,190	98,207						
	58	,133	,178	98,385						
	59	,128	,170	98,555						
	60	,121	,161	98,716						
	61	,109	,146	98,861						
	62	,102	,136	98,998						
	63	,098	,131	99,128						
	64	,096	,128	99,256						
	65	,085	,114	99,370						
	66	,077	,103	99,473						
	67	,068	,090	99,563						
	68	,061	,081	99,645						
	69	,052	,069	99,713						
	70	,050	,066	99,780						
	71	,043	,057	99,836						
	72	,042	,056	99,892						
	73	,036	,048	99,940						
	74	,026	,035	99,976						
	75	,018	,024	100,000						

Appendix 14: Common Method Bias Test of Customer Knowledge Creation Model

Latent Method Test of Customer Knowledge Creation Model

Construct	Indicator	Substantive Factor Loading	(t-value)	sig.	R1²	Method Factor Loading	(t-value)	sig.	R2²
CUI	DCI01	0.899	42.681	***	0.81	0.053	0.951	(n.s.)	0.00
	DCI02	0.832	29.170	***	0.69	-0.066	0.916	(n.s.)	0.00
	DCI03	0.916	59.155	***	0.84	-0.145	1.847	**	0.02
	DCI04	0.887	47.778	***	0.79	-0.127	1.679	**	0.02
	BCI01	0.867	35.068	***	0.75	-0.045	0.497	(n.s.)	0.00
	BCI02	0.748	13.856	***	0.56	0.174	1.442	*	0.03
	BCI03	0.761	15.285	***	0.58	0.157	1.478	*	0.02
EKA	EKA01	0.833	29.500	***	0.69	-0.055	0.843	(n.s.)	0.00
	EKA02	0.743	15.667	***	0.55	-0.066	1.012	(n.s.)	0.00
	EKA03	0.799	16.693	***	0.64	-0.065	1.107	(n.s.)	0.00
	EKA04	0.830	22.871	***	0.69	0.173	2.888	***	0.03
EKP	EKP01	0.787	21.095	***	0.62	-0.062	1.152	(n.s.)	0.00
	EKP02	0.727	13.662	***	0.53	-0.002	1.264	(n.s.)	0.00
	EKP03	0.825	22.542	***	0.68	0.097	0.063	(n.s.)	0.01
	EKP04	0.884	41.815	***	0.78	-0.023	0.589	(n.s.)	0.00
TKA	TKA01	0.832	31.076	***	0.69	-0.067	1.039	(n.s.)	0.00
	TKA02	0.855	29.481	***	0.73	-0.049	0.807	(n.s.)	0.00
	TKA03	0.837	17.289	***	0.70	0.061	1.041	(n.s.)	0.00
	TKA04	0.750	15.450	***	0.56	-0.021	0.290	(n.s.)	0.00
	TKA05	0.793	16.303	***	0.63	0.076	1.024	(n.s.)	0.01
TKP	TKP01	0.785	21.253	***	0.62	-0.118	1.767	**	0.01
	TKP02	0.678	10.834	***	0.46	0.016	0.287	(n.s.)	0.00
	TKP03	0.772	15.204	***	0.60	0.038	0.831	(n.s.)	0.00
	TKP04	0.862	42.306	***	0.74	-0.032	0.950	(n.s.)	0.00
	TKP05	0.710	15.089	***	0.50	0.112	1.644	**	0.01
SCM	SCM01	0.860	34.410	***	0.74	-0.128	1.879	***	0.02
	SCM03	0.874	41.924	***	0.76	0.009	0.240	(n.s.)	0.00
	SCM04	0.725	12.659	***	0.53	0.134	1.755	***	0.02
MAS	SUC02	0.838	21.311	***	0.70	0.080	1.467	*	0.01
	SUC03	0.754	12.577	***	0.57	0.026	0.482	(n.s.)	0.00
	SUC04	0.740	13.799	***	0.55	-0.130	1.748	**	0.02
	SUC09	0.675	10.762	***	0.46	0.008	0.364	(n.s.)	0.00
PROS	SUC05	0.708	8.520	***	0.50	0.064	1.239	(n.s.)	0.00
	SUC06	0.865	38.736	***	0.75	-0.079	1.730	**	0.01
	SUC07	0.754	14.002	***	0.57	0.078	1.362	*	0.01
	SUC08	0.648	8.518	***	0.42	0.080	1.223	(n.s.)	0.01
SCA	SCA01	0.725	12.227	***	0.53	-0.157	1.674	*	0.02
	SCA02	0.813	22.848	***	0.66	-0.068	1.262	(n.s.)	0.00
	SCA03	0.793	14.541	***	0.63	-0.002	0.033	(n.s.)	0.00
	SCA04	0.861	25.689	***	0.74	0.189	2.405	***	0.04
EUN	MUN01	0.911	58.406	***	0.83	0.047	1.337	*	0.00
	MUN02	0.780	18.520	***	0.61	0.049	1.310	(n.s.)	0.00
	TET01	0.835	27.321	***	0.70	-0.109	1.637	**	0.01
Average R²					**0.64**				**0.01**

sig. = Significance: * sig at $p<0.1$, ** sig. at $p<0.05$, *** sig. at $p<0.01$; one-tailed t-test

R1 = R^2 of model without latent method factor

R2 = R^2 of model with latent method factor

Appendix 15: Common Method Bias Test of Model of Antecedents of Customer Involvement Stages

Latent Method Test of Antecedents of Customer Involvement

Construct	Indicator	Substantive Factor Loading	(t-value)	sig.	R1²	Method Factor Loading	(t-value)	sig.	R2²
CISE	BCI04	0.893	39.525	***	0.80	-0.039	0.740	(n.s.)	0.00
	BCI05	0.883	31.149	***	0.78	0.098	1.306	*	0.01
	BCI06	0.826	28.814	***	0.68	-0.023	0.429	(n.s.)	0.00
	DCI05	0.802	24.281	***	0.64	-0.076	1.052	(n.s.)	0.01
	DCI06	0.836	25.639	***	0.70	0.131	1.583	*	0.02
	DCI07	0.797	22.159	***	0.64	-0.130	1.366	*	0.02
CISL	BCI07	0.906	63.438	***	0.82	0.079	1.448	*	0.01
	BCI08	0.859	26.064	***	0.74	-0.025	0.481	(n.s.)	0.00
	DCI08	0.896	52.167	***	0.80	0.009	0.218	(n.s.)	0.00
	DCI09	0.895	45.356	***	0.80	-0.066	1.251	(n.s.)	0.00
CUO	CUO01	0.924	58.538	***	0.85	0.002	0.109	(n.s.)	0.00
	CUO02	0.924	58.340	***	0.85	-0.002	0.110	(n.s.)	0.00
CUB	CUB01	0.911	59.334	***	0.83	-0.165	3.355	***	0.03
	CUB03	0.920	76.884	***	0.85	-0.092	1.884	***	0.01
	CUB04	0.809	23.364	***	0.65	0.272	3.431	***	0.07
MAO	MOP01	0.669	6.724	***	0.45	0.184	1.878	***	0.03
	MOP02	0.787	18.700	***	0.62	-0.078	1.179	(n.s.)	0.01
	MOP03	0.809	25.557	***	0.65	-0.035	0.666	(n.s.)	0.00
	MOA03	0.788	15.030	***	0.62	-0.044	0.882	(n.s.)	0.00
INN	INN01	0.772	16.970	***	0.60	-0.029	0.765	(n.s.)	0.00
	INN02	0.789	21.176	***	0.62	0.109	1.829	***	0.01
	INN03	0.694	9.993	***	0.48	-0.092	1.337	*	0.01
EKP	EKP01	0.786	20.149	***	0.62	-0.072	1.143	(n.s.)	0.01
	EKP02	0.728	12.063	***	0.53	0.126	1.726	**	0.02
	EKP03	0.825	23.872	***	0.68	0.005	0.143	(n.s.)	0.00
	EKP04	0.883	40.179	***	0.78	-0.048	1.067	(n.s.)	0.00
TKP	TKP01	0.800	21.078	***	0.64	0.014	0.321	(n.s.)	0.00
	TKP04	0.867	32.205	***	0.75	-0.068	1.765	**	0.00
	TKP05	0.820	27.789	***	0.67	0.058	1.259	(n.s.)	0.00
EUN	MUN01	0.911	55.758	***	0.83	0.053	1.659	**	0.00
	MUN02	0.833	28.356	***	0.69	0.026	0.720	(n.s.)	0.00
	TET01	0.783	18.256	***	0.61	-0.090	1.536	*	0.01
ORG	ORG01	0.837	40.135	***	0.70	0.030	0.749	(n.s.)	0.00
	ORG02	0.896	42.944	***	0.80	0.017	0.493	(n.s.)	0.00
	ORG03	0.879	29.713	***	0.77	-0.049	1.237	(n.s.)	0.00
Average R²					**0.70**				**0.01**

sig. = Significance: * sig at $p<0.1$, ** sig. at $p<0.05$, *** sig. at $p<0.01$; one-tailed t-test
R1 = R^2 of model without latent method factor
R2 = R^2 of model with latent method factor

Appendix 16: Measures of Sampling Adequacy and Partial Correlations

Measures of Sampling Adequacy and Partial Correlations

Level of Customer Involvement in NSD (CUI)

No.	Items		BCI01	DCI01	BCI02	BCI03	DCI02	DCI03	DCI04
1	BCI01	Wide Variety of Customer Involvement Methods Applied in Project	.912						
2	DCI01	Frequency of Contact between Customers and NSD Team	-.193	.937					
3	BCI02	Diverse Range of Customers	-.281	-.051	.871				
4	BCI03	Different Customers in Different Project Stages	-.037	-.170	-.467	.881			
5	DCI02	Customers Involved in Every Stage of the Project	.166	-.292	-.028	-.055	.897		
6	DCI03	Customers Were Deeply Involved in the Project	-.323	-.191	-.016	.098	-.457	.854	
7	DCI04	Customers Were Actively Engaged with this Project	-.157	-.132	.069	-.166	-.024	-.478	.909

Note: Measures of sampling adequacy (MSA) are on the diagonal, partial correlations in the off-diagonal

Customer Involvement in Early NSD Stages (CISE)

No.	Items		DCI05	DCI06	DCI07	BCI04	BCI05	BCI06
1	DCI05	Richly Engaged in Idea Generation and Screening Phase	.673					
2	DCI06	Richly Engaged in Concept Development Phase	-.404	.705				
3	DCI07	Richly Engaged in Business Analysis Phase	-.345	-.334	.705			
4	BCI04	Wide Scope of Customers in Idea Generation Phase	-.693	.302	.205	.701		
5	BCI05	Wide Scope of Customers in Concept Development Phase	.254	-.664	.233	-.491	.707	
6	BCI06	Wide Scope of Customers in Business Analysis Phase	.296	.224	-.668	-.311	-.418	.704

Note: Measures of sampling adequacy (MSA) are on the diagonal, partial correlations in the off-diagonal

Customer Involvement in Late NSD Stages (CISL)

No.	Items		DCI08	DCI09	BCI07	BCI08
1	DCI08	Richly Engaged in Development and Testing Phase	.568			
2	DCI09	Richly Engaged in Implementation and Launch Phase	-.772	.606		
3	BCI07	Wide Scope of Customers in Development and Testing Phase	-.642	.375	.600	
4	BCI08	Wide Scope of Customers in Implementation and Launch Phase	.467	-.552	-.742	.575

Note: Measures of sampling adequacy (MSA) are on the diagonal, partial correlations in the off-diagonal

Appendix 17: Comparison of the Formative and Reflective Model of Level of Customer Involvement in NSD

Formative CUI Model

	Items	loadings / weights	t-values	sig.	CUI β	CUI t-value, sig	TKA β	TKA t-value, sig	EKA β	EKA t-value, sig	SCM β	SCM t-value, sig	SCA β	SCA t-value, sig	MAS β	MAS t-value, sig	PROS β	PROS t-value, sig	Q²	GOF
	DCI01	.435	2.698	***																
CUI	BCI03	.458	2.949	***			.439	5.064***	.360	5.364***	.373	4.358***							n.a.	
	DCI02	.263	1.534	*																
TKP							.178	2.567***											0,526	
CUI*TKP							-.166	2.229***											n.a.	
EKP									.283	3.808***									0,645	
CUI*EKP									-.141	2.012***									n.a.	
SCM													.183	2.337**	-.085	319 (n.s.)	-.118	466 (n.s.)	0,206	
TKA											-.033	616 (n.s.)	.332	3.754***	.366	3.740***	.265	2.932***	0,156	
TKA*SCM													.205	2.258**					n.a.	
TKA*SCM															.247	2.684***			n.a.	
TKA*SCM																	-.059	702 (n.s.)	n.a.	
EKA											.282	3.808***							0,199	
EUN					.187	2.034**							.171	2.132**	.175	2.487***	.207	2.592**	0,711	
R²					**.04**		**.25**		**.28**		**.32**		**.29**		**.22**		**.13**		**GOF**	**n.a.**

Significance: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$; (n.s.) = not significant; one-tailed t-test

Q² = measures quality of each structural equation by the cross-validated redundancy index (i.e. Stone-Geisser's Q²)

GOF = SQ root (average communality x average R²). Average communality is computed as a weighted average of all communalities with the weights being the number od indicators per latent variable (Tenenhaus et al., 2003).

Appendix 17: Comparison of the Formative and Reflective Model of Level of Customer Involvement in NSD (contd.)

Reflective CUI Model

	Items	loadings / weights	t-values	sig.	CUI β	CUI t-value, sig.	TKA β	TKA t-value, sig.	EKA β	EKA t-value, sig.	SCM β	SCM t-value, sig.	SCA β	SCA t-value, sig.	MAS β	MAS t-value, sig.	PROS β	PROS t-value, sig.	Q²	GOF
	BCI01	.864	29.492	***																
	BCI02	.758	16.233	***																
	BCI03	.773	16.228	***																
CUI	DCI01	.898	41.180	***			.405	5.602****	.384	5.656***	.376	4.367***							0,027	
	DCI02	.829	28.732	***																
	DCI03	.909	48.175	***																
	DCI04	.879	40.848	***																
TKP							.179	2.508**											0,526	
CUI*TKP							-.210	2.674**											0,324	
EKP									.301	3.880***									0,645	
CUI*EKP									-.231	2.804***									0,158	
SCM													.184	2.406**	-.082	180 (n.s.)	-.117	1.441*	0,206	
TKA											-.021	180 (n.s.)	.332	3.885***	.363	3.880***	.253	2.835**	0,156	
TKA*SCM													.206	2.192**					0,371	
TKA*SCM															.245	2.586**			0,203	
TKA*SCM																	-.057	(.706)	0,412	
EKA											.310	3.200***							0,199	
EUN					.197	2.063**							.216	2.815**	.171	2.231**	.177**	(2.432)**	0,711	
R²					**.04**		**.24**		**.31**		**.33**		**.29**		**.22**		**.13**		**GOF**	**0,38**

Significance: *** p < 0.01Significance: *** p < 0.01; ** p < 0.05; * p < 0.1; (n.s.) = not significant; one-tailed t-test

Q² = measures quality of each structural equation by the cross-validated redundancy index (i.e. Stone-Geisser's Q²)

GOF = SQ root (average communality x average R²). Average communality is computed as a weighted average of all communalities with the weights being the number od indicators per latent variable (Tenenhaus et al., 2003).

