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The Effects of End-user Involvement in New Product Development

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Abstract

New product development (NPD) is undoubtedly important to the competitiveness, growth, and survivability of companies. End-user involvement in NPD is seen as a determinant for successful new products, and hence companies are increasingly shifting towards a direction where they co-create products with end-users. However, previous academic studies offer little consensus regarding the contribution of this involvement to new product outcomes. More specifically, little attention has been paid on how this involvement takes place in practice, and what the roles and contributions of end users are for successful new products. Therefore, this study investigates the effects of three different approaches to end-user involvement in NPD (design for end-users, design with end-users, and design by end-users) and explores how end users are involved in and influence the NPD process and the end product.

A qualitative research methodology with a multiple case study design was employed on account of the exploratory nature of this study. The NPD processes of six companies were investigated through in-depth semi-structured interviews with top managers and members of the NPD teams. The data were derived and analysed using thematic analysis methodology.

The findings demonstrated that the three approaches to end-user involvement entail different benefits and challenges and emphasise different tools and articulation of end user requirements across different NPD phases. Furthermore, the findings revealed that the appropriateness of each approach, as well as the impact it may have on the NPD process and the end product, depends on four situation-specific factors; including the purpose of end-user involvement, company culture and receptiveness to external knowledge, industry regulations and policies, and allocated resources. The findings of this study contributed and extended the growing body of research on end-user involvement in NPD by providing a comprehensive, holistic overview of three different approaches to end-user involvement and by emphasising a set of factors that impact the end-user involvement outcomes. Additionally, the findings provided a direction to managers for making decisions regarding how and when to involve end users for creating more effective and more efficient NPD processes.

Keywords: new product development, co-creation, open innovation, participatory design, user involvement, customer involvement

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Everything goin' be alright, go on raise a glass and say
Here's to the ones that we got
Cheers to the wish you were here but you're not
Toast to the ones here today
Toast to the ones that we lost on the way
'Cause the drinks bring back all the memories
And the memories bring back you
(Memories - Maroon 5)

Author's Declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Signature:

Printed name: Maria Ioanna Koukou

Abbreviations

CAQDAS: computer-assisted qualitative data analysis software

B2B: Business-to-business

B2C: Business-to-customer

HoQ: House of quality

IA: Instrumental approach

NPD: New product development

OI: Open innovation

PD: Participatory design

QFD: Quality function deployment

R&D: Research and development

SCAMPER: Substitute, combine, adapt, modify, put to another use, eliminate, reverse

Definitions

Co-creation: collaboration between end users and companies characterised by active involvement of end users in the NPD process.

End-user: a single individual who receives (purchases) and uses a product.

End-user involvement (in NPD): a set of collaborative activities that are initiated and facilitated by the company and in which (current or potential) end users may contribute at various NPD phases and may select or provide suggestions on the content of a new product offering, to create (new) superior products, improve new product success and to gain competitive advantage

NPD: the (design) activities carried out to conceive, develop, and deliver a product which may be highly or moderately innovative.

Chapter 1: Introduction

The purpose of this introductory chapter is to provide an overview of the research that is presented in this thesis. First, the overall background and motivation of undertaking this research are provided, highlighting the research problem and research gap. Based on that, the research aim and the research questions are outlined along with the research methodology. Next, the research relevance and the expected contribution is being discussed. Finally, an overview of the thesis structure is provided.

1.1 Research Background and Motivation

New Product Development (NPD) is widely viewed as a key strategic process for commercial success and increased sales volume of new products (Brown and Eisenhardt, 1995: 344; González and Palacios, 2002: 261; Koufteros et al., 2005: 98; Schmidt et al., 2009: 520). At the same time, NPD is considered a very risky and uncertain process (Cooper, 1993: 4; Ozer, 2005: 784). As a result, managers are often under pressure to effectively manage it and improve its performance (Nijssen and Frambach, 2000: 122). However, many new products that reach the market fail to be adopted by end users[1] (Clark and Goldsmith, 2006: 34). This uncertainty about the success of new products in combination with the effects associated with research and development (R&D) and the launch of new products results in a need for companies to get a deeper understanding and profound knowledge of end users' needs and wants in order to increase the likelihood of successful new products (Kärkkäinen et al., 2001: 161; Lagrosen, 2005: 424; van Kleef et al., 2005: 181). From a practical perspective, end-user involvement is seen as imperative in ensuring the successful development and launch of new products.

End-users have long been believed to be able to provide needs and solution related information that a company may lack (Chang and Taylor, 2016; Griffin and Hauser, 1993, von Hippel, 1986). Particularly in the last two decades, the role of end users in NPD has been transformed from passive buyers to active players (Prahalad and Ramaswamy, 2000). In this new era end users are invited to co-create products

[1] The term end-user in this study is defined as 'a single individual who receives (purchases) and uses a product' and is used interchangeably with customer and consumer

with companies (Hoyer et al., 2010). Within the NPD field, studies related to NPD and co-creation process put emphasis on the active involvement of end users into the NPD process through activities and social interactions that have been initiated by the company (Cooper, 2017; O'Hern and Rindfleisch, 2010; Piller et al., 2010). In this sense, it is widely recognised that end-user involvement in the NPD process may bring many benefits to the companies such as more appropriate products (Hoyer et al., 2010) or increase in market share (Joshi and Sharma, 2004). However, despite the popularity and great enthusiasm among practitioners and researchers for end-user involvement, most NPD studies have taken a 'passive' stance to this practice and there is little consensus regarding its contribution to new product outcomes (Cui and Wu, 2017: 61; Kristensson et al., 2004; Roberts and Darler, 2017: 14). More specifically, an understanding of co-creation practices that focus on the active involvement of end users throughout the NPD process and how to manage the process for successful NPD outcomes is rare (Galvagno and Dalli, 2014: 657; Hoyer et al., 2010; Roberts and Darler, 2017). In addition, whereas co-creation is seen as a way for better understanding end-user needs, preferences, and requirements in a timely and reliable fashion (Ogawa and Piller, 2006; von Hippel, 2005), existing studies have mainly focused on customer relationship management and neglect to examine how and to what purpose end users are involved in NPD processes (Filieri, 2014; Hoyer et al., 2010). Thus, whereas prior studies have significantly improved our understanding of end-user involvement in NPD (Cui and Wu, 2016: 516) and they have widely recognised the benefits associated with this practice, there is a need in current literature for more detailed studies which would enable a better understanding of involvement patterns, effects, and challenges faced by the companies (Laage-Hellman, et al., 2014: 258). In other words, the current literature lacks in-depth insight on a better understanding of the conditions under which end users should be involved in the NPD process.

This implies that there is still a need for more detailed studies focusing on how this active involvement takes place in practice (Laage-Hellman et al., 2014: 258; Roberts and Darler, 2017: 14). For example, Gruner and Homburg (2000: 1) have already argued that more attention should be given to end-user involvement in NPD as a means of increasing new product success. Similarly, Coviello and Joseph (2012: 87) have also stressed that literature lacks understanding on (i) how end-

users get involved in NPD in terms of their roles and contributions; and (ii) the capabilities for managing and leveraging them as a resource of NPD. Chang and Taylor (2016: 47) support this stance by saying that some companies can benefit from engaging end users in NPD, whereas other companies may experience inefficient NPD processes and poor NPD performance. Gemser and Perks (2015) and Mahr et al. (2014) note that literature tends to emphasise the (potential) benefits and neglect the drawbacks (e.g. costs) of end-user involvement in NPD and ask for closer examination on the conditions under the end users act as effective co-creators. Thus, the literature suggests that how end users get involved and what their contributions are is necessary to investigate in order to increase the effectiveness, and also to direct resources for new product development and innovation. As a result, the research aim and the research questions guiding this study are developed and will be discussed in the following section.

1.2 Research Aim and Research Questions

Based on the above discussion, it is apparent that there are some gaps in the literature that need further investigation. In general, prior literature has emphasised the importance of end-user involvement in NPD, yet there is a lack of clarity on how end users are involved in and how they affect the NPD process. Hence, the main aim of this research is to *investigate and get a deeper understanding of how end users are involved in and influence the NPD process and the end product*.

In order to achieve that, this study will investigate the practice and effects of three different levels of end-user involvement in the NPD process and the new product outcomes. These involve (i) design for end users, where end-users play a quite passive role in the NPD process; (ii) design with end users, where end users are more empowered and may strongly influence the end product; and (iii) design by end users, where end users are actively involved in the design or development of new products. In particular, the study will focus on answering the following research questions:

RQ1: How and why are end-users involved in the NPD process?

RQ1a: What are the benefits and challenges of end-user involvement in NPD?

RQ1b: When and how end users get involvement in the NPD process?

RQ2: What are the effects of end-user involvement in each successive phase of the NPD process?

RQ3: What is the contribution of end-user involvement to the (design and functionality of the) end product?

The first research question is twofold. First, it aims to gain a better insight on what are the different tools and methods employed for end-user involvement and which phases of NPD companies choose to involve end users. Second, it attempts to identify what companies hope to gain from end-user involvement and what the shortcomings are that companies are concerned about. In this sense, the study will get a better look at the benefits and challenges of end-user involvement as these have been experienced by companies. In particular, this first research question is seeking to establish how the three different approaches of end-user involvement are used and how they affect the NPD processes of companies in practice. The second research question looks into the different effects that end-user involvement may have throughout the NPD process and specifically in each one of the NPD phases. The third research question investigates the influence that end-user involvement may have on the overall design and functionality of the end product and is seeking to understand the importance of involving end-users in the NPD process.

This study adopts an interpretative approach and multiple case study research design which support the exploratory nature of this research. The six in-depth case studies were designed to include companies which follow different levels and approaches to end-user involvement in NPD and are established in a consumer goods context. The main instrument of data collection was in-depth semi-structured interviews with senior managers and other key employees which formed the NPD teams. These were complimented with a focus group, observations, and examination of relevant documentation. The thematic analysis approach was used to organise and analyse the collected data. Having outlined the research aim and research questions of this study and having addressed the

methodological approach that guides the empirical research process, the next section will highlight the relevance and significance of this study.