Appendix 18: Comparison of the Formative and Reflective Model of Customer Involvement in NSD Phases

Formative CISE and CISL Model

	Items	loadings / weights	sig.	CISE β	CISE t-value, sig	CISL β	CISL t-value, sig	Q^2	GOF
CISE	DCI06	1.00						n.a.	
CISL	DCI09	.304	(n.s.)					n.a.	
	BCI07	.774	**						
CUB				.395	4.676***	.335	2.868***	0,754	
CUO				-.158	2.012**	.006	.065 (n.s.)	0,787	
EKP				.209	2.322**	.170	1.712**	0,614	
EUN				.052	.416 (n.s.)	.063	.745 (n.s.)	0,674	
INN				-.022	.363 (n.s.)	.090	1.272 (n.s.)	0,557	
MAO				-.020	.184 (n.s.)	-.006	.578 (n.s.)	0,536	
ORG				.001	.027 (n.s.)	.053	.837 (n.s.)	0,752	
R^2				**.22**		**.21**		**GOF**	**n.a.**

Reflective CISE and CISL Model

	Items	loadings / weights	sig.	CISE β	CISE t-value, sig.	CISL β	CISL t-value, sig.	Q^2	GOF
CISE	BCI04	.852	***					0,1234	
	BCI05	.866	***						
	BCI06	.798	***						
	DCI05	.826	***						
	DCI06	.853	***						
	DCI07	.803	***						
CISL	BCI07	.901	***					0,1429	
	BCI08	.822	***						
	DCI08	.923	***						
	DCI09	.899	***						
CUB				.344	4.360***	.365	4.114***	0,4751	
CUO				-.229	2.508***	-.078	.993 (n.s.)	0,4501	
EKP				.166	1.664**	.150	2.090**	0,3590	
EUN				.042	.708 (n.s.)	.013	.214 (n.s.)	0,2751	
INN				.001	.028 (n.s.)	.136	1.858**	0,1344	
MAO				.1.03	1.273*	-.049	.649 (n.s.)	0,2501	
ORG				.012	.174 (n.s.)	.049	.711 (n.s.)	0,4662	
TKP				-.164	1.906**	-.206	2.202**	0,1250	
R^2				**.23**		**.22**		**GOF**	**0,389**

Significance: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$; (n.s.) = not significant; one-tailed t-test

Q^2 = measures quality of each structural equation by the cross-validated redundancy index (i.e. Stone-Geisser's Q^2)

GOF = SQ root (average communality x average R^2). Average communality is computed as a weighted average of all communalities with the weights being the number od indicators per latent variable (Tenenhaus et al., 2003).

Appendix 19: Collinearity Diagnostics of Formative Indicators of Level of Customer Involvement in NSD (CUI)

Collinearity Diagnostics of Manifest Items of Level of Customer Involvement

Dependent Variable	Independent Variables	Tolerance (a)	VIF (b)	Average VIF (b)
Frequency of Contact (DCI01)	Different Customers in different Stages (BCI03)	0.739	1.371	1.371
	Customer Involvement in every Stage (DCI02)	0.739	1.371	
Different Customers in different Stages (BCI03)	Customer Involvement in every Stage (DCI02)	0.427	2.344	2.344
	Frequency of Contact (DCI01)	0.427	2.344	
Customer Involvement in every Stage (DCI02)	Frequency of Contact (DCI01)	0.616	1.622	1.622
	Different Customers in different Stages (BCI03)	0.616	1.622	

(a) Tolerance = amount of variability of the selected independent variable not explained by the other independent variables (Hair et al., 2006, 227). Any variables with tolerance values below .19 are critical.

(b) VIF = Variance Inflation Factor. Cut-off values > 5.0 (Hair et al., 2006, 230). The average VIF is the sum of VIF values for each predictor divided by the number of predictors.

(c) Condition index = is the square root of the ratio of the maximum eigenvalue in the model and the eigenvalue of each variable (k) (Schloderer et al., 2005, 584)

Condition Index		
Model 1	Model 2	Model 3
3,737	3,728	4,025
4,204	6,442	5,258

Appendix 20: Correlation Matrix and Descriptive Statistics of Measures

Correlation Matrix of Measures

		(CUI)	(TKP)	(EKP)	(TKA)	(EKA)	(SCM)	(MAS)	(PROS)	(SCA)	(EUN)
1. Level of Customer Involvement	(CUI)	**.84**	.07	.20	.41	.42	.50	.11	.18	.29	.19
2. Prior Tacit Customer Knowledge Stock	(TKP)	n.s.	**.73**	.29	.19	.06	-.09	.33	.09	.22	.21
3. Prior Explicit Customer Knowledge Stock	(EKP)	.19*	.35**	**.80**	.17	.35	.08	.10	.11	.03	.08
4. Increase in Tacit Customer Knowledge Stock	(TKA)	.41**	n.s.	.15*	**.81**	.53	.30	.33	.28	.41	.19
5. Increase in Explicit Customer Knowledge Stock	(EKA)	.41**	n.s.	.34*	.50**	**.80**	.45	.23	.08	.33	.15
6. Service Concept Adaptations	(SCM)	.49**	n.s.	n.s.	.30**	.47*	**.82**	.07	-.01	.35	.12
7. Market Success	(MAS)	n.s.	.29**	n.s.	.32**	.20*	n.s.	**.75**	.36	.41	.25
8. Project Success	(PROS)	.17*	n.s.	n.s.	.29*	n.s.	n.s.	.35**	**.74**	.30	.24
9. Sustainable Competitive Advantage	(SCA)	.28**	.23*	n.s.	.38**	.29**	.32**	.30**	.40**	**.79**	.27
10. Environment Uncertainty	(EUN)	.18**	.19*	n.s.	.22**	.17*	.22**	.26**	.20*	.27**	**.84**
Number of items		7	5	4	5	4	3	3	3	4	3
Mean		3,21	5,03	4,026	5,16	4,13	3,25	4,87	4,93	5,26	4,28
SD		1,69	1,04	1,45	1,18	1,51	1,51	0,97	1,27	1,11	1,37
Skewness		.22	-.51	-.78	-.3	-.03	.36	-.213	-.58	-.45	.20
Kurtosis		-.99	.15	-.68	-.43	-.67	-.79	-.1	-.07	.47	-.69

Notes: The diagonal elements are square roots of the AVE. The upper-right triangle elements are the correlations among the latent variables (φ). The lower-left traingle elements are correlations among the composite measures (unweighted mean of items for each construct). N = 131.

N.A. =not applicable; n.s. = not significant

* signficant at $p < 0.05$ Correlation coefficients: ± .1 represent a small effect; ± .3 is a medium effect and ± .5 is a large effect (Field, 2006).

** significant at $p < 0.01$ Correlation analysis of composite measures does not distinguish between reflective and formative scales (Hair et al., 2006, 788)

Appendix 20: Correlation Matrix and Descriptive Statistics of Measures (contd.)

Correlation Matrix of Measures

		(MAO)	**(CUO)**	**(CUB)**	**(TKP)**	**(EKP)**	**(INN)**	**(CISE)**	**(CISL)**	**(ORG)**	**(EUN)**
1. Market-driven NSD	(MAO)	**.74**	.43	.46	.25	.36	.14	.19	.13	.42	.14
2. Customer Orientation	(CUO)	.49**	**.92**	.24	.12	.09	.15	-.10	-.08	.20	.15
3. Customer Involvement Orientation/Beliefs	(CUB)	.53**	.31**	**.87**	.13	.28	.15	.37	.38	.30	.10
4. Prior Tacit Customer Knowledge Stock	(TKP)	.37**	.18*	.19*	**.75**	.22	.01	-.07	-.13	.24	.15
5. Prior Explicit Customer Knowledge Stock	(EKP)	.33**	.11	.30**	.33**	**.77**	.05	.25	.22	.24	.12
6. Innovativeness	(INN)	.15*	.14	.13	.08	.07	**.75**	.05	.19	.17	.13
7. Customer Involvement in Early NSD Stages	(CISE)	.15*	-.09	.30**	-.04	.19*	.05	**.83**	.54	.12	.09
8. Customer Involvement in Late NSD Stages	(CISL)	.14	.03	.30**	-.03	.15*	.19*	.52**	**.89**	.13	.06
9. Organisational Slack	(ORG)	.48*	.20*	.30**	.33**	.30**	.17*	.11	.14	**.86**	.17
10. Environment Uncertainty	(EUN)	.15*	-.10	.07	.19*	.05	.12	.09	.05	.19*	**.84**
Number of items		4	2	3	3	4	3	6	4	3	3
Mean		4,83	6,08	5,04	4,99	4,02	3,31	2,54	3,41	3,82	4,30
SD		1,05	1,02	1,20	1,15	1,45	1,00	1,42	1,83	1,43	1,38
Skewness		-.51	-1.69	-.349	-.564	-.064	-.222	.49	.14	.02	.20
Kurtosis		.05	3.57	-.368	.102	-.680	-.532	-.90	-1.12	-.81	-.73

Notes: The diagonal elements are square roots of the AVE. The upper-right triangle elements are the correlations among the latent variables (φ). The lower-left traingle elements are correlations among the composite measures (unweighted mean of items for each construct). N = 131.
N.A. =not applicable; n.s. = not significant
* signficant at $p < 0.05$ Correlation coefficients: ± .1 represent a small effect; ± .3 is a medium effect and ± .5 is a large effect (Field, 2006).
** significant at $p < 0.01$ Correlation analysis of composite measures does not distinguish between reflective and formative scales (Hair et al., 2006, 788)

Appendix 21: Summary of Effects of the Hypothesized Model

Model 3 (Hypothesized Model)

Effect of	**R²**	**On**	**R²**	**Direct Effect**		**Total Effect**	
				β	**(t-values) sig.**	**β**	**(t-values) sig.**
Environment Uncertainty (EUN)		Level of Customer Involvement (CUI)	(0.04)	.197	(2.172)**	.200	(2.001)**
Level of Customer Involvement (CUI)	(0.04)	Increase in Explicit Customer Knowledge Stock (EKA)	(0.31)	.384	(5.656)***	.372	(5.460)***
Prior Explicit Customer Knowledge Stock (EKP)				.258	(3.790)***	.385	(3.790)***
CUI x EKP				-.231	(2.804)***	-.229	(1.027) (n.s.)
Level of Customer Involvement (CUI)	(0.04)	Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)	.405	(5.620)***	.405	(5.620)***
Prior Tacit Customer Knowledge Stock (TKP)				.178	(2.573)***	.178	(1.250) (n.s.)
CUI x TKP				-.210	(2.674)***	-.210	(1.020) (n.s.)
Level of Customer Involvement (CUI)	(0.04)	Service Concept Adaptations (SCM)	(0.33)	.385	(4.510)***	.489	(6.333)***
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)			-.021	(.301) (n.s.)	-.015	(.172) (n.s.)
Increase in Explicit Customer Knowledge Stock (EKA)	(0.31)			.310	(3.200)***	.385	(3.404)***
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)	Market Success (MAS)	(0.22)	.363	(3.880)***	.326	(3.946)***
Service Concept Adaptations (SCM)	(0.31)			-.082	(1.180) (n.s.)	-.055	(1.216) (n.s.)
SCM x TKA				.245	(2.596)***	.029	(2.606)***
Environment Uncertainty (EUN)				.171	(2.231)**	.208	(2.691)***
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)	Project Success (PROS)	(0.14)	.263	(2.835)**	.263	(3.009)***
Service Concept Adaptations (SCM)	(0.31)			-.117	(1.441)*	-.123	(1.255) (n.s.)
SCM x TKA				-.057	(.706) (n.s.)	-.057	(.744) (n.s.)
Environment Uncertainty (EUN)				.216	(2.815)***	.211	(2.786)***
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)	Sustainable Competitive Advantage (SCA)	(0.29)	.332	(3.885)***	.328	(4.069)***
Service Concept Adaptations (SCM)	(0.31)			.184	(2.406)**	.171	(2.256)**
SCM x TKA				.206	(2.192)**	.201	(2.438)***
Environment Uncertainty (EUN)				.177	(2.432)***	.213	(2.674)***

sig. = Significance: * sig at p<0.1, ** sig. at p<0.05, *** sig. at p<0.01; one-tailed t-test

Appendix 22: Summary of Effects of the Hypothesized Model Including Relationships between Level of Customer Involvement and Outcome Variables

Hypothesized Model including Direct Effect of CUI on Outcome Variables

Effect of	R^2	On	R^2	Direct Effect β	Direct Effect (t-values) sig.	Total Effect β	Total Effect (t-values) sig.
Environment Uncertainty (EUN)		Level of Customer Involvement (CUI)	(0.04)	.198	(2.153)**	.191	(2.040)**
Level of Customer Involvement (CUI)	(0.04)	Increase in Explicit Customer Knowledge Stock (EKA)	(.31)	.386	(5.596)***	.386	(5.596)***
Prior Explicit Customer Knowledge Stock (EKP)				.258	(3.601)***	.258	(3.601)***
CUI x EKP				-.229	(2.958)**	-.229	(1.033) (n.s.)
Level of Customer Involvement (CUI)	(0.04)	Increase in Tacit Customer Knowledge Stock (TKA)	(.24)	.406	(6.851)***	.406	(6.157)***
Prior Tacit Customer Knowledge Stock (TKP)				.179	(5.748)***	.179	(1.337)*
CUI x TKP				-.210	(2.637)***	-.210	(.993) (n.s.)
Level of Customer Involvement (CUI)	(0.04)	Service Concept Adaptations (SCM)	(0.33)	.376	(4.462)***	.489	(6.691)***
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)			-.016	(.305) (n.s.)	-.015	(.179) (n.s.)
Increase in Explicit Customer Knowledge Stock (EKA)	(0.31)			.310	(3.255)***	.310	(3.255)***
Level of Customer Involvement (CUI)	(0.04)	Market Success (MAS)	(0.22)	-.059	(.905) (n.s.)	.067	(.826) (n.s.)
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)			.336	(3.495)***	.336	(3.495)***
Service Concept Adaptations (SCM)	(0.33)			-.020	(.330) (n.s.)	-.020	(.330) (n.s.)
SCM x TKA				.246	(2.584)***	.246	(2.584)***
Environment Uncertainty (EUN)				.213	(2.700)***	.213	(2.700)***
Level of Customer Involvement (CUI)		Project Success (PROS)	(0.14)	.133	(1.467)*	.139	(1.590)*
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)			.228	(2.358)***	.228	(2.358)***
Service Concept Adaptations (SCM)	(0.33)			-.177	(1.839)**	-.177	(.1839)**
SCM x TKA				.052	(.639) (n.s.)	.052	(.630) (n.s.)
Environment Uncertainty (EUN)				.201	(2.646)***	.201	(2.646)***
Level of Customer Involvement (CUI)		Sustainable Competitive Advantage (SCA)	(0.29)	.019	(.330) (n.s.)	.238	(3.355)***
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)			.306	(2.985)***	.302	(2.853)***
Service Concept Adaptations (SCM)	(0.33)			.232	(2.887)***	.232	(2.887)***
SCM x TKA				.207	(2.228)**	.207	(2.228)**
Environment Uncertainty (EUN)				.169	(2.359)***	.169	(2.359)***

sig. = Significance: * sig at p<0.1, ** sig. at p<0.05, *** sig. at p<0.01; one-tailed t-test