1.3 Research Relevance and Significance

Previous studies have looked into the differences of end users as a source of information and end users as co-developers (e.g. Cui and Wu, 2017; Fang, 2008; Lin and Huang, 2013). This study is set to investigate and discuss three different levels of end-user involvement in NPD design for, design with, design by. These link with the concept of the active and central role of end users in co-creation (Prahalad and Ramaswamy, 2004) and with collaborative NPD activities where end users actively contribute and select elements of the new product being offered (O'Hern and Rindfleisch, 2010). In this sense, in all three compared levels, end users have an active and central role to the company's NPD processes. Additionally, because end user involvement in NPD has being researched from a number of different perspectives and different disciplines, it would be hard to clearly distinguish between the above-mentioned levels of end-user involvement in the current literature. For this reason, and in order to allow this study to investigate the effects of end-user involvement in-depth, the focus is on different approaches to end-user involvement which act as representatives for the three levels of end-user involvement. These include the instrumental approach (design for), open innovation (design with) and participatory design (design by); see Chapter 2. As a result of exploring comparing and amalgamating three different approaches of end-user involvement in NPD, it is hoped to gain more creative insights and a multiparadigm understanding of the investigated phenomenon (Lewis and Grimes, 1999: 678, 681). The above view also aligns with the suggestion of Cui and Wu (2017: 61) that different approaches to end-user involvement employ different ways to use end users' input and are likely to face different challenges and to be influenced by different conditions. Hence, by simultaneously investigating and comparing three different approaches of end-user involvement in NPD, this study seeks to offer a broader and more complete understanding of the contribution of end-user involvement to NPD outcomes.

Furthermore, most existing research on end-user involvement in NPD has been conducted in the context of business-to-business markets (B2B) (Hoyer et al., 2010: 292; Thomke and von Hippen, 2002: 10) and have a service domain rather

than a product domain focus (Perks and Roberts, 2014: 10-11). Therefore, by focusing on business-to-customer (B2C) context in the product domain, it is anticipated that this study will contribute to a deeper understanding of the role and effects of end-user involvement in NPD. Also, many previous studies have focused on investigating end-user involvement in the early NPD phases (e.g. Cauchick Miguel, 2005; Filieri, 2013; Tsimiklis et al., 2015). Differently, this study is set to investigate end-user effects in each of the NPD phases and hence is expected to offer a more holistic view of the phenomenon and at the same time to allow for more detailed observations and understanding of end users' role and contribution in NPD. Overall, this study is expected to enhance the understanding of end-user involvement in NPD and to provide practical guidelines to practitioners for better organising and managing end-user involvement.

1.4 Structure of the Thesis

The thesis consists of seven chapters which are structured as follows:

Chapter 1: Introduction

This chapter provides a background of the research by briefly introducing the topic of end-user involvement in NPD. The research background and research problem were outlined together with the aim and questions which guide this research. Furthermore, the methodological approach was briefly outlined, and the relevance and significance of the research were highlighted.

Chapter 2: Systematic Literature Review

This chapter starts with discussing the rationale of following a systematic literature review and presents its methodology, including Boolean codes and exclusion/inclusion criteria for identifying relevant studies on the topic. Following that the results on end-user involvement in NPD are discussed. The chapter then concludes with the main findings of the systematic literature review, the research questions that directly address the identified research gap a holistic overview of the three approaches and the proposed conceptual framework for the three approaches.

Chapter 3: Positioning the research

This chapter presents and discusses the concepts of new product development and end-user involvement. The first section discusses the NPD process and highlights the challenges associated with it. Next, end-user involvement is defined and discussed based on different roles that end users can take during the NPD process. Following that, an end-user involvement continuum is been presented, and finally, the three approaches to end-user involvement in NPD are introduced.

Chapter 4: Research Methodology

This chapter outlines and discusses the ontology and epistemology of the study, along with the selected research methodology. Following that it presents the research design including the rationale behind the multiple case study approach and the particular research methods for data collection. Next, the chapter outlines the data analysis techniques and concludes with addressing the criteria for judging the study's methodological rigour.

Chapter 5: Research Findings

This chapter includes the within-case analysis for the case studies. As such, it is using a narrative structure to provide detailed reports of the findings for each one of the case studies. Each case concludes with a summary of the main findings.

Chapter 6: Cross-case Analysis and Discussion

This chapter presents the cross-case analysis and provides an in-depth interpretation and discussion of the main findings of the study. The cross-case analysis brings together key issues and insights derived from the six case studies and develop a holistic understanding on why and how end users get involved in the NPD process as well as the impact this involvement has on the end product. Based on the discussion, a revised holistic overview for the different approaches to end-user involvement is presented.

Chapter 7: Conclusion

This is the final chapter of the thesis. This chapter starts with an overview of the thesis and following that it answers the research questions of the study. Next, it discusses and highlights the conclusions and the key theoretical, practical, and methodological contributions of the study. Finally, the chapter acknowledges the research limitations and proposes opportunities for further research.

1.5 Chapter Summary

This chapter provided an introduction to the research. The background of the research was briefly discussed, outlining the importance of end-user involvement in NPD and introducing the related research problem. Next, the aim and questions which guide this research were presented. Furthermore, the methodological approach was briefly outlined, and the relevance and significance of the research were highlighted. Finally, the structure of the thesis was presented.

Chapter 2: Systematic Literature Review

This chapter presents a systematic literature review that was conducted for identifying, synthesising and critically discussing the existing research-based knowledge and empirical evidence on the topic of end-user involvement in NPD through three approaches -namely instrumental approach (IA), open innovation (OI), and participatory design (PD). First, the three approaches are introduced. Following that, reasoning for conducting a systematic literature review and its methodology are presented. Next, the chapter emphasises the results of end-user involvement in NPD and discusses a hierarchy of evidence. The chapter then concludes with the main findings of the systematic literature review and the research questions that directly address the identified research gap.

2.1 Different Approaches to End-user Involvement

End-user involvement in NPD has been researched from different perspectives and different disciplines. Consequently, there is a vast amount of studies that broadly discuss this topic and there is no single discipline that has a monopoly on valid and useful research in this area. Researchers from the marketing domain and innovation domain provide many important views and relevant empirical research about the active involvement of end users in NPD. In addition, design studies discuss the creative, and often difficult to capture, aspects surrounding successful collaboration between end users and designers. Engineering and quality management studies also have interesting contributions to make to this field. Furthermore, within the different disciplines and domains, a variety of theoretical perspectives (such as ideas from organisational learning, knowledge management, resource-dependence theory, absorptive capacity, and so on) have been employed for generating insight on the end-user involvement in NPD phenomenon. However, this exploratory study views end-user involvement in NPD as a complex (social) system and following the suggestions by Coviello et al. (2012: 88) and Pratt (2008: 497-98) the study is approached with an open (theoretical) frame (rather than a single theoretical view). Hence, bearing in mind that the topic of end-user involvement in NPD has been researched from a wide range of (theoretical) perspectives and considering the different degrees of end-user involvement in NPD (discussed in subsection 3.2.2), this thesis explores, compares and discusses three different approaches for end-user involvement in the NPD process. These include

the ‘instrumental approach’, open innovation, and participatory design, and act as representatives of the three different degrees of end-user involvement in NPD (section 3.2.2). These three approaches emanate from different streams of research and differ in how end users are involved in different NPD phases. Furthermore, they are based on different viewpoints: the instrumental approach is based on the assumption that the ‘voice of the customer’ and particularly the emotions of end users are very important for NPD; open innovation is based on the assumption that companies should be open to external knowledge coming from end users and participatory design is based on the standpoint that end users can be equal members of the NPD team and contribute design and development of a new product. Finally, to the best of the author’s knowledge, these three approaches have never been brought together in a research study. However, it is important to note that this line of inquiry is not intended to suggest that there are only these three approaches that could act as representatives of end-user involvement in NPD; rather, it is utilised so to make it easier to approach the vast and complex literature. In the next subsections, the three approaches are described in some detail, highlighting the different perspectives of these approaches.

2.1.1 Instrumental Approach

The issue of product development according to end users’ needs has been a subject of many studies (e.g. Kahn et al., 2013). The instrumental approach (IA) consists of a number of similar methods that have been developed to support and capture the view and needs of customers, and translate them into product characteristics. These methods are quality function deployment (QFD), Kano’s model and Kansei engineering. Researchers in the past have discussed the integration of the three methods for providing a more structured and formalised methodology for NPD (e.g. Hartono et al., 2013; Taifa and Desai, 2015). However, QFD, as a means for bringing the voice of the customer into the NPD process (Bahill and William, 1993), is the main representative of the IA approach as it is the most commonly discussed in the literature and also (comparing to the other methods in the IA) most frequently used by companies.

In the late 1960 and early 1970, Yoji Akao and others in Japan worked on improving the design process of a new product, so it was high quality from the early phases

of the design cycle (Chan and Wu, 2002). This process, of improving the design, was called quality function deployment (QFD). Nowadays, QFD is been widely embraced by a variety of industries (e.g. manufacturing, software systems, services, education) as a means for bringing the 'voice of the customer' into the product development process from conceptual design through to manufacturing (Griffin, 1992; Bahill and William, 1993). By following the QFD method, it is assumed that the company already has a (product) idea and that the development of that idea will be oriented towards end-user needs (Huovila and Seren 1998; Kaulio 1998). Hence, end-user needs are the basis for further development and their requirements are transferred into technical specifications. Subsequently, QFD is a useful method for providing qualified insights on the end-user-oriented design of a product (Urban and Hauser 1993). QFD is usually illustrated as a four-step model, which includes the house of quality (HOQ), parts deployment, process planning and production planning (Shen et al., 2000). However, the HOQ which aims to identify end users' desires and requirements, is the most commonly used step by companies and the most discussed in the literature (Hauser and Clausing, 1988).

The Kano model is used with the aim to capture the non-linear relationship between product performance and customer satisfaction, and it is regarded as a useful tool for classifying and prioritising end-user needs (Kano et al., 1984). Kano's model is based on the assumption that meeting end users' expectations and requirements do not necessarily guarantee a higher level of satisfaction (Matzler and Hinterhuber, 1998). Building on this, three types of product attributes are identified which when met, may influence end-user satisfaction in different ways (Xu et al., 2009). These include must-be requirements (essential criteria of a product), one-dimensional requirements (end-user satisfaction is proportional to the level of fulfilment), attractive requirements (product criteria which have the most significant influence on how satisfied an end-user will be with a given product) (Kano et al., 1984). The Kano model is constructed through surveys which contain a set of question pairs for each and every product attribute (Berger et al., 1993). Kano's model is widely recognised and used in the analysis of end-user needs and satisfaction. It has been discussed by a number researchers as a useful tool to study end-user requirements and achieve better design in

various industries, such as electronics (Wang and Ji, 2010), website design (Tan et al., 1999; Zhang and Dran, 2001), and car design (Yadav et al., 2017).