Appendix 23: Summary of Effects of Extended Model

Effect of	R^2	On	R^2	Direct Effect β	Direct Effect (t-values) sig.	Total Effect β	Total Effect (t-values) sig.
Environment Uncertainty (EUN)		Level of Customer Involvement (CUI)	(0.04)	.197	(2.157)**	.196	(2.055)**
Level of Customer Involvement (CUI)	(0.04)	Increase in Explicit Customer Knowledge Stock (EKA)	(0.31)	.384	(5.558)***	.384	(6.258)***
Prior Explicit Customer Knowledge Stock (EKP)				.254	(5.558)***	.254	(3.522)***
CUI x EKP				-.233	(2.981)***	-.233	(1.056) (n.s.)
Level of Customer Involvement (CUI)		Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)	.404	(6.851)***	.405	(5.596)***
Prior Tacit Customer Knowledge Stock (TKP)				.178	(2.470)***	.178	(1.241) (n.s.)
CUI x TKP				-.209	(2.449)***	-.210	(.964) (n.s.)
Level of Customer Involvement (CUI)	(0.04)	Service Concept Adaptations (SCM)	(0.33)	.385	(4.682)***	.490	(6.605)***
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)			-.021	(.359) (n.s.)	-.021	(.212) (n.s.)
Increase in Explicit Customer Knowledge Stock (EKA)	(0.31)			.309	(3.252)***	.309	(3.357)***
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)	Market Success (MAS)	(0.22)	.332	(3.173)***	.302	(2.931)**
Increase in Explicit Customer Knowledge Stock (EKA)	(0.31)			.069	(.977) (n.s.)	.039	(.364) (n.s.)
Service Concept Adaptations (SCM)	(0.33)			-.104	(1.468)*	-.085	(1.050) (n.s.)
SCM x TKA				.245	(2.439)***	.051	(.942) (n.s.)
Environment Uncertainty (EUN)				.205	(2.816)***	.211	(2.566)***
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)	Project Success (PROS)	(0.14)	.288	(2.694)***	.291	(2.620)***
Increase in Explicit Customer Knowledge Stock (EKA)	(0.31)			-.066	(.785) (n.s.)	-.099	(.865) (n.s.)
Service Concept Adaptations (SCM)	(0.33)			-.098	(1.170) (n.s.)	-.100	(.950) (n.s.)
SCM x TKA				-.055	(.673) (n.s.)	-.035	(.266) (n.s.)
Environment Uncertainty (EUN)				.213	(2.613)**	.213	(2.641)**
Increase in Tacit Customer Knowledge Stock (TKA)	(0.24)	Sustainable Competitive Advantage (SCA)	(0.29)	.311	(3.531)***	.301	(3.312)***
Increase in Explicit Customer Knowledge Stock (EKA)	(0.31)			.053	(.780) (n.s.)	.107	(1.273) (n.s.)
Service Concept Adaptations (SCM)	(0.33)			.157	(1.888)**	.148	(1.766)**
SCM x TKA				.157	(1.888)**	.216	(1.315)*
Environment Uncertainty (EUN)				.183	(2.330)**	.207	(2.723)**

sig. = Significance: * sig at p<0.1, ** sig. at p<0.05, *** sig. at p<0.01; one-tailed t-test

Appendix 24: Results of the Customer Knowledge Creation Model

Testing Hierarchical Models

	R^2							ΔR^2, (ΔF)							GOF^b		
Model(a)	CUI	TKA	EKA	SCM	MAS	PROS	SCA	CUI	TKA	EKA	SCM	MAS	PROS	SCA	MAS	PROS	SCA
M1	.038	.171	.180	.326	.16	.13	.26	.000 (n.s.)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	.075	.067	.102
M2	.038	.196	.261	.329	.16	.13	.26	.000 (n.s.)	.025** (3.960)	.081*** (14.029)	.003 (n.s.)	n.a.	n.a.	n.a.	.075	.067	.102
M3	.038	.240	.306	.327	.22	.13	.29	.000 (n.s.)	.044*** (7.295)	.045*** (8.170)	-.002 (n.s.)	.057*** (9.122)	.005 (n.s.)	.028** (4.936)	.156	.107	.108

Parameter Estimates for Model M3

	β, (t-statistic)							Bootstrapped SE							Findings	
Constructs	CUI	TKA	EKA	SCM	MAS	PROS	SCA	CUI	TKA	EKA	SCM	MAS	PROS	SCA	Hyp.	supported
CUI		.405*** (5.602)	.384*** (5.656)	.385*** (4.510)	n.a.	n.a.	n.a.	n.a.	.070	.068	.085	n.a.	n.a.	n.a.	H1 H2	✓ ✓
EKP		n.a.	.257*** (3.737)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	.071	n.a.	n.a.	n.a.	n.a.		
TKP		.179** (2.508)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	.096	n.a.	n.a.	n.a.	n.a.	n.a.		
EKA		n.a.	n.a.	.310*** (3.200)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	.087	n.a.	n.a.	n.a.	H4a	✓
TKA		n.a.	n.a.	-.021(n.s.) (.391)	.363*** (3.880)	.253** (2.835)	.332*** (3.885)	n.a.	n.a.	n.a.	.055	.087	.091	.084	H4b H5a-c	- ✓
SCM		n.a.	n.a.	n.a.	-.082 (n.s.) (1.180)	-.117* (1.441)	.184** (2.406)	n.a.	n.a.	n.a.	n.a.	.064	.079	.074	H6a-b H6c	✓ -
CUI x EKP		n.a.	-.231** (2.804)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	.075	n.a.	n.a.	n.a.	n.a.	H3	✓
CUI x TKP		-.210** (2.674)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	.080	n.a.	n.a.	n.a.	n.a.	n.a.	H3	✓
SCM x TKA		n.a.	n.a.	n.a.	.245** (2.596)	-.057 (n.s.) (.706)	.206** (2.192)	n.a.	n.a.	n.a.	n.a.	.086	.077	.098	H7a H7b H7c	✓ - ✓
EUN	.197** (2.172)	n.a.	n.a.	n.a.	.177** (2.432)	.216** (2.815)	.171** (2.231)	.093	n.a.	n.a.	n.a.	.072	.079	.074		

(a) = M1: predictor variables; M2: predictor and moderator variables; M3: predictor variables, moderator variables and interaction effect; * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, n.s. = not significant; n.a. = not applicable; b = average communality x average R^2 (Tenenhaus et al., 2005)

Appendix 25: *Explained Variance (R²), Communality, Redundancy, Effect Size, Prediction Relevance (Q²) and Goodness-of fit Index*

	Model 1								**Model 2**							
Constructs	R^2	Communality	Redundancy	f^2			Q^2	GOF	R^2	Communality	Redundancy	f^2			Q^2	GOF
				MAS	PROS	SCA						MAS	PROS	SCA		
CUI	.04	0.716	0.027				0.02		.04	0.716	0.027				0.02	
EKA	.19	0.642	0.113				0.10		.26	0.642	0.112				0.15	
EKP	n.a.						n.a.			0.645					0.65	
EUN		0.711		.044	.045	.037	0.71			0.710		.045	.045	.037	0.71	
MAS	.16	0.566	0.035				0.08		.16	0.566	0.035				0.09	
SCM	.33	0.674	0.152	.001	.015	.073	0.20		.33	0.674	0.151	.158	.118	.208	0.19	
PROS	.13	0.556	0.031				0.07		.13	0.556	0.031				0.07	
SCA	.26	0.632	0.040				0.13		.26	0.632	0.040				0.16	
TKA	.17	0.662	0.113	.099	.076	.108	0.11		.20	0.662	0.113	.076	.065	.182	0.12	
TKP	n.a.						n.a.			0.526					0.52	
								0.343								0.376

	Hypothesized Model (Model 3)								**Rival Model**							
Constructs	R^2	Communality	Redundancy	f^2			Q^2	GOF	R^2	Communality	Redundancy	f^2			Q^2	GOF
				MAS	PROS	SCA						MAS	PROS	SCA		
CUI	.04	0.716	0.027				0.03		.04	0.712	0.027	.071	.065	.077	0.02	
CUI*EKP							0.16		n.a.							
CUI*TKP							0.32		n.a.							
EKA	.31	0.643	0.112				0.20		n.a.							
EKP		0.645					0.65		n.a.							
EUN		0.710		.033	.037	.035	0.71			0.710		.028	.036	.087	0.71	
MAS	.22	0.565	0.035				0.10		.08	0.557	0.008				0.04	
SCM	.33	0.674	0.151	.081	.032	.115	0.21		n.s.							
PROS	.15	0.555	0.031				0.07		.08	0.555	0.018				0.04	
SCA	.29	0.636	0.040				0.19		.13	0.636	0.050				0.07	
TKA	.24	0.662	0.113	.186	.094	.152	0.16		n.a.							
TKP		0.526					0.20		n.a.							
TKA*SCM				.080			0.41		n.a.							
TKA*SCM					.018		0.37		n.a.							
TKA*SCM						.039	0.53		n.a.							
								0.404								0.231

Q^2 = measures quality of each structural equation by the cross-validated redundancy index (i.e. Stone-Geisser's Q^2)

GOF = SQ root (average communality x average R^2). Average communality is computed as a weighted average of all communalities with the weights being the number od indicators per latent variable (Tenenhaus et al., 2003).

Appendix 26: Direct Effect Model of Prior Customer Knowledge Stock

Direct Effect of Prior Customer Knowledge Stock on Level of Customer Involvement (Model A)

Effect of	R²	On	R²	Direct Effect β	Direct Effect (t-values) sig.	Total Effect β	Total Effect (t-values) sig.
Environment Uncertainty				.169	(1.958)**	.169	(1.850)**
Prior Explicit Customer Knowledge Stock (EKP)		Level of Customer Involvement (CUI)	(0.07)	.171	(2.224)**	.171	(2.101)**
Prior Tacit Customer Knowledge Stock (TKP)				.058	(.653) (n.s.)	.058	(.310) (n.s.)
Level of Customer Involvement (CUI)	(0.07)	Increase in Tacit Customer Knowledge Stock (TKA)	(.17)	.414	(5.232)***	.414	(5.232)***
		Increase in Explicit Customer Knowledge Stock (EKA)	(.19)	.431	(7.362)***	.431	(7.362)***
		Service Concept Adaptations (SCM)	(.32)	.374	(4.067)***	.500	(6.575)***

sig. = Significance: * sig at p<0.1, ** sig. at p<0.05, *** sig. at p<0.01; one-tailed t-test

Appendix 27: Partial Moderation Effect Model of Prior Customer Knowledge Stock

Partial Moderation Effect of Prior Customer Knowledge Stock on Level of Customer Involvement (Model B)

Effect of	R²	On	R²	Direct Effect β	Direct Effect (t-values) sig.	Total Effect β	Total Effect (t-values) sig.
Environment Uncertainty				.182	(2.102)**	.182	(1.970)**
Prior Explicit Customer Knowledge Stock (EKP)		Level of Customer Involvement (CUI)	(.07)	.188	(2.149)**	.188	(2.064)**
Prior Tacit Customer Knowledge Stock (TKP)				-.009	(.109) (n.s.)	-.009	(.067) (n.s.)
Level of Customer Involvement (CUI)	(.07)			.403	(5.581)***	.403	(5.581)***
Prior Tacit Customer Knowledge Stock (TKP)		Increase in Tacit Customer Knowledge Stock (TKA)	(.24)	.163	(1.901)**	.160	(1.281) (n.s.)
CUI x TKP				-.208	(2.558)***	-2.07	(.950) (n.s.)
Level of Customer Involvement (CUI)				.385	(5.718)***	.385	(5.718)***
Prior Explicit Customer Knowledge Stock (EKP)		Increase in Explicit Customer Knowledge Stock (EKA)	(.31)	.259	(3.786)***	.332	(4.678)***
CUI x EKP				-.229	(3.000)***	-.229	(1.045) (n.s.)
Level of Customer Involvement (CUI)				.375	(4.204)***	.489	(6.437)***
Increase in Tacit Customer Knowledge Stock (TKA)		Service Concept Adaptations (SCM)	(.33)	-.015	(.301) (n.s.)	-.015	(.173) (n.s.)
Increase in Explicit Customer Knowledge Stock (EKA)				.310	(3.316)***	.310	(3.317)***

sig. = Significance: * sig at p<0.1, ** sig. at p<0.05, *** sig. at p<0.01; one-tailed t-test

Appendix 28: Characteristics of Customer Involvement Methods

No.	Customer Involvement Methods	Degree of Activeness*	SD	Usefulness**	Creativity***
21	Others	n.a.		4,67	n.a.
1	Beta testing	3,9	1,0	4,15	2
2	Prototyping	3,6	0,8	4,14	2
3	Customer complaints and feedback	3,1	1,2	4,06	1
4	Customer co-development meetings	4,1	0,6	4,05	1
5	Customer surveys	2,9	1,1	4,05	1
6	Customer service interaction reports	3,6	0,7	4,03	1
7	(Semi-)structured interviews	3,3	0,8	3,95	1
8	Ethnographic methods	3,7	1,1	3,91	2
9	Focus Groups	3,8	0,8	3,9	1
10	Technological forecasting	3,5	1,1	3,78	1
11	Unstructured interviews	3,4	1,2	3,73	1
12	Lead users	3,8	0,8	3,71	3
13	Transactional customer data analysis	3,0	1,2	3,71	2
14	Experiment	3,8	1,0	3,69	2
15	Virtual Customer Communities	3,1	0,6	3,62	1
16	Trend Scanning	3,5	1,1	3,59	1
17	Toolkits	3,6	1,0	3,54	3
18	Conjoint analysis	3,5	0,8	3,53	1
19	Open Source Invention	3,6	0,8	3,39	3
20	Games-based learning	3,4	0,5	2,56	2