Kansei engineering as a technique to translate end users' psychological feelings to product design characteristics was conceived in the 1970s in Hiroshima University by Mitsuo Nagamachi (2002). The Japanese expression 'kansei' could be loosely translated as 'total emotions' (Roy et al., 2009). More accurately, Kansei is interpreted as the impression somebody gets from a certain artefact, environment or situation using all of their senses of sight, hearing, feeling, smell, taste as well as their recognition (ibid:173). In this sense, using Kansei engineering NPD teams try to translate end users' emotions into product elements and apply them to the design and development of a new product. In the current literature, Kansei engineering has been discussed for the design and development of consumer goods such as mobile phones, sports shoes, refrigerators, shampoos (Chen et al., 2015; Nagamachi, 2008), and self-monitoring blood glucose applications (Dewi et al., 2017).

2.1.2 Open Innovation

The term open innovation (OI) was popularised by Henry Chesbrough in 2003, arguing that it is impossible for a company to have all the skills and knowledge in-house and thus it should open up to acquire and share knowledge, ideas and practices from the outside of its immediate environment. Hence, OI refers to "the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation respectively" (Chesbrough, 2006: 2). In this notion, NPD performance is not solely performed by internal R&D functions, but also depends on the contributions of a broad range of external players (e.g. customers, suppliers, competitors) (Bahemia and Squire, 2010: 603; Piller and Ihl, 2009: 5). Nevertheless, the dynamics of the change towards 'open' have deeper roots (e.g. many pharmaceutical companies began to look externally for product innovation in the 80s and 90s) (Golightly et al., 2012). Using the input of outsiders to improve internal NPD and innovation processes and to identify commercialisation opportunities in not as new as one may think (Huizing, 2011). More specifically, OI logic is based on concepts that first came to comprise it such as complementary assets (Teece, 1986), exploration versus exploitation (March, 1991) and absorptive capacity (Cohen and Levinthal, 1990).

When the focus is on involving end-users in the NPD process, OI echoes studies on the user innovation (von Hippel, 1986) and the not-invented-here syndrome (Katz and Allen, 1982), and has been touching on related concepts such as collaborative innovation (Sawhey et al., 2005), crowdsourcing (Howe, 2006), virtual customer integration (Dahan and Hauser, 2002), and co-creation (Prahalad and Ramaswamy, 2000). In recent literature, there is much discussion about the involvement of end users in the innovation process and their effective outcomes as an external resource for NPD. For instance, when following an open innovation approach, end users have been reported to be involved in the development of sports equipment (Franke and Shah, 2002), medical equipment (Lüthje, 2003) and software security features (Franke and von Hippel, 2003).

2.1.3 Participatory Design

Participatory design (PD) first originated in Scandinavia introducing user participation in decisions related to computing systems (Muller, 1991) as a response to the transformation of workplaces driven by the introduction of computers. This period was underlined by the 'workplace democracy movement' (Muller and Kuhn 1993) and was led by labour unions who suggested that good ideas may potentially arrive from employees; if they were given the opportunity to interact with or were consulted by technology designers. Therefore, the initial aim was to ensure that those who will use information technologies play a critical role in their design (Bannon and Ehn, 2013). Through the years, PD has evolved and has slightly changed its purpose. Iivary and Lyytinen (1998) and Smed et al. (2010) identify three generations of PD. In the first generation, PD started as a question of information and workers' rights (Thoresen, 1992) focusing mostly on policies, work-life and the organisation and tried to secure the workers with better tools for doing their jobs (Bannon and Ehn, 2013). In the second generation with the project UTOPIA intended to develop a marketable product by developing skill-enhancing tools and user-friendly IT systems for graphic workers (Sundblad, 2011). More recently, in the third generation, PD has been evolved and has moved from applications in IT and human-computer interaction to include applications in other various fields such as space design, product development, industrial design, and architecture (Sanders and Stappers, 2008). In PD researchers have developed a number of tools and techniques in order to strengthen the position of end-users in their efforts to improve work-life and more recently to participate in the design

and development of new products. Such techniques are scenario building, idea writing and sketching, future workshops, organisational games, cooperative prototyping and mock-ups (Demirbilek and Demirkan, 2004; Kensing and Blomberg, 1998). Hence, PD is meant to help NPD teams and end-users to work together and to jointly make things (e.g. prototypes) (Pals et al., 2008). Overall, PD helps to overcome the shortcomings of traditional market research, in which one tries to capture what people say (e.g. through focus groups or interviews), or what people do (e.g. through observations); alternatively, participatory design is about what people make (e.g. sketches) (Sanders, 2000).

In the current literature, the terms participatory design and co-design are usually used interchangeably. Sanders and Stappers (2008:7) argue that "the terminology used until the recent obsession with what is now called co-creation/co-design" was ‘participatory design’. For clarity, the term ‘participatory design’ (PD) will be used throughout this thesis.

2.2 Reasoning for Conducting a Systematic Literature Review

The need for a systematic literature review mainly stems from the observation that current literature on end-user involvement is highly dispersed; covering different aspects of end-user involvement (e.g. when to involve end users or what type of end users), different disciplinary views at different level of analyses, different NPD phases (e.g. focusing on the fuzzy front end), different industries, different contexts (e.g. business-to-business or business-to-customer) and different approaches to research (e.g. quantitative studies or qualitative studies). Furthermore, whereas different studies (either conceptual or empirical) have discussed how or why end users may be involved in the NPD process, relations and comparisons between different facets of end-user involvement in NPD have been omitted. Another reason for choosing a systematic literature review is that it uses explicit and rigorous criteria to identify, critically evaluate and synthesise all the literature on a particular topic (Cronin et al., 2008: 38; Denyer and Tranfield, 2009; Tranfield et al., 2003: 216). Therefore, through a systematic literature review on three approaches to end-user involvement in NPD, this thesis offers a multi-level and multi-perspective review for identifying and synthesising the

diverse empirical literature on this topic. Based on the above insight, the following review questions have been addressed to direct the systematic literature review:

- What is the impact of end-user involvement in NPD?
- Is there evidence that the three approaches are different towards the impact of end-user involvement in NPD?
- In which phase of NPD end users are involved in the three approaches, and which tools they use?

2.3 Systematic Literature Review Planning

The search for relevant papers to be included in the systematic literature review covered the period of up to December 2017. To retrieve as many relevant studies as possible and to avoid specific publishing sources, three databases were used: Google Scholar, Scopus and EBSCOhost[2]. The subsequent search and selection process followed four consecutive steps:

1. Search terms and elimination of duplicates

First, through the scoping of the literature which took place prior to the systematic research of literature, the most appropriate keywords and search-terms were identified. Whereas there are different ways of end-user involvement in NPD, participatory design, open innovation, and the instrumental approach were selected as cases of conceptualisations for representing the three-levelled categorisation of end-user involvement (i.e. design by, design with, design for – section 3.2.2). Hence, the keywords guiding the literature search were centred around the concept of NPD in the innovation management domain and were specifically selected to represent the three identified representative approaches to end-user involvement (participatory design, open innovation and instrumental approach). Although no particular literature streams (e.g. marketing orientation) were deliberately excluded, the specific keywords used could have contributed to limiting return results that were not concerned directly with end-user involvement in NPD (which is the phenomenon under investigation in this study). Table 2.1 distinguishes the different major terms and summarises all keywords used in the

[2] Search on EBSCOhost included all Business and Management databases: Business Source Premier, EconLit, PsycARTICLES, Psychology and Behavioral Sciences Collection, PsycINFO and SocINDEX with Full Text

searches. Using specific combinations of these keywords different versions of Boolean expressions were formed (e.g. ["new product development" OR "product development" OR "product design"] AND ["participatory design" OR "Scandinavian design" OR "co-design" OR "codesign"] AND ["customer" OR "consumer" OR "user"]). The search across all three databases yielded 19,668 academic titles in total. However, during an initial screening, many of these articles were found multiple times in among the three databases or they were not published in an academic journal or deemed not relevant as they did not focus explicitly on the combination of end-user and their involvement in NPD. Thus, after removing not relevant papers and duplicates, the sample was reduced to 302 academic titles.

Table 2.1 Terms and keywords used for searches in the systematic literature review

Terms	End-user	Involvement	NPD	Approach
Keywords	User; customer; consumer; end user; end-user	Involvement; integration; participation; co-creation; cocreation; co-development; co-production	New product development; product development; product design	Open innovation; participatory design; co-design; codesign; Scandinavian; quality function deployment; kano model; kano; kansei engineering; kansei

2. Setting inclusion and exclusion criteria and title and abstract screening

As a second step, exclusion and inclusion criteria were set to filter the results and identify articles relevant to the purpose of the study. It was decided to include only peer-reviewed journal articles that contained empirical evidence and exclude propositional papers, for example, literature reviews (e.g. Greer and Lei, 2012; Kujala, 2003; Scariot et al., 2012), books or book chapters (e.g. Rioboo, 2016; Wu et al., 2017), conference papers (e.g. Papageorgiou et al., 2017), and master dissertations and doctoral theses (e.g. Gunia, 2015; Li, 2015). Another important criterion for identifying relevant studies was to include articles focusing on product development. Having this in mind, studies about services design and development were excluded (a case in point being Bowen et al. (2013)). In addition, the focus of this study is the NPD process and therefore studies broadly discussing end-user involvement outside of the NPD process boundaries (e.g. after

product launch or before the FFE) were excluded. Titles and abstracts were read and papers that fell outside of the study's scope and did not meet the inclusion and exclusion criteria (see table 2.2 for a detailed overview on inclusion and exclusion criteria) were eliminated (Adams et al., 2016; Bakker, 2010).