* Scale 1-5; 1=clearly reactive, 5=clearly proactive; Mean value of expert survey
** Scale 1-5; 1=not useful, 5=very useful; Mean value of main survey
*** Categories of creativity: 1=say-Methods, 2=do-Methods, 3=make-Methods (Sanders and William, 2003)
n.a. = not available

Appendix 29: Correlation Coefficients of Proxy Variables in Cluster Analysis

	Pearson Correlation Among Indices							
	1	2	3	4	5	6	7	8
1. Idea Generation	1.00							
2. Concept Development	.66**	1.00						
3. Business Analysis	.27**	.42**	1.00					
4. Development & Testing	.33**	.47**	.45**	1.00				
5. Implementation & Launch	.27**	.35**	.28**	.65**	1.00			
6. Variety of Methods	.40**	.40**	.29**	.17	.13	1.00		
7. Early Customer Involvement	.13	.15	.23**	.36**	.30**	.51**	1.00	
8. Late Customer Involvement	.63**	.71**	.54**	.70*	.67**	.30**	.25**	1.00

n = 126; *p < .05; **p < .01

Appendix 30: Results of Agglomeration Schedule of Ward's Method

Ward Method

STOPPING RULE

Stage	Number of Clusters: Before Joining	Number of Clusters: After Joining	Agglomeration Coefficient: Value	Agglomeration Coefficient: % Increase to next stage
115	17	16	250,713	4,31%
116	16	15	261,514	5,02%
117	15	14	274,647	5,04%
118	14	13	288,500	4,91%
119	13	12	302,675	5,81%
120	12	11	320,260	5,90%
121	11	10	339,167	5,87%
122	10	9	359,080	7,85%
123	9	8	387,272	9,32%
124	8	7	423,381	8,96%
125	7	6	461,328	8,87%
126	6	5	502,264	9,77%
127	**5**	**4**	551,322	10,07%
128	4	**3**	606,836	22,97%
129	3	2	746,247	39,36%
130	2	1	1040,000	-

(Hair et al, 2006) n = 131

Appendix 31: Predictive Validity of Four-Cluster Solution

Four Cluster Solution

Ward Hierarchical Clustering

Cluster Centroids

Cluster	**TKA**	**PROCH**	**EKA**
1	5.64	3.89	5.02
2	4.76	2.44	3.47
3	5.05	3.27	3.89
4	5.54	3.98	4.95

Statistical Significance of Criterion Variables

F value	3.202	7.355	7.417
Significance (α-level)	0.026	0.000	0.000

Appendix 32: Predictive Validity of Five-Cluster Solution

Five Cluster Solution

Ward Hierarchical Clustering

Cluster Centroids

Cluster	**TKA**	**PROCH**	**EKA**
1	5.64	3.89	5.02
2	4.76	2.44	3.47
3	5.36	3.54	3.88
4	4.77	3.03	3.90
5	5.54	3.98	4.95
Statistical Significance of Criterion Variables			
F value	3.258	5.518	5.971
Significance (α-level)	0.014	0.000	0.000

Appendix 33: Final Cluster Centres of Four-Cluster Solution

Final Cluster Centers

	Cluster			
	1	2	3	4
Number of Methods used in Idea Generation	5,76	,77	2,25	5,18
Number of Methods used in Concept Development	4,14	,81	2,93	6,45
Number of Methods used in Business Analysis Phase	1,14	,35	1,15	4,05
Number of Methods used in Development and Testing Phase	1,48	,70	3,13	6,55
Number of Methods used in Implementation and Launch Phase	,95	,77	2,93	4,18
Diversity of Methods	1,74	,66	1,61	2,11
CISE=BCI04-06,DCI05-07	3,56	1,75	2,32	3,30
CISL=BCI07-08,DCI08-09	3,68	2,51	3,66	4,47

Appendix 34: Test of Population Covariance Matrices

Test of Equal Population Covariance Matrices						
	1		2		3	
	A	B	A	B	A	B
Box M	360,96	340,140	216,150	298,810	202,242	1,877***
F-value	3,931***	3,610***	1,461***	2,049***	107,885	1,108 (n.s.)

Significance: *** p < 0.01; ** p < 0.05; * p < 0.1; (n.s.) = not significant

Appendix 35: Test Results of Four-Cluster Solution

ANOVA

	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
Number of Methods used in Idea Generation	166,190	3	2,937	122	56,594	,000
Number of Methods used in Concept Development	165,205	3	2,683	122	61,577	,000
Number of Methods used in Business Analysis Phase	68,440	3	2,741	122	24,970	,000
Number of Methods used in Development and Testing Phase	178,526	3	3,018	122	59,163	,000
Number of Methods used in Implementation and Launch Phase	75,511	3	2,087	122	36,173	,000
Diversity of Methods	12,853	3	,162	122	79,373	,000
CISE=BCI04-06,DCI05-07	21,081	3	1,499	122	14,062	,000
CISL=BCI07-08,DCI08-09	21,058	3	2,941	122	7,161	,000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

Appendix 36: Characteristics of Groups pertaining to Cluster Variate

Characteristics of Strategic Groups

Strategic Customer Involvement Groups' Descriptive Statistics

	Group 1 Early Involvement Strategist (n = 15)	Group 2 Minimalist (n = 39)	Group 3 Balanced Involvement Strategist (n = 50)	Group 4 Maximizer (n = 22)	F-Statistic
Cluster Variate					
Methods in Idea Generation					
Cluster Mean	6.067	0.744	2.580	4.955	40,840***
Standard Error	0.759	0.141	0.260	0.490	
Significant Different to Group (a)	2, 3	1, 3, 4	1, 2, 4	2, 3	
Methods in Concept Development					
Cluster Mean	3.867	0.744	3.240	6.000	40,504***
Standard Error	0.515	0.179	0.247	0.588	
Significant Different to Group (a)	2, 4	1, 3, 4	2, 4	1, 2, 3	
Methods in Business Analysis					
Cluster Mean	1.400	0.359	0.920	4.227	30,108***
Standard Error	0.363	0.119	0.148	0.671	
Significant Different to Group (a)	4	4	4	1, 2, 3	
Methods in Development & Testing					
Cluster Mean	1.667	0.513	2.900	6.364	50,151***
Standard Error	0.398	0.103	0.271	0.616	
Significant Different to Group (a)	4	3, 4	2, 4	1, 2, 3	
Methods in Implementation & Launch					
Cluster Mean	0.933	0.795	2.440	4.318	29,127***
Standard Error	0.284	0.205	0.254	0.304	
Significant Different to Group (a)	3, 4	3, 4	2, 4	1, 2, 3	
Diversity of Methods					
Cluster Mean	1.748	0.579	1.625	2.088	96,843***
Standard Error	0.100	0.077	0.297	0.303	
Significant Different to Group (a)	2, 4	1, 3, 4	2, 4	2, 3	
Early Customer Involvement					
Cluster Mean	4.367	1.756	2.107	3.447	28,440***
Standard Error	0.224	0.190	0.135	0.280	
Significant Different to Group (a)	2, 3	1, 4	1, 4	2, 3	
Late Customer Involvement					
Cluster Mean	4.400	2.423	3.270	4.807	12,074***
Standard Error	0.530	0.258	0.227	0.298	
Significant Different to Group (a)	2	1, 4	2, 4	2, 3	

Significance: *** p<.01; ** p<.05; *p<0.1; (n.s.) = not significant

(a) Indicates the group numbers from which this group was significantly different at p<.1 by the Hochberg posthoc-comparison (Field, 2006)

Appendix 37: Characteristics of Groups related to Environment, Innovation and Firm Culture

Characteristics of Strategic Groups
Strategic Customer Involvement Groups' Descriptive Statistics

	Group 1 Early Involvement Strategist (n = 15)	Group 2 Minimalist (n = 39)	Group 3 Balanced Involvement Strategist (n = 50)	Group 4 Maximizer (n = 22)	F-Statistic
Characteristics of Strategic Groups					
Innovativeness (INN01 - INN03)					
Cluster Mean	3,267	3,111	3,427	3,258	0,733 (n.s.)
Standard Error	0,244	0,188	0,130	0,186	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	
Organisational Slack (ORG01 - ORG03)					
Cluster Mean	3,9110	3,5385	3,7133	4,2576	1,271 (n.s.)
Standard Error	0,4260	0,2070	0,2193	0,2519	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	
Environment Uncertainty (MUN01, MUN02, TET01)					
Cluster Mean	4,200	4,077	4,453	4,333	0,591 (n.s.)
Standard Error	0,373	0,249	0,183	0,218	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	
Customer Involvement Orientation (CUB01 - CUB04)					
Cluster Mean	5,783	4,551	4,975	5,511	5,838***
Standard Error	0,266	0,178	0,171	0,231	
Significant Different to Group (a)	2, 3	1, 4	1	2	
Customer Orientation (CUO01 - CUO02)					
Cluster Mean	6,200	6,064	6,110	5,955	0,187 (n.s.)
Standard Error	0,233	0,161	0,133	0,296	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	
Market-driven NSD (MAO03; MOP01 - MOP03)					
Cluster Mean	5,067	4,600	4,864	5,046	1,210 (n.s.)
Standard Error	0,223	0,157	0,161	0,225	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	
Prior Tacit Customer Knowledge Stock (TKP)					
Cluster Mean	5,173	5,164	4,820	5,018	0,960 (n.s.)
Standard Error	0,321	0,158	0,153	0,190	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	
Prior Explicit Customer Knowledge Stock (EKP)					
Cluster Mean	4,483	3,885	3,695	4,398	1,939 (n.s.)
Standard Error	0,449	0,210	0,206	0,298	
Significant Different to Group (a)	(n.s.)	(n.s.)	(n.s.)	(n.s.)	

Significance: *** p<.01; ** p<.05; *p<0.1; (n.s.) = not significant
(a) Indicates the group numbers from which this group was significantly different at p<.1 by the Tukey HSD posthoc-comparison (Field, 2006)

Appendix 38: Results of the Model of Antecedents

	β, (t-statistic)		Bootstrapped SE		Findings	
Constructs	CISE	CISL	CISE	CISL	Hyp	supported
MAO	.104*	-.049 (n.s.)	1.273	.649	H1a H1b	✓ -
CUO	-.229***	.078 (n.s.)	2.508	.993	H2a H2b	- -
CUB	.344***	.365***	4.360	4.114	H3a H3b	✓ ✓
INN	.001 (n.s.)	.136**	.028	1.858	H4a H4b	- ✓
TKP	-.164**	-.206**	1.906	2.202	H5a H5b	✓ ✓
EKP	.150**	.166**	2.090	1.664	H6a H6a	- -
EUN	.042 (n.s.)	.013 (n.s.)	.708	.214		
ORG	.012 (n.s.)	.049 (n.s.)	.174	.711		

Significance: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, n.s. = not significant

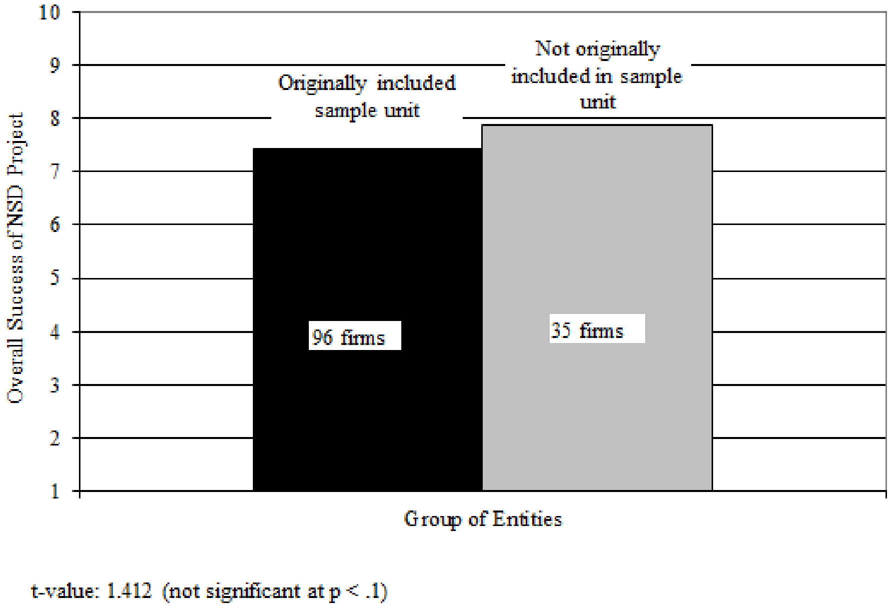
Appendix 39: Explained Variance (R^2), Communality, Redundancy, Effect Size, Prediction Relevance (Q^2) and Goodness-of-fit Index

Constructs	Antecendents to Customer Involvement				
	R²	Communality	Redundancy	Q²	GOF
(CISE)	.23	.695	.091	0.123	
(CISL)	.22	.787	.107	0.143	
(CUB)		.750		0.475	
(CUO)		.852		0.450	
(EKP)		.599		0.359	
(EUN)		.704		0.275	
(INN)		.562		0.134	
(MAO)		.550		0.250	
(ORG)		.748		0.466	
(TKP)		.569		0.125	
					0.389

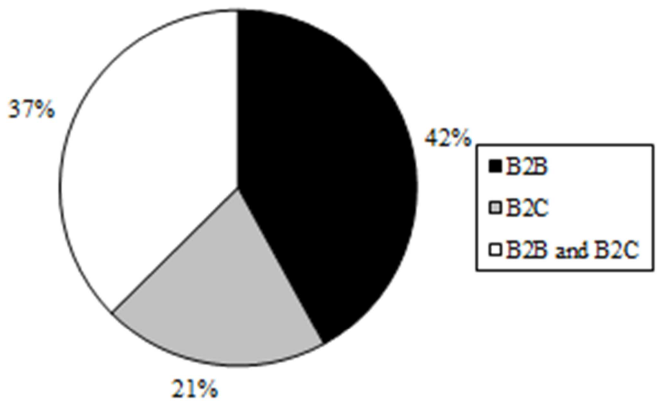
Q² = measures quality of each structural equation by the cross-validated redundancy index (i.e. Stone-Geisser's Q²)

GOF = SQ root (average communality x average R²). Average communality is computed as a weighted average of all communalities with the weights being the number od indicators per latent variable (Tenenhaus et al., 2003).