Table 2.2 Inclusion and exclusion criteria

Criterion	Inclusion	Exclusion	Reason for Inclusion/exclusion
Study type	Peer-reviewed journal articles, empirical studies	Conference papers, books and book chapters, theoretical and conceptual studies, master and doctoral theses (e.g. Alves et al., 2015 or Haro et al., 2014)	Empirical journal articles since are peer-reviewed are more likely to show reliable results and most advanced level of research than less formally published studies.
Date	Any study published between 1990 and December 2017	All studies published before 1990	The study has a broad timeframe and thus, this gives the ability to identify as many relevant studies as possible.
Language	English	Any other language	Most journal articles are published in English and this is the only relevant language that the author is fluent in.
Context relevance	Addresses end-user involvement in NPD and/or: • tools and methods for end-user involvement • types of end user (e.g. Herstatt and von Hippel, 1992) • types of innovation (e.g. Coviello and Joseph, 2012) • including details of the research methods	Focus is on: • services and service design (e.g. Kristensson et al. 2008) • customisation (e.g. Tarara et al., 2015). • other external sources and not explicitly on end users (e.g. Santoro et al., 2017; Svendsen et al. 2011) • motivating end-user involvement in NPD (e.g. Antikainen; Fernandes and Remelhe, 2016) • both product and service sectors (e.g. Mahr et al., 2014) • broadly discussing end-user involvement prior to FFE or after product launch	Including papers that are looking into other external sources (e.g. suppliers) or into other concepts (e.g. motivation for end-user involvement) broadens the scope too much.

3. ***Full-text assessment***

The third step entailed retrieving the 247 articles and reading the full texts (Bakker, 2010). After close examination of the contents of the articles, 151 of them were excluded as not relevant.

4. Additional searching

Finally, through snowballing and serendipitous search techniques a further 3 articles were included leading to a final sample of 99 papers for further analysis; Figure 2.1 illustrates the selection process.

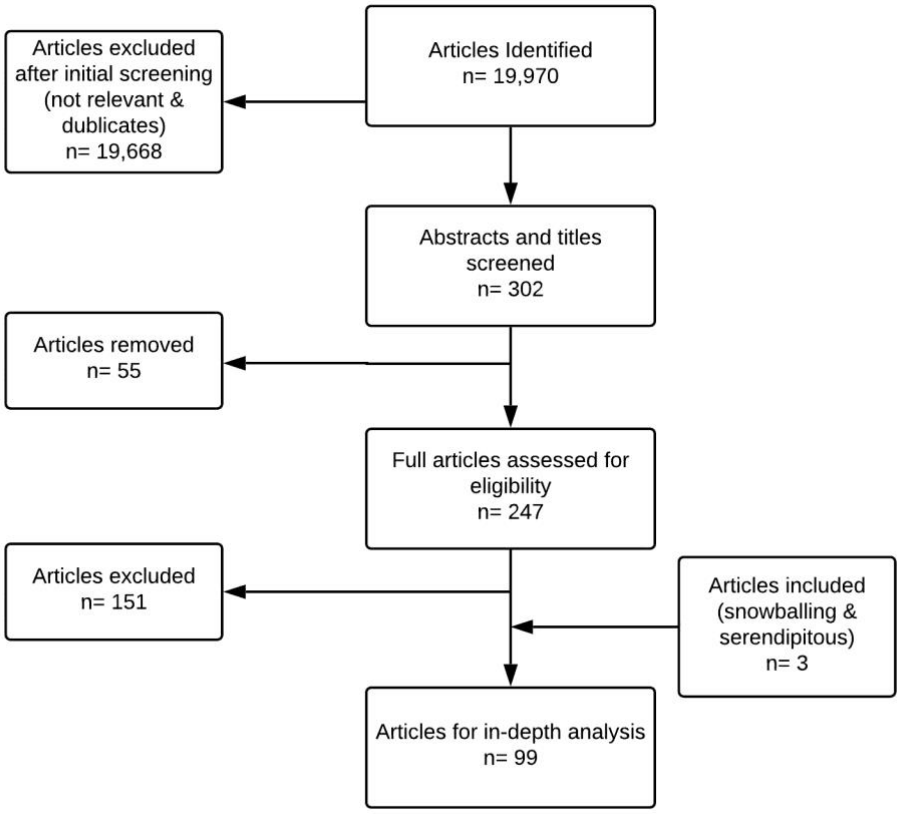

Figure 2.1 PRISMA illustrating the articles selection process

After all relevant papers were obtained, they were classified based on their contents into three themes following Tranfield et al.'s (2003) remark about thematic analysis. Table 2.3 provides an overview of the retrieved papers per theme.

Table 2.3 Overview of retrieved papers per theme

Topic	Approach	Authors
Impact of end-user involvement	Open Innovation	Antorini and Muñiz (2013), Cui and Wu (2016), Cui and Wu (2017), Daecke et al. (2015), Dahlsten (2004), Enkel et al. (2005a), Enkel et al. (2005b), Filieri (2013), Füller and Matzler (2007), Gruner and Homburg (2000), Herstatt and Hippel (1992), Jahanmir and Lages (2015), Jespersen (2010), Karagozoglou and Brown (1993), Krasae-In and Anuntavoranich (2016), Lettl (2007), Liu and Fang (2017), Olson and Bakke (2001), Sandmeier et al. (2010), Schaarschmidt and Kilian (2014), Tsimiklis et al. (2017), Vrgović and Jošanov-Vrgović (2017)
	Participatory Design	Barcellini et al. (2015), Han et al. (2016), Hess et al. (2013), Hussain et al. (2012) Kautz (2011), Krasae-in (2017), Lahti and Seitamaa-Hakkarainen (2005), Merter and Hasirci (2016), Olsen and Welo (2011), Pals et al. (2008), Reed et al. (2015), Roberts and Darler (2017), Stålberg et al. (2016), Suteu and Buzatu (2014), Wilkinson et al. (2016), Wilkinson and De Angeli (2014)
	Instrumental Approach	Ahmed and Amagoh (2010), Bergquist and Abeysekera (1996), Carnevalli and Cauchick Miguel (2011), Cauchick Miguel (2005), Chen (2010), Chen and Chuang (2008), Cristiano et al. (2001), Cristiano et al. (2000), De Pelsmaeker et al (2015), Dewi (2016), Dominici and Palumbo (2013), Elboushi and Sherif (1997), Ettlie et al. (1994), Erikkson and McFadden (1993), González et al. (2003), Griffin (1992), Hauser (1993), Lai et al. (2007), Lin et al. (2006), Lockamy and Khurana (1995), Martins and Aspinwall (2001), Matzler and Hinterhuber (1998), Nagamachi (2002), Nakada (1997), Rahman and Rahim (2006), Shen and Wang (2016), Soota (2017), Sun et al. (2009), Taifa and Desai (2015), Tama et al. (2015), Tontini (2007), Tottie and Lager (1995), Vatthanakul et al. (2010), Vonderembse and Raghunathan (1997), Waisarayutt and Siritaweechai (2006), Wang and Ji (2010), Wood et al. (2016), Xiong et al. (2016)
Phase of involvement	Open Innovation	Bae (2008), Blohm et al. (2011), Bosch-Sijtsema and Bosch (2015), Daecke et al. (2015), Dahlsten (2004), Enkel et al. (2005b), Filieri (2013), Füller et al. (2008), Gassmann et al. (2006), Gruner and Homburg (2000), Jahanmir and Lages (2015), Jespersen (2010), Krasae-in (2017), Krasae-In and Anuntavoranich (2016), Laage-Hellman et al. (2014), Lettl et al. (2006), Lettl (2007), Öberg (2010), Olson and Bakke (2001), Rohrbeck et al. (2009), Schaarschmidt and Kilian (2014), Tsimiklis et al. (2017)
	Participatory Design	Barcellini et al. (2015), Bruno and Muzzupappa (2010), Han et al. (2016), Hess et al. (2013), Hussain et al. (2012), Lahti and Seitamaa- Hakkarainen (2005), Merter and Hasirci (2016), Pals et al. (2008), Reed et al. (2015), Stålberg et al. (2016), Suteu and Buzatu (2014), Wilkinson et al. (2016), Wilkinson and De Angeli (2014)
	Instrumental Approach	Ahmed and Amagoh (2010), Arrighi et al., (2015), Bergquist and Abeysekera (1996), Cauchick Miguel (2005), Cauchick Miguel (2013), Chen and Chuang (2008), Dominici and Palumbo (2013), Elboushi and Sherif (1997), Erikkson and McFadden (1993), Hauser (1993), Ionica and Leba (2015), Lai et al. (2007), Lin et al. (2006), Nagamachi (2002), Nakada (1997), Pullman (2002), Shen and Wang (2016), Taifa and Desai (2015), Tottie and Lager (1995), Waisarayutt and Siritaweechai (2006), Wood et al. (2016)
Tools used during the NPD process	Open Innovation	Almirall and Wareham (2008), Antikainen et al. (2010), Antorini and Muñiz (2013), Bae (2008), Bosch-Sijtsema and Bosch (2015),Covielo and Joseph (2012), Daecke et al. (2015), Dahlsten (2004), Enkel et al. (2005b), Filieri (2013), Füller and Matzler (2007), Herstatt and Hippel (1992), Hofstetter et al. (2017), Karagozoglou and Brown (1993), Krasae-In and Anuntavoranich (2016), Kohler et al. (2011), Laage-Hellman et al. (2014), Olson

Topic	Approach	Authors
		and Bakke (2001), Prugl and Schreier (2006), Rohrbeck et al. (2009), Schaarschmidt and Kilian (2014), Tsimiklis et al. (2017), Vrgović and Jošanov-Vrgović (2017)
	Participatory Design	Barcellini et al. (2015), Bruno and Muzzupappa (2010), Han et al. (2016), Hess et al. (2013), Hussain et al. (2012), Kautz (2011), Krasae-in (2017), Lahti and Seitamaa-Hakkarainen (2005), Merter and Hasirci (2016), Olsen and Welo (2011), Pals et al. (2008), Reed et al. (2015), Roberts and Darler (2017), Stålberg et al. (2016), Suteu and Buzatu (2014), Wilkinson et al. (2016), Wilkinson and De Angeli (2014)
	Instrumental Approach	Ahmed and Amagoh (2010), Bergquist and Abeysekera (1996), Bouchard et al. (2009), Chen and Chuang (2008), De Pelsmaeker et al (2015), Dewi (2016), Dominici and Palumbo (2013), Duhovnik (2006), Elboushi and Sherif (1997), González et al. (2003), Griffin and Hauser (1993), Hauser (1993), Ioanica and Leba (2015), Lai et al. (2007), Matzler and Hinterhuber (1998), Nakada (1997), Pullman (2002), Nagamachi (2002), Rahman et al. (2006), Shen and Wang (2016), Soota (2017), Taifa and Desai (2015), Tama et al. (2015), Tontini (2007), Tottie and Lager (1995), Vatthanakul et al. (2010), Waisarayutt and Siritaweechai (2006), Wang and Ji (2010), Wood et al. (2016), Xiong et al. (2016)

Following that, each retrieved paper was read again, and inspired by the study of Ryan and Bernard (2003: 94) 'cutting and sorting' was used by identifying and highlighting keywords or text that were relevant to each of the themes and then arranging them into categories that go together. This resulted in different sub-themes. To ease the later discussion, analysis and interpretation of data, some of the sub-themes were combined and some were split into subcategories (Table 2.4). 'Impact of end user' was divided into two sub-themes, (i) benefits and (ii) challenges, and into a number of subcategories, according to the keywords or key-phrases identified in the retrieved papers (e.g. cost, engagement, product requirements, end-user needs, time). The theme 'phases of involvement' was divided into three sub-themes (phases of NPD) for the reason that there is a variety of NPD models used across the papers and in some cases, some of the phases overlap or are not very clearly described as to what they include (see section 3.1). Finally, regarding the theme 'tools used during the NPD process', this was divided into three sub-themes according to the type of interaction that end users have with the companies during the NPD process. A detailed description of the three sub-themes can be found in subsection 2.4.4.

Table 2.4 Themes, subthemes, and subcategories

Themes	Subthemes	Subcategories
Impact of end-user involvement	• Benefits • Challenges	Benefits related to: end user, risk, ideas generated, planning, financial factors
Phases of involvement	• Idea phases • Development phases • Launch phases	Idea phases: idea generation, concept development Development phases: design development, testing Launch phases: pre-announcement, market launch
Tools used during the NPD process	• Indirect • Direct • Web-technology based	Indirect: survey, interview, observation, questionnaires, complaints/remarks, user clinics Direct: mock-up, brainstorming, workshop, inspirational pictures/story cards, presentations, focus groups, living labs, evaluation sessions Web-technology based: online forums/communities, wiki systems, virtual design platforms, open-source software, online interviews, online surveys

2.4 Systematic Literature Review Results and Analysis

Before the detailed analysis of the 99 papers according to the different themes and sub-themes takes place, some significant observations will be discussed.

2.4.1 Popularity and Publications

Because the three approaches originated from different regions, it shall be expected that each one of them would have been applied mostly in its region of origin; OI was popularised in the U.S.A. through Chesbrough's (2003) writing, PD has its origins in the Scandinavian countries (Ind, 2013) and IA methods root in Japan (Akao and Mazur, 2003; Green and Wind, 1975; Löfgren and Wittel, 2008; Nagamachi, 1995). However, findings from the systematic literature review show differently, see Table 2.5. It is interesting to see that with regard to OI 18 out of 39 empirical studies have taken place in Europe. Likewise, whereas IA has been used nine times in studies that took place in Asian countries, the second nation of application and very close to this number is the U.S.A. with six studies taking place there. However, IA seems to be applied across a larger range of nations. Finally, although the seventeen papers about PD constitute a narrow base for comparison, it is worth mentioning that besides Europe it has also been used in a case study in a developing country (i.e. Cambodia), which agrees with the broader aim of PD to increase the involvement of socially and economically marginalised people in

decision making over their own lives. Thus, within the set of retrieved papers, it is interesting to see that researchers are applying OI mostly in European countries, whereas the most empirical studies for IA have taken place in Asia and the US; moreover, the seventeen papers on PD are not enough to draw conclusions but provide an indication that this approach is perhaps less in use by companies in the U.S.A. and Asia.

Table 2.5 Empirical studies per region

	Open Innovation	Participatory Design	Instrumental Approach
Europe	18	7	6
North Europe	1	1	2
United States	3	-	6
South America	-	-	3
Asia	2	1	9
Developing Countries	-	1	-
International	2	-	4
Unclear	13	7	13

In addition to where studies took place, another interesting finding is the number of publications during years for each one of the three approaches (see Table 2.6). Although PD was introduced in the late 1970s, according to Ind (2013: 88), all retrieved papers about end-user involvement were published during the last twelve years. Again, seventeen papers are not enough to draw conclusions, but this supports the need for more research on PD. In contrast, IA appears to have almost a constant stream of publications from 1992 until 2017, and the publications about OI have increased since 2000, which corresponds with its popularisation. Hence, this probably indicates that PD is still a relatively obscure approach for NPD.

Table 2.6 Number of publications

	1992-1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2017	Total
Open Innovation	2	-	3	13	11	10	39
Participatory Design	-	-	-	2	7	8	17
Instrumental Approach	5	7	6	8	7	10	43

2.4.2 Why Do End Users Get Involved?

The retrieved papers also generate insight into the benefits and challenges associated with end-user involvement during NPD. Different categories regarding the benefits and the challenges of end-user involvement in NPD have emerged, and these will be discussed in the next subsections.

2.4.2.1 Benefits of end-user involvement

To start with, Table 2.7 displays the categorisation into benefits that are related directly to end-user needs, risk mitigation, idea generation, product development planning and financial factors. One of the most cited reasons in the literature for end-user involvement in NPD is the opportunity to enhance product performance by a better understanding of end-user needs (e.g. Kujala, 2008). Hence, not surprisingly, the identification and better understanding of end users' real needs and requirements, and the identification of important design features, is addressed in all three approaches and is often stressed as a means to increase end-user satisfaction (e.g. Ahmed and Amagoh, 2010: 210; Dahlsten, 2004: 147; Dominici and Palumbo, 2013: 90; Han et al., 2016: 21; Hussain et al., 2012: 109; Lin et al., 2006: 242; Nakada, 1997: 130; Olsen and Welo, 2011: 189; Stålberg et al., 2016: 156; Suteu and Buzatu, 2014: 223; Tsimiklis et al., 2015: 67; Wang and Ji, 2010: 173; Wood et al., 2016; Xiong et al., 2016:11). Only for PD is it also shown that end-user involvement increases long-term adoption of products and product engagement (Hussain et al., 2012; Wilkinson and De Angeli, 2014). This is further evidenced in the study of Wilkinson and De Angeli (2014: 629), which was focused on co-designing products with end users who belonged to 'sensitive' demographics (older people and people with disabilities) and emphasised identifying and drawing out the potential psychological impact that design has upon end-user self-esteem. Also, in another study by Wilkinson et al. (2016: 86), it is emphasised that close engagement with end users leads to the identification of subconscious as well as conscious needs and preferences. Liu and Fang (2017: 2) argue that products developed through OI could be either more reliable or more technologically advanced in the eyes of the consumers; however this is not supported by any other of the 38 retrieved studies. Thus, whereas all three approaches have the potential to effectively capture end-user needs and requirements and use them for the development of new products, the results

confirm that PD differentiates from OI and IA by taking in terms of a deeper understanding of the end-user perception and experience.

Table 2.7 Benefits of end-user involvement

Benefits related to	Open Innovation	Participatory Design	Instrumental Approach
1. End-user			
Requirements/needs identification	●	●	●
Increase engagement/adoption	○	●	○
2. Risk			
Reduce uncertainty of product designs	●	●	●
Reduce changes in later phases of NPD	○	○	●
3. Ideas generated			
Increase number of ideas	●	●	○
Increase degree of novelty of ideas	●	●	○
4. Planning			
Better insight into product requirements	○	●	●
Prioritise product requirements	●	○	●
Enhanced communication between departments	○	○	●
5. Financial factors			
Reduce product development cost	●	○	●
Reduce time-to-market	○	○	●
Identification of new markets	○	●	○

●...addressed in the literature ○...not addressed in the literature

Notwithstanding the more intimate involvement of the end user in the case of PD, the main aim of all three approaches is to develop products that meet end-user needs; this often leads to the creation of better looking, better functioning and more relevant products (Antorini and Muñiz, 2013: 27). Therefore, involving end users into NPD processes can minimise risks associated with product design. The openness and collaboration between end users, and between end users and designers in OI can reduce uncertainty, lack of clarity and failure rates of new products (Daecke et al., 2015: 421; Dahlsten, 2004: 147; Filieri, 2013: 49; Sandmeier et al., 2010: 103), and gives the chance for the development of better functioning and more relevant products (Antorini and Muñiz, 2013: 27). Similarly, in IA, proper analysis of end-user requirements (including comparison against product requirements that are deemed important by designers and engineers) can result in successful products with more attractive designs and reduce complaints

and returns of products (Cauchick Miguel, 2005: 76; Nagamachi, 2002: 293; Nakada, 1997: 139; Rahman and Rahim, 2006: 386; Vatthanakul et al., 2010: 344). With regard to PD, the outcome of reduced uncertainty about product designs is partly supported by the evidence in the retrieved papers. However, based on the fact that end-user feedback influences design decisions and designers, and end users have close and continuous interaction during the design of a product, it becomes perceptible that this can have positive effect on the design of a product and reduce uncertainty (Hussain et al., 2012: 109; Lahti and Seitamaa-Hakkarainen, 2005: 113). Furthermore, the systematic way of thinking that IA promotes (all end-user requirements are classified and put against all product characteristics) results in better understanding of the new product's requirements, and in reduction of design changes in the last phases of NPD (Cauchick Miguel, 2005: 78-79; Elboushi and Sherif, 1997: 142). Putting it all together, whereas the three approaches are capable of reducing the uncertainty of product designs, IA also has the potential to reduce changes in products in later phases of NPD, something that has not been addressed for OI and PD.

Regarding the benefits related to idea generation, end-user involvement in OI and PD results in an increasing amount of ideas and solutions generated, fosters products' degree of novelty and, therefore, enables faster and more efficient responses to market changes (Hussain et al., 2012: 109; Jahamir and Lages, 2015: 73; Krasae-in and Anuntavoranich, 2016: 579; Lettl, 2007: 69; Merter and Hasirci, 2016: 15; Sandmeier et al., 2010: 103; Vrgović and Jošanov-Vrgović, 2017: 459; Wilkinson and De Angeli, 2014: 628). Contrastingly, for IA, there is no discussion in any of the retrieved papers about the number or characteristics of ideas generated. This supports the notion that IA is explicitly focused on improving existing products (e.g. González et al., 2003 and Tontini, 2007: 602), whereas OI and PD seem to have the potential to support the development of new ideas.