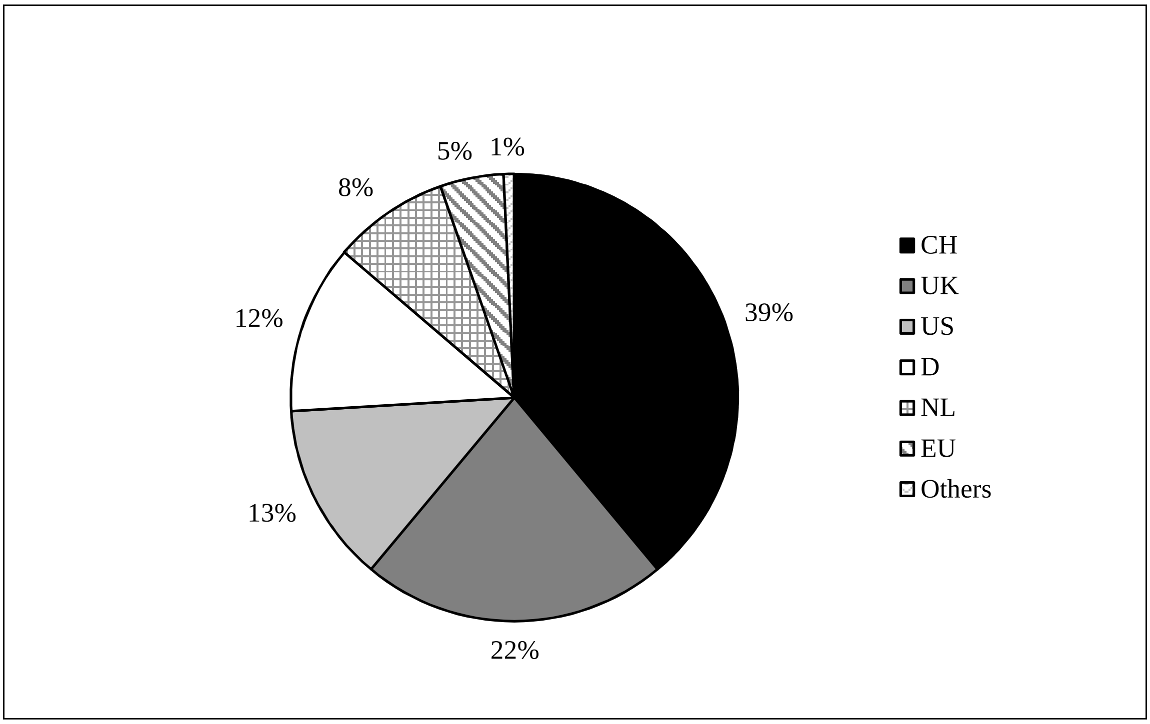
Appendix 40: Comparison of Sample and Non-Sample Respondents



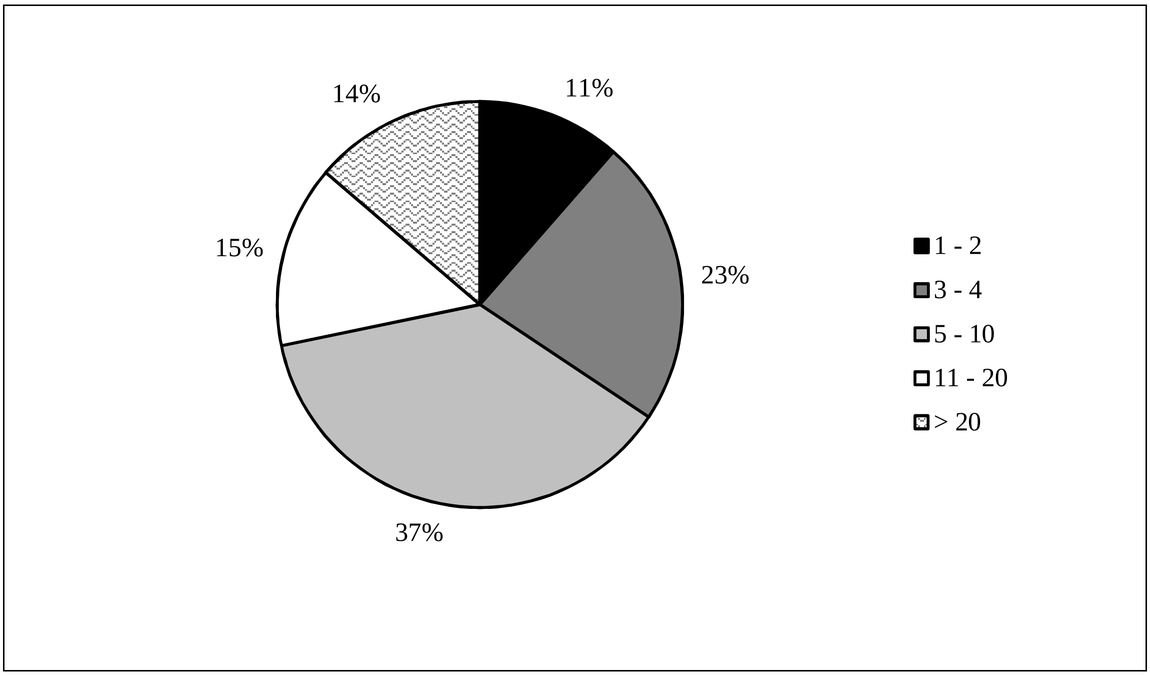
Appendix 41: Type of Customers Served



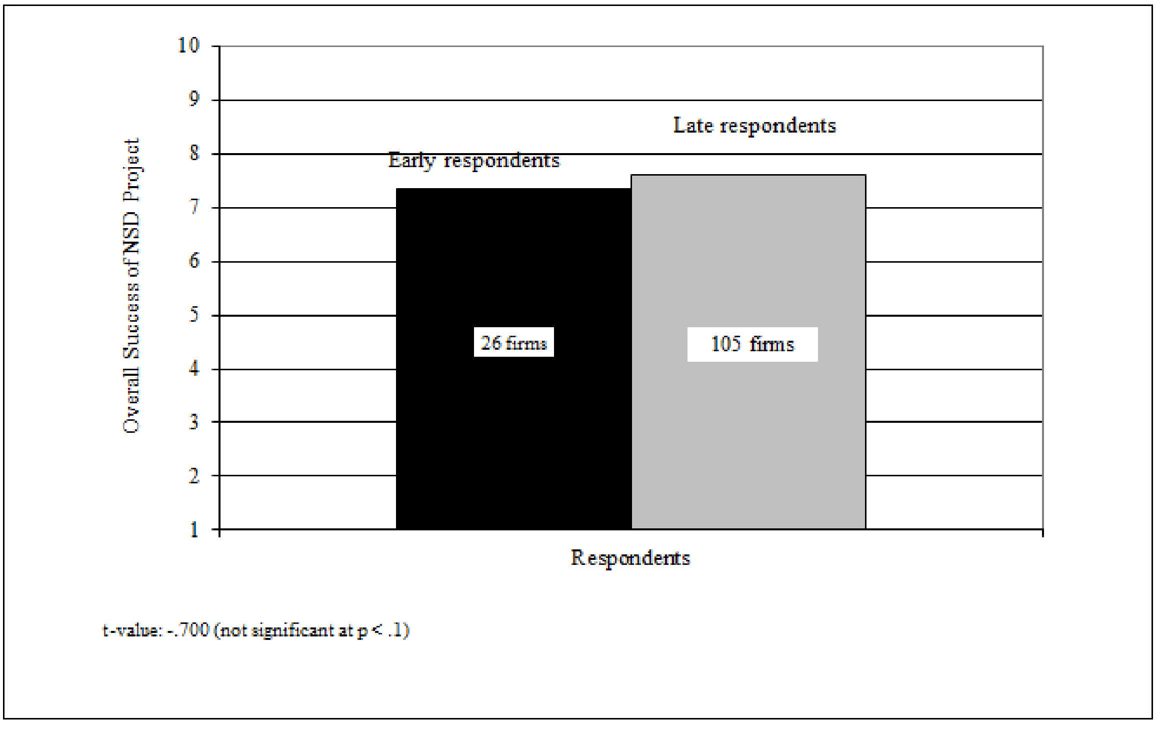
Appendix 42: Countries



Appendix 43: Size of NSD Project measured by Number of Team Members



Appendix 44: Comparison of Early and Late Respondents



Appendix 45: Differences between Groups of Respondents with regard to Key Variables of Research Models

Group of Entities		Number of firms	Customer Involvement									Posthoc-test (c)	r (e)			Remarks
			Level of Customer Involvement (CUI)			Customer Involvement in Early NSD Stage (CISE)			Customer Involvement in Late NSD Stages (CISL)							
			Mean	SE	U or H statistics (d)	Mean	SE	U or H statistics (d)	Mean	SE	U or H statistics (d)		CUI	CISE	CISL	
Type of markets served (a)	B2B	55	3.77	0.22		2.83	0.19		3.45	0.23						
	B2C	27	2.13	0.26	17,817***	1.83	0.22	10,1***	2.71	0.36	5,92 (n.s.)	B2B and B2C	0.23	0.19		Service firms serving B2B-markets involve customers to a higher degree than companies serving consumers. However, the effect of type of market served on customer involvement is small. As for CISL, no statistical significant differences exist between the three groups.
	B2B and B2C	49	3.15	0.24		2.61	0.22		3.74	0.27						
Type of services (a)	Mass Service	63	3.03	0.22		2.44	0.18		3.71	0.24		Service shop & Mass service			-0.31	Service shops significantly involve customers to a lower degree at the end of NSD than other types of services. The effect ranges from medium to high.
	Service Shop	20	2.59	0.35	7,650 (n.s.)	2.10	0.30	4,673 (n.s.)	2.34	0.28	11,384***	Service shop & Professional service			-0.45	
	Professional Service	41	3.60	0.26		2.83	0.22		3.28	0.27		Service shop & not specified			-0.53	
	not specified	7	4.14	0.67		3.07	0.57		4.54	0.66						
Type of innovation (b) (f)	Incremental	77	3.12	0.19	1926 (n.s.)	2.66	0.16	1818 (n.s.)	3.25	0.20	1807 (n.s.)					no statistically significant differences between groups
	Radical	54	3.33	0.23		2.38	0.19		3.64	0.26						

(a) Based on non-parametric Kruskal-Wallis test type (Monte Carlo exact test); significance: *** $p < 0.01$; ** $p < 0.05$; n.s. = not significant
(b) Based on non-parametric Mann-Whitney U test type (Monte Carlo exact test); significance: *** $p < 0.01$; ** $p < 0.05$;n.s.= not significant
(c) Based on non-parametric Mann-Whitney U test type between groups showing significant differences of dependent variable. We used Bonferroni correction to account for inherent Type I error and divided the critical value of .05 by the number of tests we conducted (Field, 2006, 550)
(d) U = test results from Mann-Whitney U test type for two independent samples; H = test results from Kruskal-Wallis test type. SPSS labels it chi-square, because Kruskal-Wallis test statistic is approximately a chi-square distribution. If the calculated value of Kruskal-Wallis Test is less than the chi-square table value, then the null hypothesis will be accepted. If the calculated value of Kruskal-Wallis Test H is greater than the chi-square table value, then we will reject the null hypothesis and say that the sample comes from a different population (Field, 2006)
(e) r = effect size calculated from the z-scores of the post-hoc test statistics that indicates the importance of an effect observed between the independent and dependent variable; $z/\sqrt{N}$; r = .10 (small effect), r = .30 (medium effect) and r = .50 (large effect) (Field, 2006, 32).
(f) Incremental service innovation = summated score of INN01-INN03 < 3.5; radical service innovation = summated score of INN01-INN03 ≥ 3.5

Appendix 45: Differences between Groups of Respondents with regard to Key Variables of Research Models (contd.)

Group of Entities		Number of firms	Antecedents to Customer Involvement on Firm Level									Posthoc-test (c)	r (e)			Remarks
			Customer Orientation (CUO)			Market-driven NSD (MAO)			Customer Involvement Orientation (CUB)							
			Mean	SE	U or H statistics (d)	Mean	SE	U or H statistics (d)	Mean	SE	U or H statistics (d)		CUO	MAO	CUB	
Type of markets served (a)	B2B	55	6.00	0.14		4.83	0.14		5.23	0.17		B2C and B2B			-0.31	
	B2C	27	6.26	0.17	1,171 (n.s.)	4.52	0.21	3,769 (n.s.)	4.44	0.23	9,804***	B2C and B2B&B2C			-0.32	B2C companies are significantly less customer involvement oriented than companies serving B2B- or both markets. The effect is medium.
	B2B and B2C	49	6.07	0.15		5.02	0.14		5.16	0.15						
Type of services (a)	Mass Service	63	6.23	0.12		4.83	0.13		5.03	0.15						
	Service Shop	20	6.08	0.18	4.726 (n.s.)	4.73	0.20	0,706 (n.s.)	4.74	0.27	6,126 (n.s.)					no statistically significant differences between groups
	Professional Service	41	5.79	0.20		4.85	0.18		5.04	0.20						
	not specified	7	6.43	0.23		5.00	0.50		6.00	0.28						
Type of innovation (b)	Incremental	77	6.04	0.11	1934 (n.s.)	4.79	0.11	1901,5 (n.s.)	5.02	0.13	1980,5 (n.s.)					no statistically significant differences between groups
	Radical	54	6.14	0.14		4.90	0.16		5.07	0.17						

(a) Based on non-parametric Kruskal-Wallis test type (Monte Carlo exact test); significance: *** $p < 0.01$; ** $p < 0.05$; n.s. = not significant
(b) Based on non-parametric Mann-Whitney U test type (Monte Carlo exact test); significance: *** $p < 0.01$; ** $p < 0.05$;n.s.= not significant
(c) Based on non-parametric Mann-Whitney U test type between groups showing significant differences of dependent variable. We used Bonferroni correction to account for inherent Type I error and divided the critical value of .05 by the number of tests we conducted (Field, 2006, 550)
(d) U = test results from Mann-Whitney U test type for two independent samples; H = test results from Kruskal-Wallis test type. SPSS labels it chi-square, because Kruskal-Wallis test statistic is approximately a chi-square distribution. If the calculated value of Kruskal-Wallis Test is less than the chi-square table value, then the null hypothesis will be accepted. If the calculated value of Kruskal-Wallis Test H is greater than the chi-square table value, then we will reject the null hypothesis and say that the sample comes from a different population (Field, 2006)
(e) r = effect size calculated from the z-scores of the post-hoc test statistics that indicates the importance of an effect observed between the independent and dependent variable; $z/\sqrt{N}$; r = .10 (small effect), r = .30 (medium effect) and r = .50 (large effect) (Field, 2006, 32).
(f) Incremental service innovation = summated score of INN01-INN03 < 3.5; radical service innovation = summated score of INN01-INN03 ≥ 3.5

Appendix 45: Differences between Groups of Respondents with regard to Key Variables of Research Models (contd.)