As already mentioned, IA promotes a systematic way of thinking, and so it has an excellent potential for using it as a tool for planning the development processes (Chen, 2010: 678; Waisarayutt and Siritaweechai, 2006: 178). In this sense, Vatthanakul et al. (2010: 344) assert that IA supports representation and structuring of end-user requirements, especially on how to link those requirements to product characteristics. Moreover, through the use of matrices

and models (mainly the house of quality [HoQ]), product requirements are prioritised, and planning becomes more specific, leading to a more precise and easier competitive analysis (Cauchick Miguel, 2005: 76; Chen and Chuang, 2008: 670; Elboushi and Sherif, 1997: 142; Erikkson and McFadden, 1993: 497). In addition to the use of planning and the analysis of requirements, QFD is an instrument for communicating information between different departments within a company (Tottie and Lager, 1995: 267). Communication between different departments of a company gets improved and cross-functional integration is being promoted, resulting in better decision-making processes (Martins and Aspinwall, 2001: 36; Matzler and Hinterhuber, 1998: 36; Waisarayutt and Siritaweechai, 2006: 178). Differently to IA, OI and PD have been limitedly studied with regard to the benefits related to the effective planning of the development process and enhanced communication. The studies of Hussain et al. (2012: 109), Roberts and Darler (2017: 23-24) and Stålberg et al. (2016:156) are the only ones stressing that interaction between end users and designers in PD has potential to generate further insight into product requirements. For OI, Filieri (2013: 51) suggests that if a company involves its end users in the early phases of NPD, it will understand how end users react to new product's offerings and, thus, it will be able to identify which kind of project should be prioritised. Hence, a number of retrieved papers demonstrate the advantages that IA has on planning processes related to end-user involvement in NPD in comparison to the two other approaches.

Benefits of end-user involvement related to financial factors include reduction of product development costs, lessening time-to-market and identification of new markets. Wilkinson and De Angeli (2014: 628) state that because in PD designers can have a close liaison with target demographics (in their case older people and people with disabilities), it can help companies realise new avenues for ideation inspired directly from end-user involvement in the design and development process; this could lead to another potential source of revenues. However, OI and IA seem to have more direct benefits of involving end users in the NPD process. In the studies of Herstatt and von Hippel (1992: 220) and Karagozoglou and Brown (1993: 210), OI is found to be faster and less costly than other marketing research methods; also Sandmeier et al. (2010: 103) stresses that end-user involvement helps to enable faster and more efficient reaction to market changes. Similarly, IA also enables companies to reduce costs and shorten time-to-market (González

et al., 2003: 54; Vonderembse and Raghunathan, 1997: 269). Therefore, by involving end users in NPD, OI and IA studies claim that firms might reduce product development costs and time-to-market; differently, PD is reported to have only potential for discovering or creating new markets.

At this point, it is worth mentioning that some of the retrieved studies suggest that the instrumental methods (QFD, Kano's Model, and Kansei Engineering) can be more successful when used as complementary to one another or in combination with other tools. For instance, in their study González et al. (2003: 54–5) made use of factor analysis in order to reduce the amount of end-user requirements obtained from HoQ in a structured form and Chen and Chuang (2008: 680) integrated robust design with the Kano model to enhance end-user satisfaction and product quality. In other cases, increased benefits have been reported by using QFD in combination with Kano's method or process management (Chen, 2010: 678; Lai et al., 2007: 55; Matzler and Hinterhuber, 1998: 36). More specifically, by integrating the Kano model for the non-linear relationship between performance and satisfaction into QFD, it can enhance the understanding of end-user needs, leading to superior product designs (Tontini, 2007: 600, 602).

Whereas the three approaches emanate from different traditions and perspectives, they have been found to not only have differences but also to share similarities regarding the benefits of involving end users in NPD. To begin with, OI, PD and IA are similar in two points: (i) to successfully identify end-user needs and requirements and (ii) to reduce risks related to the uncertainty of product designs. Furthermore, although OI's philosophy is closer to that of PD, with regard to the benefits of end-user involvement, it shares more similarities with IA. More specifically, this is expressed by the reduction of product development costs and time-to-market, and by the prioritisation of product ideas and requirements. PD has been found to be similar to OI in terms of the increased number of ideas generated and the increased degree of novelty of ideas. The only similarity between PD and the IA, other than the two that were mentioned at the start and are similar between all three approaches, is that they can get a better insight into product requirements. Moreover, PD increases product engagement and potential of identifying new markets, whereas the IA can lead to fewer changes in later phases of NPD and can boost communications between the departments of a

company. So, despite their different perspectives, the three approaches have been found to share similarities on the benefits of involving end users in NPD.

2.4.2.2 Challenges for end-user involvement

Effectively involving end users in NPD process is not that simple, as can be derived from the retrieved papers. Despite the many benefits a company can gain, there are also risks and challenges that should not be overlooked. Nevertheless, discussion on this matter is not very common in the current literature. However, the following paragraphs discuss the challenges and risks as they have been identified from the systematic review of papers (see Table 2.8).

Table 2.8 Challenges of end-user involvement

Challenges related to	Open Innovation	Participatory Design	Instrumental Approach
Articulating end-user needs	●	●	●
Tools and methods used	●	●	○
Identification of right type of end user	●	○	○
Phase of end-user involvement	●	○	○
Communication between company and end users	●	●	●
Communication within company	○	○	●
Time-consuming	○	○	●
Complexity of products	○	●	●

●...addressed in the literature ○...not addressed in the literature

Identifying end-user needs is the main aim of end-user involvement in all three approaches, but this alone is not enough if those needs cannot be properly translated into product characteristics and products that end users really want. The ability of the company to understand its end users is crucial to the NPD process as it could shorten the time for identifying solutions that correspond to end users' needs (Krasae-in, 2017: 159). There is consensus in the retrieved papers that articulating end-user needs is a major challenge for companies regardless of the approach followed. Among the OI studies, it is argued that companies often fail to benefit sufficiently from end-user involvement in NPD processes, as they fail in identifying latent and unarticulated end-user needs (Cui and Wu, 2016; Enkel et al., 2005a; Schaarschmidt and Kilian, 2014). Similarly, in PD end users may focus

on wrong considerations or face difficulties on articulating their views and ideas (Lahti and Seitamaa-Hakkarainen, 2005: 113) and in IA there are times that companies have problems in attaining the voice of the customer (Martins and Aspinwall, 2001: 586). So, effectively articulating end-user needs is a common challenge for all three approaches.

In addition to the difficulties with eliciting requirements from end users, the selection of appropriate tools and methods is another concern for OI and PD approaches (Enkel et al., 2005a: 212; Hess et al., 2013: 587). This is not the case for the IA, which is limited to more straight-forward traditional tools (e.g. interviews) for collecting information about end users. However, in the studies of González et al. (2003: 54–5) and Lai et al. (2007: 55), it is suggested that QFD in combination with other methods, such as Kano's method or factor analysis, can reduce and better interpret end-user requirements obtained from HoQ. Hence, the use of appropriate tools in order to have more effective communication and outcomes from the involvement of end users during the NPD process is a challenge in OI and PD, whereas in the IA sometimes integration of the methods and complementary tools are used for better interpretation of end-user information.

Moreover, effective involvement of end users in OI is considered to be highly dependent on the selection of the end-user type and the phase of NPD in which end users get involved, as well as the degree of novelty of the developed product (Enkel et al., 2005b: 432; Jespersen, 2010). It is further suggested that different NPD phases require different types of end users (Jespersen, 2010: 486).

Issues in communication (either internally in the company or between company and end users) are also evident in a few studies. For example, in their study, Enkel et al. (2005a: 210) maintain that quite often part of end users' information disappears due to misunderstandings between end users and employees and lack of proper articulation of their needs and ideas. In a similar way, Cui and Wu (2017:74) suggest that companies may face difficulties in utilising and processing a high amount of information coming by end users. In addition, poor management of heterogeneity of a group, use of inadequate tools or lack of common terminology can lead to difficulties in articulating end users' needs when they are working with designers in the PD approach (Hess et al., 2013; Reed et al., 2015: 409). Appropriate management support, the organisational structure and the

culture that supports it, are also essential for successful implementation of HoQ in QFD (Cristiano et al., 2001: 93; Griffin, 1992: 183). Moreover, factors such as top management support, good communication between end users and designers, organisational structure, and keeping end-user requirements in front of engineers as they design the product play a crucial role on the success of end-user involvement in NPD in the three approaches.

Another determinant that can affect the success of using IA is related to the time that it takes to implement it (Carnevalli and Cauchick Miguel, 2011: 57; Martins and Aspinwall, 2001: 586). In support of this notion, Martins and Aspinwall's (2001: 586) study on UK companies implementing QFD has shown that these companies considered it to be very time consuming, although the majority only used HoQ. There are just two studies related to PD approach acknowledging that involving end users in NPD can be time-consuming, however, it is not perceived to be a significant challenge as through this approach, more appropriate and desirable products can be created and uncertainties on product design are reduced (Merter and Hasirci, 2016: 15; Reed et al., 2015: 409). Moreover, the complexity of the developed product can also be a challenge when implementing QFD, as the design of more complex products is less apt to benefit from this approach (Cristiano et al., 2000: 94; Ettlie et al., 1994: 114). The latter is also the only other challenge that designers in PD face; according to Pals et al. (2008: 290) it is best suited for specific design questions (rather than predicting adoption or considering how the product is experienced). Hence, the three approaches are mainly addressed to face different challenges during their NPD processes.

In conclusion, for OI the concern is about challenges regarding end users and tools, whereas the IA focuses more on internal relationships and the complexity of products. Finally, PD seems less challenged, but that might also have to do with the smaller number of papers retrieved for this approach.

2.4.3 When Do End Users Get Involved?

After exploring the benefits and challenges of end-user involvement in the three approaches, attention turns towards the phase or phases of the NPD process in which end users are or should be involved. For reasons that many of the research papers (i) do not specify the phase of involvement for the end users or (ii) are

using terms that are too generic to define the phase (e.g. early design phases in Pals et al., 2008: 290) or (iii) investigate end-user involvement in different industries or different settings and therefore make use of different NPD models, it was decided that NPD would be divided into three broader phases namely: ideation, development and launch (see Table 2.9).

Table 2.9 Phases of end-user involvement

	Open Innovation	**Participatory Design**	**Instrumental Approach**
Idea phases (idea generation, concept development)	Bae (2008), Bosch-Sitjema and Bosch (2015), Blohm et al. (2011), Daecke et al. (2015), Dahlsten (2004), Filieri (2013), Füller et al. (2008), Gassmann et al. (2006), Gruner and Homburg (2000), Jahamir and Lages (2015), Krasae-In and Anuntavoranich (2016), Öberg (2010), Olson and Bakke (2001), Rohrbeck et al. (2009), Schaarschmidt and Kilian (2014), Tsimiklis et al. (2015)	Han et al. (2016), Krasae-In (2017), Merter and Hasirci (2016), Reed et al. (2015), Suteu and Buzatu (2014), Wilkinson et al. (2016)	Ahmed and Amagoh (2010), Arrighi et al. (2016), Bergquist and Abeysekera (1996), Cauchick Miguel (2005), Erikkson and McFadden (1993), Lai et al. (2007), Tottie and Lager (1995), Waisarayutt and Siritaweechai (2006)
Development phases (design development, testing)	Bae (2008), Bosch-Sitjema and Bosch (2015), Dahlsten (2004), Füller et al. (2008), Laage-Hellman et al. (2014), Lettl (2007), Öberg (2010), Schaarschmidt and Kilian (2014)	Barcellini et al. (2015), Bruno and Muzzupappa (2010), Hess et al. (2013), Han et al. (2016), Hussain et al. (2012), Krasae-in (2017), Lahti and Seitamaa-Hakkarainen (2005), Merter and Hasirci (2016), Pals et al. (2008), Reed et al. (2015), Stålberg et al. (2016), Suteu and Buzatu (2014), Wilkinson et al. (2016)	Bouchard et al. (2009), Ionica and Leba (2015), Huang et al. (2014), Shen and Wang (2016), Wood et al. (2016)
Launch phases (pre-announcement, market launch)	Bae (2008), Bosch-Sitjema and Bosch (2015), Dahlsten (2004), Füller et al. (2008), Gruner and Homburg (2000), Öberg (2010), Schaarschmidt and Kilian (2014)		Dominici and Palumbo (2013), Nakada (1997)

Findings from the retrieved papers show that the three approaches position end-user involvement in different NPD phases. More specifically, for OI some studies (Filieri, 2013: 48; Jahanmir and Lages, 2015: 4; Rohrbeck et al., 2009: 426; Tsimiklis et al., 2015: 60) have focused on end-user involvement in the early phases of NPD. Some (e.g. Blohm et al., 2011: 109; Gassmann et al., 2006: 6) suggest that involving end users in the early phases of NPD can increase the likelihood of generating innovative ideas and offer a promising way to benefit from external innovation sources. Similarly, the majority of the retrieved papers on IA support the notion that end-user involvement happens mainly during the early (product planning) phases, so that end users' wants, feelings and requirements can be identified, determined and measured (Ahmed and Amagoh, 2010: 210; Bergquist and Abeysekera, 1996: 271; Cauchick Miguel, 2005, 2013: 423; Dominici and Palumbo, 2013: 90; Erikkson and McFadden, 1993: 497; Lai et al., 2007; Lin et al., 2006; Nagamachi, 2002; Tottie and Lager, 1995; Waisarayutt and Siritaweechai, 2006). Finally, Hess et al. (2013: 571) posit that for PD end-user involvement can be continuous during all phases. This stance is partially supported by a small number (5) of the retrieved papers that have been published after 2015 and have investigated end-user involvement in the initial phases (mainly for identifying end users' need) as well as in the development phases of NPD (Han et al., 2016; Krasae-in, 2017; Merter and Hasirci, 2016; Reed et al., 2015; Wilkinson et al., 2016).

Regarding the development phases of NPD, the papers about OI stressed that end-user involvement could make valuable contributions to the design of a product, lead to substantial improvements of product quality and reduce time and costs (Laage-Hellman et al., 2014: 273; Lettl, 2007: 60). Whereas PD and IA papers do not discuss specific advantages of involving end users in the development phases, they (Bruno and Muzzupappa, 2010; Lahti and Seitamaa-Hakkarainen, 2005: 105) agree that end-user involvement is used during the entire development phase and that QFD, and the Kano model are used during the product planning and design phases (Chen and Chuang, 2008: 670; Ionica and Leba, 2015; Pullman et al., 2002: 358–9.

Clear involvement of end users during launch phases of NPD are discussed only in very few cases where it is suggested that IA can be applied even after a product

has been launched onto the market (Dominici and Palumbo, 2013; Nakada, 1997: 145). In addition, in papers related to PD it is suggested that research should broaden its horizon to also include end-user involvement in later phases (Hussain et al., 2012: 104). However, Elboushi and Sherif (1997: 143) stress that HoQ transfers the voice of the customer during several phases (from product planning to testing and launching), whereas Dominici and Palumbo (2013: 90) and Nakada (1997: 145) suggest that in order to measure end-user preference Kansei Engineering and the Kano model can be used after a product has been launched in the market, and Hauser (1993: 66–7) maintains that HoQ can be used throughout the development process as an organisational history and framework for making decisions. Similarly, in OI it is often stated that end users can be involved during the entire NPD process, ranging from idea generation and product development and testing phase, to market introduction (Bae, 2008: 369; Dahlsten, 2004: 146; Füller et al., 2008; Lettl et al., 2006: 254). However, in the study of Daecke et al. (2015: 420), the participants supported that involving end users in the design and development phases is not helpful. Depending on the phase, end users can play various roles. For example, in the idea generation phase they will have the role of initiator (concentrating on creating ideas and new product possibilities); in the development phase the role of (co-)developer; and finally, the role of supporting in marketing tactics and later becoming the user once the product is launched (Öberg, 2010: 1003; Schaarschmidt and Kilian, 2014: 355). It is also worth noting that end-user involvement explicitly in the later phases of NPD is not encouraged as the end users' input will be reduced to only incremental improvements (Enkel et al., 2005b: 432).

In conclusion, whereas evidence from the majority of the retrieved papers suggests that end-user involvement in PD is used explicitly in the design phases of NPD, it is noted that in the last four years further research has been taken place on applying PD during development as well as initial phases of NPD. Furthermore, whereas OI can be used during the entire NPD, many studies have focused on the importance of involving end users during the early phases. Finally, while the majority of companies choose to use IA explicitly in the early (product planning) phases with the aim of identifying end-user requirements, a few exceptions show that it can also be useful during various phases of NPD process as a framework to keep designers focused on end-user requirements and to evaluate and capture end

users' perceptions of the new product. Hence, this means that depending on the approach, if the perspectives embedded in literature are correct on this matter, end users get involved in different phases of the NPD process.

2.4.4 How Do End Users Get Involved?

There are a number of different ways in which end users get involved through the three different approaches in NPD processes. Based on findings obtained by the systematic literature review, the tools identified for use for end-user involvement will be discussed based on the type of interaction that end users have with companies. To this purpose, three categories have been created. The first category consists of indirect tools where end users are 'passive' participants: they provide information about their needs and requirements and the designers take that information and translate it into product characteristics. The second category covers direct tools in which end users are 'active' participants: they are taking part in a number of tasks along with designers, such as the development of prototypes or workshop sessions. The last is web-based tools where end users interact with designers and other end users and jointly, through online forums, create and design platforms, etc.; an overview of the various tools used in the three approaches is found in Table 2.10.

Table 2.10 Summary of tools used to involve end users in NPD

Tools	Open Innovation	Participatory Design	Instrumental Approach
1. Indirect			
Survey	●	●	●
Interview	○	●	●
Observation	○	●	●
Questionnaires	○	○	●
Complaints/remarks	○	○	○
User clinics	●	○	○
2. Direct			
Mock-up	○	●	○
Brainstorming	○	●	●
Workshops	●	●	○
Inspirational pictures/story cards	○	●	○
Presentations	○	●	○
Focus Groups	○	●	●

Tools	Open Innovation	Participatory Design	Instrumental Approach
Living Labs	●	○	○
Evaluation sessions	○	○	●
3. Web-technology based			
Online forums/communities	●	●	○
Wiki systems	○	●	○
Virtual design platforms	●	●	○
Open-source software	●	●	○
Online interviews	●	○	○
Online surveys	●	○	○

●...addressed in the literature

○...not addressed in the literature

The OI approach was popularised around the same time as internet usage was growing rapidly. Thus, it is not a surprise that it relies more than the other two approaches on web-technology based tools for engaging with end users during the NPD process. According to some studies (e.g. Antikainen et al., 2010; Antorini and Muñiz, 2013; Bae, 2008; Daecke et al., 2015; Füller and Matzler, 2007; Kohler et al., 2011; Prugl and Schreier, 2006: 247; Tsimiklis et al., 2015), group discussions, the creation of figures or models, online communities, online surveys and interviews, as well as virtual design platforms, are few of the possible ways of interacting with end users online. For companies this means getting valuable information on end-user needs and ideas, feedback about products under development and help in creating virtual prototypes and virtual scenarios. Furthermore, virtual prototypes and animated 3D models in scenarios allow end users to experience new products long before they are fully developed and so are still able to be changed according to end-user needs and wants and at little cost to companies (Füller and Matzler, 2007: 380). Similarly, PD also uses web-based tools, such as online forums, wiki systems, virtual design platforms or open-source software (Lahti and Seitamaa-Hakkarainen, 2005: 105), although not as often as does OI. Along these lines, Hess et al. (2013: 573) suggest that users can have a strong influence on the design and decision process by using online tools and social technologies such as online forums, wiki systems, virtual design platforms and open-source software. Contrastingly, the use of any kind of online tools has never been reported for IA in the retrieved papers.

Whereas companies following IA emphasise the development of matrices, charts, tables and models, many studies only mention the use of indirect tools (e.g. surveys, interviews) for identifying and gathering information on end-user needs (e.g. Bergquist and Abeysekera, 1996: 272; Tottie and Lager, 1995: 263). The most common method of identifying the desired product characteristics is conducting (mostly personal) interviews with end users (Dominici and Palumbo, 2013: 91; Duhovnik, 2006: 70; Elboushi and Sherif, 1997: 137; González et al., 2003: 52; Hauser, 1993: 65; Matzler and Hinterhuber, 1998: 35; Pullman et al., 2002: 358; Tottie and Lager, 1995: 263). This way, detailed information on end-user needs is gathered and innovative solutions can be identified (Duhovnik, 2006: 71). Other popular methods include surveys and questionnaires (Bergquist and Abeysekera, 1996: 272; Dewi, 2016: 8254; Elboushi and Sherif, 1997: 137; Lai et al., 2007: 54; Ionica and Leba, 2015: 988; Rahman and Rahim, 2006: 594; Wang and Ji, 2010: 177). Indirect tools can also be used in the PD approach and another example of this kind of tool can be found in Wilkinson and De Angeli's (2014: 621) study, where designers used a combination of surveys, semi-structured interviews and observation of participants in a controlled domestic environment. For OI, use of indirect tools, more specifically interviews and user clinics, is not very common (Coviello and Joseph, 2012; Enkel et al., 2005b; Herstatt and von Hippel, 1992; Laage-Hellman et al., 2014; Rohrbeck et al., 2009).