Group of Entities		Number of firms	Customer Knowledge Stock and Environment Uncertainty: Increase in Tacit Customer Knowledge Stock (TKA)			Increase in Explicit Customer Knowledge Stock (EKA)			Environment Uncertainty (EUN)			Posthoc-test (c)	r (e)			Remarks
			Mean	SE	U or H statistics (d)	Mean	SE	U or H statistics (d)	Mean	SE	U or H statistics (d)		TKA	EKA	EUN	
Type of markets served (a)	B2B	55	5.43	0.15		3.97	0.18		4.47	0.18						
	B2C	27	4.81	0.22	5,776 (n.s.)	3.58	0.30	7,978**	3.91	0.25	2,582 (n.s.)	B2C and B2B&B2C		-0.28		B2C companies significantly produces less exmplicit customer knowledge when working with customers than companies which serve both types of markets. The effect is medium.
	B2B and B2C	49	4.99	0.18		4.55	0.23		4.31	0.20						
Type of services (a)	Mass Service	63	5.08	0.18		4.07	0.19		4.03	0.18						
	Service Shop	20	4.76	0.26	4,872 (n.s.)	3.69	0.32	3,890 (n.s.)	4.25	0.35	7,730 (n.s.)					no statistically significant differences between groups
	Professional Service	41	5.32	0.18		4.25	0.25		4.61	0.19						
	not specified	7	5.71	0.42		4.82	0.49		5.09	0.40						
Type of innovation (b)	Incremental	77	5.06	0.13	1801 (n.s.)	4.10	0.18	2054 (n.s.)	4.15	0.15	1722 (n.s.)					no statistically significant differences between groups
	Radical	54	5.25	0.18		4.13	0.22		4.52	0.20						

(a) Based on non-parametric Kruskal-Wallis test type (Monte Carlo exact test); significance: *** $p < 0.01$; ** $p < 0.05$; n.s. = not significant

(b) Based on non-parametric Mann-Whitney U test type (Monte Carlo exact test); significance: *** $p < 0.01$; ** $p < 0.05$;n.s.= not significant

(c) Based on non-parametric Mann-Whitney U test type between groups showing significant differences of dependent variable. We used Bonferroni correction to account for inherent Type I error and divided the critical value of .05 by the number of tests we conducted (Field, 2006, 550)

(d) U = test results from Mann-Whitney U test type for two independent samples; H = test results from Kruskal-Wallis test type. SPSS labels it chi-square, because Kruskal-Wallis test statistic is approximately a chi-square distribution. If the calculated value of Kruskal-Wallis Test is less than the chi-square table value, then the null hypothesis will be accepted. If the calculated value of Kruskal-Wallis Test H is greater than the chi-square table value, then we will reject the null hypothesis and say that the sample comes from a different population (Field, 2006)

(e) r = effect size calculated from the z-scores of the post-hoc test statistics that indicates the importance of an effect observed between the independent and dependent variable; $z/\sqrt{N}$; r = .10 (small effect), r = .30 (medium effect) and r = .50 (large effect) (Field, 2006, 32).

(f) Incremental service innovation = summated score of INN01-INN03 < 3.5; radical service innovation = summated score of INN01-INN03 ≥ 3.5

Appendix 46: Usage of Customer Involvement Methods in Relation to New Service Outcomes and Stages of NSD

Usage of Methods in NSD Phases -> New Service Outcomes

		Overall Success (SUC01)					**Market Success (MAS)**					**Project Success (PROS)**					**Sustainable Competitive Advantage (SCA)**					Frequencies		Levene's Test for Equality of Variances (a)
		Method used		Method not used			Method used		Method not used			Method used		Method not used			Method used		Method not used					
		Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Method used	Method not used	Null Hypothesis
Idea Generation & Screening Phase																								
Beta testing	CIM01	8.40	.678	7.52	.147	.121 (n.s.)	5.35	.280	5.02	.082	.788 (n.s.)	5.05	.578	4.99	.102	.114 (n.s.)	5.95	.366	5.23	.099	1.439*	5	126	*H0 rejected for SCA*
Conjoint analysis	CIM02	7.86	.459	7.53	.150	.307 (n.s.)	5.29	.363	5.02	.081	.748 (n.s.)	5.18	.553	4.98	.101	.661 (n.s.)	5.54	.311	5.24	.100	.688 (n.s.)	7	124	
Customer co-development meetings	CIM03	7.52	.342	7.56	.159	.452 (n.s.)	4.84	.192	5.09	.086	-1.330*	4.78	.213	5.05	.113	1.106 (n.s.)	5.30	.243	5.24	.103	.253 (n.s.)	29	102	*H0 rejected for MAS*
Customer complaints & feedback reports	CIM04	7.45	.235	7.61	.184	.239 (n.s.)	4.84	.124	5.16	.102	-1.936**	4.89	.177	5.05	.120	-.797 (n.s.)	5.22	.155	5.28	.124	-.290 (n.s.)	51	80	*H0 rejected for MAS*
Customer surveys	CIM05	7.56	.245	7.55	.179	.488 (n.s.)	4.92	.141	5.02	.096	1.069 (n.s.)	4.99	.174	4.99	.124	-.025 (n.s.)	5.14	.143	5.31	.127	-.833 (n.s.)	45	86	
Customer service interaction reports	CIM06	7.37	.265	7.63	.172	.191 (n.s).	4.96	.140	5.07	.098	-.651 (n.s.)	4.91	.201	5.02	.114	-.489 (n.s.)	5.24	.165	5.26	.119	-.082 (n.s.)	41	90	
Ethnographic methods	CIM07	7.82	.241	7.44	.177	1.253 (n.s.)	4.99	.160	5.05	.092	-.327 (n.s.)	4.84	.192	5.05	.178	-.958 (n.s.)	5.12	.167	5.31	.118	-.909 (n.s.)	38	93	
Experiments	CIM08	8.63	.596	7.48	.147	1.921**	5.47	.408	5.01	.080	1.396*	5.22	.544	4.78	.101	.574 (n.s.)	5.24	.599	5.25	.096	.232 (n.s.)	8	123	*H0 rejected for SUC01 and MAS*
Focus groups	CIM09	7.83	.336	7.50	.159	.784 (n.s.)	5.31	.205	4.99	.087	1.363*	4.93	.245	5.00	.110	-.245 (n.s.)	5.63	.251	5.19	.103	1.535*	18	113	*H0 rejected for MAS*
Games-based learning techniques	CIM10	7.33	.667	7.55	.147	-.229 (n.s.)	5.83	.083	5.02	.080	1.543*	4.58	.917	5.00	.100	-.623 (n.s.)	4.92	.583	5.16	.098	-.536 (n.s.)	3	128	*H0 rejected for MAS*
Lead user technique	CIM11	7.86	.143	7.53	.152	1.557*	5.00	.231	5.04	.083	-.102 (n.s.)	5.25	.494	4.98	.103	.609 (n.s.)	5.50	.318	5.24	.110	.600 (n.s.)	7	124	*H0 rejected for SUC01*
Open source invention	CIM12	8.00	.516	7.53	.149	.683 (n.s.)	4.58	.412	5.06	.081	-1.243(n.s.)	4.83	.427	5.00	.103	-.346 (n.s.)	5.33	.271	5.26	.100	.175 (n.s.)	6	125	
Prototyping	CIM13	7.75	.579	7.53	.148	.440 (n.s.)	5.04	.303	5.05	.083	.029 (n.s.)	5.33	.363	4.96	.104	1.080 (n.s.)	5.44	.287	5.23	.102	.597 (n.s.)	12	119	
(Semi-)structured interviews	CIM14	7.87	.296	7.45	.165	1.243 (n.s.)	5.13	.180	5.01	.088	.660 (n.s.)	4.83	.210	5.04	.114	-.897 (n.s.)	5.58	.193	5.16	.110	1.891**	31	100	*H0 rejected for SCA*
Technological forecasting	CIM15	8.14	.312	7.48	.156	1.904**	5.18	.197	5.01	.086	.625 (n.s.)	5.27	.335	4.96	1.05	.950 (n.s.)	5.43	.289	5.23	.103	.618 (n.s.)	14	117	*H0 rejected for SUC01; F(1,98) = 5.419; p<.05*
Toolkits for users	CIM16	7.50	.866	7.55	.147	-.061 (n.s.)	4.50	.396	5.05	.081	1.192 (n.s.)	4.75	.445	5.00	.103	-.428 (n.s.)	5.25	.395	5.26	.099	-.010 (n.s.)	4	127	
Transactional customer data analysis	CIM17	7.60	.366	7.54	.158	.148 (n.s.)	5.04	.183	5.03	.088	.017 (n.s.)	4.91	.227	5.01	.111	-.337 (n.s.)	5.25	.253	5.26	.104	-.025 (n.s.)	20	111	
Trend Scanning	CIM18	7.90	.292	7.48	.162	1.076 (n.s.)	5.24	.192	5.00	.087	1.118 (n.s.)	5.06	.267	4.98	.108	-.292 (n.s.)	5.61	.239	5.18	.104	1.656**	21	110	*H0 rejected for SCA*
Unstructured interviews	CIM19	7.66	.259	7.52	.170	.437 (n.s.)	5.01	.177	5.04	.090	-.172 (n.s.)	4.88	.207	5.02	.114	-.600 (n.s.)	5.67	.199	5.13	.108	2.341**	29	102	*H0 rejected for SCA*
Virtual Customer Communities	CIM20	8.14	.508	7.52	.130	.977 (n.s.)	4.71	.334	5.05	.082	-.954 (n.s.)	4.21	.280	5.04	.104	-1.861**	5.00	.244	5.27	.101	-.628 (n.s.)	7	124	
Others	CIM21 (b)	9.00	(n.a.)	7.54	.145	.881 (n.s.)	3.75	(n.a.)	5.04	.079	-1.419*	5.75	(n.a.)	4.99	.101	.661 (n.s.)	4.75	(n.a.)	5.25	.098	-.458 (n.s.)	1	130	*H0 rejected for SCA*

Sample (n) = 131
t-value: one-tailed independent -test; significance: *** p < 0.01; ** p < 0.05; n.s. = not significant
(a) When Levene's test is significant at p ≤ .05, the assumption of homogeneity of variances has been violated. In designs in which several groups of participants are tested (independent t-test), the assumption of homogeneity of variances that each of these samples comes from populations with the samogeneity of variances has 64).
(b) Customer sounding board
(c) Truth tables, Customer sounding board, competitive analysis

Appendix 46: Usage of Customer Involvement Methods in Relation to New Service Outcomes and Stages of NSD (contd.)

Usage of Methods in NSD Phases -> New Service Outcomes

		Overall Success (SUC01)					**Market Success (MAS)**					**Project Success (PROS)**					**Sustainable Competitive Advantage (SCA)**					Frequencies		Levene's Test for Equality of Variances (a)
		Method used		Method not used			Method used		Method not used			Method used		Method not used			Method used		Method not used					
		Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Method used	Method not used	Null Hypothesis
Concept Development Phase																								
Beta testing	CIM01	7.77	.508	7.53	.151	.504 (n.s.)	5.10	.222	5.02	.085	.257 (n.s.)	5.52	.256	4.93	.107	1.758**	5.69	.315	5.20	.101	1.509*	13	118	*H0 rejected for PROS and SCA*
Conjoint analysis	CIM02	7.71	.354	7.53	.156	.394 (n.s.)	5.09	.255	5.03	.084	.238 (n.s.)	4.91	.294	5.00	.107	-.281 (n.s.)	5.21	.262	5.26	.103	-.148 (n.s.)	14	117	
Customer co-development meetings	CIM03	7.74	.279	7.48	.169	.808 (n.s.)	5.12	.177	5.00	.088	.659 (n.s.)	4.71	.216	5.09	.111	-1.686**	5.35	.196	5.22	.111	.588 (n.s.)	35	96	*H0 rejected for PROS*
Customer complaints & feedback reports	CIM04	7.45	.263	7.61	.171	-.532 (n.s.)	4.85	.140	5.13	.096	-1.786**	4.81	.179	5.10	.120	-1.376*	5.22	.158	5.28	.122	-.291 (n.s.)	47	84	*H0 rejected for MAS and PROS*
Customer surveys	CIM05	7.53	.259	7.56	.175	-.071 (n.s.)	4.92	.142	5.09	.096	.738 (n.s.)	5.08	.180	4.95	.121	.660 (n.s.)	5.37	.133	5.20	.128	.842 (n.s.)	43	88	
Customer service interaction reports	CIM06	7.45	.245	7.59	.178	-.456 (n.s.)	4.93	.143	5.08	0.96	-.857 (n.s.)	4.69	.198	5.12	.113	-1.997*	5.19	.182	5.29	.114	-.510 (n.s.)	40	91	
Ethnographic methods	CIM07	7.60	.236	7.53	.178	.210 (n.s.)	4.99	.161	5.05	0.92	-.313 (n.s.)	4.74	.194	5.08	.116	-1.510*	5.17	.160	5.29	.118	-.526 (n.s.)	35	96	*H0 rejected for PROS*
Experiments	CIM08	7.24	.359	7.60	.157	-.840 (n.s.)	4.88	.229	5.06	.085	-.735 (n.s.)	5.19	.285	4.96	.107	.764 (n.s.)	5.42	.316	5.23	.100	.682(n.s.)	17	114	
Focus groups	CIM09	8.09	.226	7.44	.167	2.322**	5.18	.182	5.00	.089	.871 (n.s.)	4.95	.184	5.00	.115	-.214 (n.s.)	5.57	.228	5.18	.106	1.486*	23	108	*H0 rejected for SUC01; F(1,98) = 8.229; p<.05 and for SCA*
Games-based learning techniques	CIM10	8.60	.400	7.51	.148	1.457*	5.80	.339	5.00	.080	1.934**	4.70	.267	5.00	.104	-.579 (n.s.)	5.55	.421	5.24	.099	.606 (n.s.)	5	126	*H0 rejectedfor SUC01 and MAS*
Lead user technique	CIM11	7.93	.358	7.50	.156	.956 (n.s.)	5.00	.200	5.04	.087	-.154 (n.s.)	5.10	.306	4.99	.106	.385 (n.s.)	5.45	.261	5.23	.104	.722 (n.s.)	15	116	
Open source invention	CIM12	7.86	.508	7.53	.150	.505 (n.s.)	4.79	.387	5.04	.081	-.740 (n.s.)	5.43	.302	4.98	.104	1.034 (n.s.)	5.39	.361	5.25	.100	.336 (n.s.)	7	124	
Prototyping	CIM13	7.90	.390	7.48	.155	1.076 (n.s.)	5.13	.212	5.01	.063	.528 (n.s.)	5.20	.283	4.95	.107	.915 (n.s.)	5.33	.192	5.24	.109	.350 (n.s.)	21	110	
(Semi-)structured interviews	CIM14	7.83	.306	7.49	.162	.884 (n.s.)	5.02	.206	5.03	.087	-.073 (n.s.)	5.90	.251	5.01	.110	-.414 (n.s.)	5.50	.240	5.20	.105	1.169 (n.s.)	23	108	
Technological forecasting	CIM15	8.58	.260	7.45	1.54	3.769***	5.29	.206	5.00	.085	1.026 (n.s.)	5.08	.382	4.98	.104	.287 (n.s.)	5.29	.361	5.25	.100	.118 (n.s.)	12	119	*H0 rejected for SUC01; F(1,98) = 4.951; p<.05*
Toolkits for users	CIM16	8.00	.548	7.53	.149	.620 (n.s.)	4.95	.357	5.03	.081	-.210 (n.s.)	4.85	.437	5.00	.103	-.282 (n.s.)	6.30	.414	5.21	.097	2.186**	5	126	*H0 rejected for SCA*
Transactional customer data analysis	CIM17	7.42	.369	7.57	.157	-.366 (n.s.)	4.96	.204	5.05	.087	-.380 (n.s.)	5.01	.246	4.98	.110	.085 (n.s.)	5.47	.264	5.21	.104	.930 (n.s.)	19	112	
Trend Scanning	CIM18	7.93	.330	7.50	.157	.956 (n.s.)	5.27	.205	5.00	.086	1.049 (n.s.)	4.95	.344	4.99	.104	-.151 (n.s.)	5.68	.277	5.20	.106	1.603*	15	116	*H0 rejected for SCA*
Unstructured interviews	CIM19	7.36	.362	7.59	.161	-.637 (n.s.)	4.54	.191	5.15	.084	-3.112***	4.84	.202	5.03	.114	-.737 (n.s.)	5.54	.222	5.18	.107	1.436*	25	106	*H0 rejected for MAS and SCA*
Virtual Customer Communities	CIM20	8.33	.408	7.49	.151	1.482*	5.00	.273	5.04	.083	-.117 (n.s.)	4.92	.395	4.99	.104	-.204 (n.s.)	5.33	.239	5.25	.102	.218 (n.s.)	9	122	*H0 rejected for SUC01*
Others	CIM21 (c)	9.00	.577	7.52	.146	1.547*	4.50	.381	5.03	.081	1.027 (n.s.)	5.91	.300	4.97	.102	1.417*	5.50	.750	5.25	.097	.386 (n.s.)	3	128	*H0 rejected for SUC01 and PROS*
Business Analysis Phase																								
Beta testing	CIM01	7.67	.882	7.55	.147	.124 (n.s.)	5.25	.250	5.03	.081	.413 (n.s.)	5.08	.982	4.99	.101	.138 (n.s.)	5.92	.651	5.24	.098	1.049 (n.s.)	3	128	
Conjoint analysis	CIM02	8.00	.816	7.54	.147	.553 (n.s.)	5.25	.520	5.03	.082	.479 (n.s.)	4.81	.277	4.99	.103	-.317 (n.s.)	4.88	.599	5.27	.099	-.699 (n.s.)	4	127	
Customer co-development meetings	CIM03	7.08	.452	7.60	.152	-1.027 (n.s.)	4.58	.271	5.08	.083	-1.813**	4.10	.219	5.08	.105	-2.851**	4.83	.323	5.30	.101	-1.397*	12	119	*H0 rejected for MAS, PROS and SCA*
Customer complaints & feedback reports	CIM04	7.81	.251	7.45	.175	1.137 (n.s.)	5.03	.177	5.04	.088	-.050 (n.s.)	5.16	.256	4.96	.109	.719 (n.s.)	5.45	.229	5.22	.106	.853 (n.s.)	37	94	
Customer surveys	CIM05	7.39	.465	7.58	.151	-.443 (n.s.)	5.08	.172	5.02	.090	.311 (n.s.)	4.99	.205	4.99	.116	-.001 (n.s.)	5.67	.159	5.12	.114	2.500***	18	113	*H0 rejected for SCA*
Customer service interaction reports	CIM06	7.75	.351	7.53	.155	.440 (n.s.)	5.17	.183	5.01	.088	.705 (n.s.)	4.87	.264	5.01	.109	-.508 (n.s.)	5.45	.222	5.22	.107	.817 (n.s.)	12	119	
Ethnographic methods	CIM07	7.68	.304	7.52	.163	.410 (n.s.)	4.91	.208	5.06	.087	-.705 (n.s.)	4.70	.299	5.05	.104	-1.293*	5.44	.260	5.22	.103	.872 (n.s.)	22	109	*H0 rejected for PROS*
Experiments	CIM08	8.60	.400	7.51	.148	1.457*	5.10	.359	5.03	.081	.164 (n.s.)	4.85	.504	5.00	.103	-.282 (n.s.)	5.60	.528	5.24	.098	.709 (n.s.)	5	126	*H0 rejected for SUC01*
Focus groups	CIM09	7.46	.291	7.56	.157	-.202 (n.s.)	4.92	.239	5.05	.085	-.462 (n.s.)	4.79	.196	5.01	.109	1.010 (n.s.)	5.48	.321	5.23	.102	.773 (n.s.)	13	118	
Games-based learning techniques	CIM10	7.50	.500	7.55	.148	.213 (n.s.)	5.31	.188	5.02	.081	.618 (n.s.)	4.81	.277	4.99	.103	-.317	5.06	.524	5.26	.099	-.354 (n.s.)	4	127	
Lead user technique	CIM11	7.78	.222	7.53	.154	.428 (n.s.)	5.16	.220	5.02	.084	.450 (n.s.)	5.36	.368	4.97	.104	.999 (n.s.)	5.39	.323	5.25	.101	.373 (n.s.)	9	122	
Open source invention	CIM12	8.00	.707	7.54	.147	.553 (n.s.)	5.19	.277	5.03	.082	.340 (n.s.)	4.69	.188	5.00	.103	-.536 (n.s.)	5.75	.530	5.24	.099	.908 (n.s.)	4	127	
Prototyping	CIM13	7.69	.328	7.53	.156	.327 (n.s.)	5.23	.143	5.01	.087	1.304 (n.s.)	5.35	.354	4.95	.104	1.173 (n.s.)	5.85	.287	5.19	.101	2.022**	13	118	*H0 rejected for SCA*
(Semi-)structured interviews	CIM14	7.68	.297	7.53	.161	.383 (n.s.)	5.11	.194	5.02	.087	.365 (n.s.)	5.04	.275	4.98	.108	.193 (n.s.)	5.51	.266	5.21	.103	1.099 (n.s.)	19	112	
Technological forecasting	CIM15	7.67	.527	7.54	.150	.220 (n.s.)	5.08	.224	5.03	.084	.166 (n.s.)	5.22	.392	4.98	.104	.621 (n.s.)	5.64	.309	5.23	.101	1.079 (n.s.)	9	122	
Toolkits for users	CIM16	9.00	.000	7.53	.146	1.255 (n.s.)	5.50	.000	5.03	.081	.726 (n.s.)	5.13	.875	4.99	.101	.164 (n.s.)	6.00	.250	5.24	.098	.960 (n.s.)	2	129	
Transactional customer data analysis	CIM17	8.17	.490	7.49	.150	1.363*	5.19	.244	5.02	.084	.609 (n.s.)	4.77	.288	5.01	.106	-.700 (n.s.)	5.44	.274	5.24	.103	.597 (n.s.)	12	119	*H0 rejected for SUC01*
Trend Scanning	CIM18	7.82	.444	7.53	.152	.562 (n.s.)	5.48	.240	4.99	.083	1.695**	5.18	.436	4.97	.102	.571 (n.s.)	6.14	.295	5.18	.100	2.836***	11	120	*H0 rejected for MAS and SCA*
Unstructured interviews	CIM19	7.21	.381	7.59	.155	-.803 (n.s.)	4.80	.267	5.06	.083	1.002 (n.s.)	4.84	.342	5.03	.104	-.527(n.s.)	5.43	.319	5.23	.101	.618 (n.s.)	14	117	
Virtual Customer Communities	CIM20	8.33	.333	7.53	.147	.831 (n.s.)	5.00	.144	5.03	.081	-.066 (n.s.)	4.92	.795	4.99	.101	-.115 (n.s.)	5.25	.250	5.26	.099	-.009 (n.s.)	3	128	
Others	CIM21										(n.a.)											0	131	

Sample (n) = 131

t-value: one-tailed independent -test; significance: *** p < 0.01; ** p < 0.05; n.s. = not significant

(a) When Levene's test is significant at p ≤ .05, the assumption of homogeneity of variances has been violated. In designs in which several groups of participants are tested (independent t-test), the assumption of homogeneity of variances that each of these samples comes from populations with the saeity of variances has been viol

(b) Customer sounding board

(c) Truth tables, Customer sounding board, competitive analysis

Appendix 46: Usage of Customer Involvement Methods in Relation to New Service Outcomes and Stages of NSD (contd.)

Usage of Methods in NSD Phases -> New Service Outcomes

		Overall Success (SUC01)					**Market Success (MAS)**					**Project Success (PROS)**					**Sustainable Competitive Advantage (SCA)**					Frequencies		Levene's Test for Equality of Variances (a)
		Method used		Method not used			Method used		Method not used			Method used		Method not used			Method used		Method not used					
		Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Method used	Method not used	Null Hypothesis
Business Analysis Phase																								
Beta testing	CIM01	7.67	.882	7.55	.147	.124 (n.s.)	5.25	.250	5.03	.081	.413 (n.s.)	5.08	.982	4.99	.101	.138 (n.s.)	5.92	.651	5.24	.098	1.049 (n.s.)	3	128	
Conjoint analysis	CIM02	8.00	.816	7.54	.147	.553 (n.s.)	5.25	.520	5.03	.082	.479 (n.s.)	4.81	.277	4.99	.103	-.317 (n.s.)	4.88	.599	5.27	.099	-.699 (n.s.)	4	127	
Customer co-development meetings	CIM03	7.08	.452	7.60	.152	-1.027 (n.s.)	4.58	.271	5.08	.083	-1.813**	4.10	.219	5.08	.105	-2.851**	4.83	.323	5.30	.101	-1.397*	12	119	*H0 rejected for MAS, PROS and SCA*
Customer complaints & feedback reports	CIM04	7.81	.251	7.45	.175	1.137 (n.s.)	5.03	.177	5.04	.088	-.050 (n.s.)	5.16	.256	4.96	.109	.719 (n.s.)	5.45	.229	5.22	.106	.853 (n.s.)	37	94	
Customer surveys	CIM05	7.39	.465	7.58	.151	-.443 (n.s.)	5.08	.172	5.02	.090	.311 (n.s.)	4.99	.205	4.99	.116	-.001 (n.s.)	5.67	.159	5.12	.114	2.500***	18	113	*H0 rejected for SCA*
Customer service interaction reports	CIM06	7.75	.351	7.53	.155	.440 (n.s.)	5.17	.183	5.01	.088	.705 (n.s.)	4.87	.264	5.01	.109	-.508 (n.s.)	5.45	.222	5.22	.107	.817 (n.s.)	12	119	
Ethnographic methods	CIM07	7.68	.304	7.52	.163	.410 (n.s.)	4.91	.208	5.06	.087	-.705 (n.s.)	4.70	.299	5.05	.104	-1.293*	5.44	.260	5.22	.103	.872 (n.s.)	22	109	*H0 rejected for PROS*
Experiments	CIM08	8.60	.400	7.51	.148	1.457*	5.10	.359	5.03	.081	.164 (n.s.)	4.85	.504	5.00	.103	-.282 (n.s.)	5.60	.528	5.24	.098	.709 (n.s.)	5	126	*H0 rejected for SUC01*
Focus groups	CIM09	7.46	.291	7.56	.157	-.202 (n.s.)	4.92	.239	5.05	.085	-.462 (n.s.)	4.79	.196	5.01	.109	1.010 (n.s.)	5.48	.321	5.23	.102	.773 (n.s.)	13	118	
Games-based learning techniques	CIM10	7.50	.500	7.55	.148	.213 (n.s.)	5.31	.188	5.02	.081	.618 (n.s.)	4.81	.277	4.99	.103	-.317	5.06	.524	5.26	.099	-.354 (n.s.)	4	127	
Lead user technique	CIM11	7.78	.222	7.53	.154	.428 (n.s.)	5.16	.220	5.02	.084	.450 (n.s.)	5.36	.368	4.97	.104	.999 (n.s.)	5.39	.323	5.25	.101	.373 (n.s.)	9	122	
Open source invention	CIM12	8.00	.707	7.54	.147	.553 (n.s.)	5.19	.277	5.03	.082	.340 (n.s.)	4.69	.188	5.00	.103	-.536 (n.s.)	5.75	.530	5.24	.099	.908 (n.s.)	4	127	
Prototyping	CIM13	7.69	.328	7.53	.156	.327 (n.s.)	5.23	.143	5.01	.087	1.304 (n.s.)	5.35	.354	4.95	.104	1.173 (n.s.)	5.85	.287	5.19	.101	2.022**	13	118	*H0 rejected for SCA*
(Semi-)structured interviews	CIM14	7.68	.297	7.53	.161	.383 (n.s.)	5.11	.194	5.02	.087	.365 (n.s.)	5.04	.275	4.98	.108	.193 (n.s.)	5.51	.266	5.21	.103	1.099 (n.s.)	19	112	
Technological forecasting	CIM15	7.67	.527	7.54	.150	.220 (n.s.)	5.08	.224	5.03	.084	.166 (n.s.)	5.22	.392	4.98	.104	.621 (n.s.)	5.64	.309	5.23	.101	1.079 (n.s.)	9	122	
Toolkits for users	CIM16	9.00	.000	7.53	.146	1.255 (n.s.)	5.50	.000	5.03	.081	.726 (n.s.)	5.13	.875	4.99	.101	.164 (n.s.)	6.00	.250	5.24	.098	.960 (n.s.)	2	129	
Transactional customer data analysis	CIM17	8.17	.490	7.49	.150	1.363*	5.19	.244	5.02	.084	.609 (n.s.)	4.77	.288	5.01	.106	-.700 (n.s.)	5.44	.274	5.24	.103	.597 (n.s.)	12	119	*H0 rejected for SUC01*
Trend Scanning	CIM18	7.82	.444	7.53	.152	.562 (n.s.)	5.48	.240	4.99	.083	1.695**	5.18	.436	4.97	.102	.571 (n.s.)	6.14	.295	5.18	.100	2.836***	11	120	*H0 rejected for MAS and SCA*
Unstructured interviews	CIM19	7.21	.381	7.59	.155	-.803 (n.s.)	4.80	.267	5.06	.083	1.002 (n.s.)	4.84	.342	5.03	.104	-.527(n.s.)	5.43	.319	5.23	.101	.618 (n.s.)	14	117	
Virtual Customer Communities	CIM20	8.33	.333	7.53	.147	.831 (n.s.)	5.00	.144	5.03	.081	-.066 (n.s.)	4.92	.795	4.99	.101	-.115 (n.s.)	5.25	.250	5.26	.099	-.009 (n.s.)	3	128	
Others	CIM21										(n.a.)											0	131	

Sample (n) = 131
t-value: one-tailed independent -test; significance: *** p < 0.01; ** p < 0.05; n.s. = not significant
(a) When Levene's test is significant at p ≤ .05, the assumption of homogeneity of variances has been violated. In designs in which several groups of participants are tested (independent t-test), the assumption of homogeneity of variances that each of these samples comes from populations with the samogeneity of variances has 64).
(b) Customer sounding board
(c) Truth tables, Customer sounding board, competitive analysis

Appendix 46: Usage of Customer Involvement Methods in Relation to New Service Outcomes and Stages of NSD (contd.)

Usage of Methods in NSD Phases -> New Service Outcomes

		Overall Success (SUC01)					**Market Success (MAS)**					**Project Success (PROS)**					**Sustainable Competitive Advantage (SCA)**					Frequencies		Levene's Test for Equality of Variances (a)
		Method used		Method not used			Method used		Method not used			Method used		Method not used			Method used		Method not used					
		Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Mean	SE	Mean	SE	t-value (sig.)	Method used	Method not used	Null Hypothesis
Development and Testing Phase																								
Beta testing	CIM01	7.93	.207	7.36	.188	2.061**	5.05	.125	5.02	.103	.099 (n.s.)	5.20	.157	4.89	.128	1.471*	5.42	.163	5.18	.119	1.173 (n.s.)	44	87	*H0 rejected for SUC01; F(1,98) =4.110; p>.05 and PROS*
Conjoint analysis	CIM02	7.80	.490	7.54	.149	.345 (n.s.)	4.80	.464	5.04	.081	-.584 (n.s.)	4.90	.312	5.00	.102	-.183 (n.s.)	5.70	.463	5.24	.099	.916 (n.s.)	5	126	
Customer co-development meetings	CIM03	7.58	.281	7.54	.168	.608 (n.s.)	4.90	.194	5.07	.085	-.973 (n.s.)	4.71	.202	5.08	.115	-1.579*	5.25	.202	5.25	.110	-.033 (n.s.)	31	100	*H0 rejected for PROS*
Customer complaints & feedback reports	CIM04	7.81	.251	7.45	.175	1.137 (n.s.)	5.09	.154	5.01	.093	.420 (n.s.)	5.00	.199	4.99	.116	.048 (n.s)	5.39	.179	5.21	.115	.840 (n.s.)	37	94	
Customer surveys	CIM05	7.75	.280	7.48	.168	.789 (n.s.)	5.08	.172	5.02	.090	.311 (n.s.)	4.99	.205	4.99	.144	-.001 (n.s.)	5.67	.159	5.12	.114	2.500**	32	99	*H0 rejected for SCA*
Customer service interaction reports	CIM06	8.00	.306	7.47	.160	1.289*	5.17	.183	5.01	.088	.705 (n.s.)	4.87	.264	5.01	.108	-.508 (n.s.)	5.45	.222	5.22	.108	.817 (n.s.)	19	112	*H0 rejected for SUC01*
Ethnographic methods	CIM07	7.80	.256	7.48	.171	.946 (n.s.)	4.97	.178	5.05	.089	-.462 (n.s.)	4.62	.225	5.10	.110	-2.067**	5.33	.188	5.24	.112	.390 (n.s.)	30	101	*H0 rejected for PROS*
Experiments	CIM08	7.67	.466	7.54	.152	.257 (n.s.)	5.00	.256	5.04	.084	-.136 (n.s.)	5.36	.293	5.01	.083	.1254 (n.s)	5.19	.289	5.26	.103	-.224	12	119	
Focus groups	CIM09	8.45	.413	7.47	151	1.919**	5.36	.293	5.00	.083	1.254 (n.s.)	5.09	.237	4.89	.107	.296 (n.s.)	5.66	.306	5.22	.101	1.268 (n.s.)	11	120	*H0 rejected for SUC01*
Games-based learning techniques	CIM10	6.33	1.202	7.58	.145	-1.298 (n.s.)	4.92	.939	5.03	.079	-.225 (n.s.)	5.25	.144	4.99	.103	1.489 (n.s.)	4.75	.946	5.27	.097	-.801 (n.s.)	3	128	
Lead user technique	CIM11	7.93	.305	7.50	.157	1.237 (n.s.)	5.09	.267	5.02	.084	.238 (n.s.)	5.20	.264	4.97	.107	.703 (n.s.)	5.26	.301	5.24	.101	.362 (n.s.)	14	117	
Open source invention	CIM12	8.00	.408	7.54	.148	1.070 (n.s.)	5.00	.102	5.04	.082	-.270 (n.s.)	4.25	.445	5.02	.102	-1.318*	5.69	.387	5.24	.099	.793 (n.s.)	4	127	*H0 rejected for PROS*
Prototyping	CIM13	7.63	.247	7.52	.178	.345 (n.s.)	5.06	.142	5.02	.097	.182 (n.s.)	5.14	.165	4.93	.124	1.001 (n.s.)	5.39	.143	5.20	.124	.904 (n.s.)	40	91	
(Semi-)structured interviews	CIM14	7.95	.326	7.47	.160	1.264 (n.s.)	5.06	.238	5.03	.083	.126 (n.s.)	5.07	.230	4.98	.111	.339 (n.s.)	5.38	.241	5.23	.106	.554 (n.s.)	22	109	
Technological forecasting	CIM15	8.00	.683	7.53	.148	.683 (n.s.)	5.33	.279	5.02	.082	.821 (n.s.)	5.08	.293	4.99	.104	.198 (n.s.)	5.38	.486	5.25	.099	.270 (n.s.)	6	125	
Toolkits for users	CIM16	7.57	.571	7.55	.149	.036 (n.s.)	4.57	.331	5.06	.081	-1.385*	5.46	.387	4.97	.103	1.119 (n.s.)	5.18	.465	5.26	.099	-.189 (n.s.)	7	124	*H0 rejected for MAS*
Transactional customer data analysis	CIM17	8.21	.350	7.47	.155	1.603*	5.25	.210	5.00	.085	.936 (n.s.)	5.07	.274	4.98	.107	.272 (n.s.)	5.36	.264	5.34	.104	.362 (n.s.)	14	117	
Trend Scanning	CIM18	8.43	.528	7.50	.149	1.454*	5.54	.221	5.00	.082	1.502*	5.43	.271	4.97	.105	1.034 (n.s.)	6.00	.278	5.21	.100	1.849**	7	124	*H0 rejected for SUC01, MAS and SCA*
Unstructured interviews	CIM19	7.67	.444	7.53	.153	.291 (n.s.)	4.92	.320	5.05	.080	-.403 (n.s.)	4.75	.348	5.04	.104	-.868 (n.s.)	5.48	.311	5.22	.102	.847 (n.s.)	15	116	
Virtual Customer Communities	CIM20	8.44	.444	7.48	.150	1.697**	5.33	.333	5.01	.082	1.019 (n.s.)	5.19	.393	4.98	.104	.546 (n.s.)	5.33	.276	5.25	.102	.218 (n.s.)	9	122	*H0 rejected for SUC01*
Others	CIM21										(n.a.)											0	131	
Implementation and Launch Phase																								
Beta testing	CIM01	8.21	.269	7.40	.103	2.194**	5.24	.142	4.99	.092	1.222 (n.s.)	5.48	.237	4.88	.108	2.338**	5.77	.198	5.14	.107	2.582**	24	107	*H0 rejected for SUC01, PROS and SCA*
Conjoint analysis	CIM02	6.00	1.000	7.57	.145	-1.342*	4.37	.625	5.04	.080	1.031 (n.s.)	6.53	.375	4.98	.101	.784 (n.s.)	5.38	.875	5.26	.097	.153 (n.s.)	2	129	*H0 rejected for SUC01*
Customer co-development meetings	CIM03	7.78	.344	7.50	.159	.744 (n.s.)	4.87	.244	5.07	.082	-.954 (n.s.)	4.80	.243	5.03	.110	-.854 (n.s.)	5.26	.246	5.25	.105	.024 (n.s.)	23	108	
Customer complaints & feedback reports	CIM04	8.02	.195	7.32	.188	2.599**	5.15	.131	4.98	.099	.974 (n.s.)	5.02	.158	4.97	.128	.215 (n.s.)	5.42	.157	5.17	.121	1.224 (n.s.)	43	88	*H0 rejected for SUC01; F(1,98) = 8.043 p<.05*
Customer surveys	CIM05	7.85	.230	7.39	1.83	1.528*	5.08	.144	5.01	.059	.384 (n.s.)	5.03	.152	4.97	.131	.254 (n.s.)	5.51	.134	5.12	.122	1.92**	46	85	*H0 rejected for SUC01 and SCA*
Customer service interaction reports	CIM06	7.91	.278	7.48	.164	1.121 (n.s.)	5.15	.181	5.01	.088	.638 (n.s.)	4.88	.250	5.02	.110	-.524 (n.s.)	5.50	.194	5.21	.109	1.138 (n.s.)	22	109	
Ethnographic methods	CIM07	8.04	.279	7.42	.165	1.771**	5.21	.194	4.99	.087	1.179 (n.s.)	4.63	.243	5.09	.107	1.930 (n.s.)	5.33	.187	5.23	.112	.402 (n.s.)	28	103	*H0 rejected for SUC01*
Experiments	CIM08	8.00	.577	7.54	.147	.477 (n.s.)	5.58	.300	5.02	.081	1.055 (n.s.)	5.58	.583	4.97	.101	.902 (n.s.)	6.17	.363	5.23	.098	1.451*	3	128	*H0 rejected for SCA*
Focus groups	CIM09	8.86	.459	7.48	.148	2.184**	5.61	.327	5.00	.081	1.721**	5.32	.411	4.97	.103	.779 (n.s.)	5.71	.489	5.22	.098	1.130 (n.s.)	7	124	*H0 rejected for MAS*
Games-based learning techniques	CIM10	6.00		7.56	.145	-.942 (n.s.)	4.50	.000	5.03	.080	-.587 (n.s.)	5.50	.000	4.98	.101	.443 (n.s.)	7.00	.000	5.24	.089	1.194 (n.s.)	1	130	
Lead user technique	CIM11	7.92	.336	7.51	.155	.807 (n.s.)	5.13	.286	5.02	.083	.360 (n.s.)	5.06	.256	4.98	.108	.221(n.s.)	5.67	.325	5.21	.100	1.356*	12	119	*H0 rejected for SCA*
Open source invention	CIM12	8.00	.577	7.54	.145	.477 (n.s.)	5.25	.382	5.03	.081	.413 (n.s.)	4.00	.520	5.01	.101	-1.523*	6.25	.289	5.23	.097	1.586*	3	128	*H0 rejected for PROS and SCA*
Prototyping	CIM13	7.20	.416	7.59	.154	-.871 (n.s.)	5.08	.223	5.02	.086	.220 (n.s.)	5.77	.208	4.89	.107	2.852**	5.93	.228	5.18	.102	2.579*	15	116	*H0 rejected for PROS and SCA*
(Semi-)structured interviews	CIM14	8.19	.356	7.46	.155	.1660**	5.14	.245	5.01	.084	.496 (n.s.)	5.19	.280	4.97	.108	.725 (n.s.)	5.64	.279	5.20	.102	1.494*	16	115	*H0 rejected for SUC01 and SCA*
Technological forecasting	CIM15	9.00	.000	7.53	.146	1.255 (n.s.)	5.50	.000	5.02	.081	.726 (n.s.)	5.13	.875	4.99	.101	.164 (n.s.)	6.00	.250	5.24	.098	.960 (n.s.)	2	129	
Toolkits for users	CIM16	7.83	.490	7.52	.151	.623 (n.s.)	5.27	.231	5.01	.085	.942 (n.s.)	5.31	.294	4.96	.106	1.014 (n.s.)	5.73	.276	5.21	.101	1.566*	12	119	*H0 rejected for SCA*
Transactional customer data analysis	CIM17	8.44	.412	7.48	.151	1.697**	5.44	.231	5.00	.083	1.403*	5.47	.319	4.96	.105	1.303 (n.s.)	5.92	.309	5.21	.100	1.878**	9	122	*H0 rejected for SUC01, MAS and SCA*
Trend Scanning	CIM18	8.63	.375	7.48	.150	1.921**	5.56	.215	5.00	.083	1.703**	5.25	.324	4.98	.105	.654 (n.s.)	5.97	.293	5.20	.100	1.903**	8	123	*H0 rejected for SUC01, MAS and SCA*
Unstructured interviews	CIM19	8.07	.385	7.49	.154	1.254 (n.s.)	5.02	.284	5.04	.083	-.071 (n.s.)	5.21	.342	4.96	.105	.764 (n.s.)	5.73	.338	5.20	.100	1.720**	14	117	*H0 rejected for SCA*
Virtual Customer Communities	CIM20	8.29	.892	7.51	.144	1.215 (n.s.)	5.50	.469	5.00	.080	1.394*	5.46	.448	4.98	.103	1.119 (n.s.)	5.75	.570	5.22	.097	1.219 (n.s.)	7	124	*H0 rejected for MAS*
Others	CIM21										(n.a.)											0	131	

Sample (n) = 131

t-value: one-tailed independent -test; significance: *** p < 0.01; ** p < 0.05; n.s. = not significant

(a) When Levene's test is significant at p ≤ .05, the assumption of homogeneity of variances has been violated. In designs in which several groups of participants are tested (independent t-test), the assumption of homogeneity of variances that each of these samples comes from populations with the saeity of variances has been viol

(b) Customer sounding board

(c) Truth tables, Customer sounding board, competitive analysis