In few studies (Bouchard et al., 2009; Chen and Chuang, 2008: 671; Duhovnik, 2006: 70; Nakada, 1997: 133; Tontini, 2007: 607) companies have conducted focus groups, brainstorming and evaluation sessions to obtain data on end users' needs and perceptions, showing that direct tools are not commonly used in IA. According to Duhovnik (2006: 71–2), evaluation sessions can be used in addition to the end-user needs obtained by such other methods as interviews and can reveal causes of dissatisfaction. However, it is worth noting that according to Griffin and Hauser (1993: 12), personal interviews may be more cost-effective than focus groups. In the PD approach, direct tools are commonly used, in the form of interactive sessions, such as workshops where end users and designers have discussions, focus groups complemented by presentations, brainstorming and problem-solving sessions, creation of mock-ups, and use of inspirational pictures or story cards (Hussain et al., 2012: 95; Kautz, 2011; Merter and Hasirci, 2016: 6; Pals et al., 2008; Roberts and Darler, 2017:26; Stålberg et al., 2016). Living labs and informal

debates with focus groups were discussed in only two papers regarding the ways that end users get involved through the OI approach (Almirall and Wareham, 2008; Dahlsten, 2004). Finally, Schaarschmidt and Kilian (2014: 353, 356) chose to investigate an extreme example of a company that had adopted an unusual number of tools to involve its end users throughout the NPD process, including ideation workshops and prototype testing sessions.

Putting it all together, it seems that OI relies more on web technology for engaging end users in the NPD process; an explanation for this may be that this approach was popularised at a time when internet use was growing rapidly. Because PD is based on the pragmatic assumption that end users' views are as important as those of designers and therefore very important during the design and development of a product, the retrieved papers show that companies have adopted a number of different tools to enhance communication and end-user engagement. Moreover, companies following IA mainly use traditional methods, such as interviews and surveys, to identify and rank their requirements for the design of products. In conclusion, the three approaches are different in the tools they use for involving end users in NPD. Although OI makes use of direct and indirect tools, it seems to rely more on web technology, whereas PD is more balanced through close interaction between end users and designers supported by indirect and direct contact as well as web-based tools; in contrast to the other two approaches, IA relies mostly on indirect tools for obtaining end-user needs and requirements.

2.5 Hierarchy of Evidence

The surprisingly low number of retrieved papers (especially for PD but also for the other two approaches) that have been identified from the systematic literature review and their descriptive (rather than analytical) nature leads mainly to assumptions rather than evidence on the impact of end-user involvement in NPD. For this reason, and in order to determine the suitability of evidence, it is necessary to evaluate the context and findings presented in the papers dealing explicitly with the impact of end-user involvement in NPD – a total of 72 papers. As a first step of doing so, and inspired by medical literature (see Barbour, 2001; Daly et al., 2007; Evans, 2003; Mantzoukas, 2008) a hierarchy of evidence is being developed in order to rank the validity of the results of research across the set of

72 papers. An overview of the different levels of the proposed hierarchy is presented in Table 2.11.

Table 2.11 Hierarchy of evidence

Quality of evidence	Features
Level I	Descriptive papers that focus on how end users get involved in the NPD process or on the type of end user that is best to be used according to the phase of NPD – no evidence for supporting the impact.
Level II	Authors comments on end-user involvement that are based on the analysis of the results from case studies and surveys. Focus is no explicitly on end-user involvement. Some indicators but not strong or clear evidence.
Level III	Evidence based on comments from the studied companies (managers, designers, employees). No clear evidence.
Level IV	Strong evidence supported by facts and outcomes related to the impact of end-user involvement in NPD.

In order to strengthen the hierarchy of evidence and because the variables are not the same across studies, Bacharach's (1989) recommendations will be followed to further evaluate the presented findings by examining them against two dimensions. One dimension is falsifiability which, according to Bacharach (1989: 501) 'determines whether a theory is constructed such that empirical refutation is possible'. Because end-user involvement is assumed to be critical for the success of a new product, this dimension applies to papers that do not present any evidence to support the notion that end-user involvement is necessary for the success of a new product. In other words, there is no evidence on what the result would be if end users were not involved. A second dimension is used in order to identify the definitions that authors have used across the papers regarding the impact and involvement of end users, the outcomes of the involvement and the factors determining the success of a new product. The interrelationship between those definitions and outcomes is then tested. The results of this analysis indicate that in the majority of the papers, the factors that determine the success of a new product are not discussed and, more interestingly, only 7[3] out of the 72 papers (that explicitly discuss end-user involvement) have shown strong evidence regarding the impact of end-user involvement in NPD (level IV on the hierarchy of

[3] The 7 selected papers include: Cristiano et al. (2001); Dahlsten (2004); Enkel et al. (2005b); Griffin (1992); Hauser (1993); Nagamachi (2002); Vonderembse and Raghunathan (1997)

evidence). Hauser's (1993) paper provides an example of this category as it indicates that after the launch of the new product onto the market, the researched company was receiving orders that were well above its capacity and subsequently increased significantly its market share (ibid.: 67). Another example is the company discussed by Dahlsten (2004), which has been awarded several influential prizes after its newly developed product was launched onto the market (for an example of the results of the analysed papers, see Appendix II). To sum up, a majority of the retrieved papers follow a descriptive approach, neither providing evidence nor discussing factors that determine the success of a new product that has been developed with the involvement of end users. The seven papers that according to the developed hierarchy of evidence have succeeded in supporting their findings with more concrete facts even show that there is need for further investigation into the benefits and challenges that end-user involvement can bring to the development of a new product.

2.6 Main Findings and Research Questions

By synthesising all research outcomes and insights published in peer-reviewed journals related to the concept of end-user involvement in NPD up to 2017, the systematic literature review concludes with three main findings.

First, the surprisingly low number of the retrieved papers (especially for PD) and their descriptive (rather than analytical) nature leads mostly to assumptions rather than evidence on the impact of end-user involvement in NPD. However, it should be recognised that this study has only considered peer-reviewed journal articles (see table 2.2). Therefore, the low number of retrieved papers on PD could be due to the fact that PD methods were initially developed by computer scientists who have a natural science background on research and hence their contributions were published mostly through books (e.g. Schuler and Namioka, 1993) and conference papers (e.g. Kyng, 1994). Another explanation for the low number of identified papers across the three approaches could be that most empirical studies on end-user involvement have a service domain rather than a product domain focus (Perks and Roberts, 2014: 10-11). Despite these limitations, it remains surprising that among the 99 identified papers, only a limited number of studies have looked directly at the impact of end-user involvement. Most studies are descriptive in nature and have focused on how a company practices

end-user involvement and the potential benefits or challenges this could bring rather than discussing the actual outcomes (e.g. effects on operational performance or effects on the end product). Furthermore, only seven papers out of 99 provide sufficient detail about the impact but do not provide an adequate base of evidence, because of their diversity in foci, notwithstanding the generic notion that consumer research and end-user involvement are of paramount importance to successful NPD. Subsequently, the above finding indicates a shortfall in the understanding of end-user involvement in NPD which may be seen as a serious gap in the literature.

The second finding of this systematic literature review is that risks and challenges associated with end-user involvement in NPD are not very often discussed in the literature. Whereas the majority of the retrieved papers discuss and emphasise the benefits of end-user involvement in NPD, there is only a limited number of studies (19 papers) that have explicitly or merely focused on discussing challenges of end-user involvement in NPD. On this analysis, it may be deemed that within the current literature, the conditions, outcomes, and effects of end-user involvement in NPD may be poorly understood.

The third finding is that the literature rarely has distinguished between distinct approaches or methods of end-user involvement in NPD. That way, most of the previous empirical studies have neglected to consider how different approaches may focus on different ways for capturing and transferring end user's needs and requirements, within different levels of comprehensiveness (richness of information).

Similarly, a fourth and final finding is that the majority of the studies have focused on discussing end-user involvement on specific NPD phases (e.g. the fuzzy front end) and most of them have not considered the potential contribution or potential challenges of involving end users throughout the NPD process. Also, the current literature implies that tools for involving end-users are confined to specific NPD phases. Therefore, more clarity is needed to which 'design questions' which tool can contribute. As a consequence, the last two findings underline that there is no solid evidence in the current literature to substantiate how best involving end users in the development of a product is related to successful NPD.

Based on the above-identified gaps in the literature, this study aims to contribute to an increased knowledge of end-user involvement in NPD by investigating how end-users are involved in and influence the NPD process. Accordingly, the study addresses three research questions:

RQ1: How and why are end-users involved in the NPD process?

> **RQ1a**: What are the benefits and challenges of end-user involvement in NPD?
>
> **RQ1b**: When and how end users get involvement in the NPD process?

RQ2: What are the effects of end-user involvement in each successive phase of the NPD process?

RQ3: What is the contribution of end-user involvement to the (design and functionality of the) end product?

The first research question looks into understanding how NPD teams choose the different tools and phases employed for involving end-users into the NPD process and to what purpose companies choose to invite and involve end users. This question will attempt to identify what benefits companies are hoping for as well as what the drawbacks and challenges are that companies are concerned about and have experienced when involving end users in their NPD processes. In particular, this inquiry is seeking to establish how the three different approaches of end-user involvement are used and affect the NPD of companies in practice. The second research question looks into the different effects that end-user involvement may have throughout the NPD process and specifically in each one of the NPD phases. The third research question investigates the influence that end-user involvement may have on the overall design and functionality of the end product and is seeking to understand the importance of involving end-users in the NPD process.

2.7 Framing the Three Approaches

In summary, each of the three approaches – OI, PD and IA – have distinct patterns for engaging with end users and involving them during the NPD process. A holistic

overview of these distinct patterns for the three approaches is illustrated in Figure 2.2.

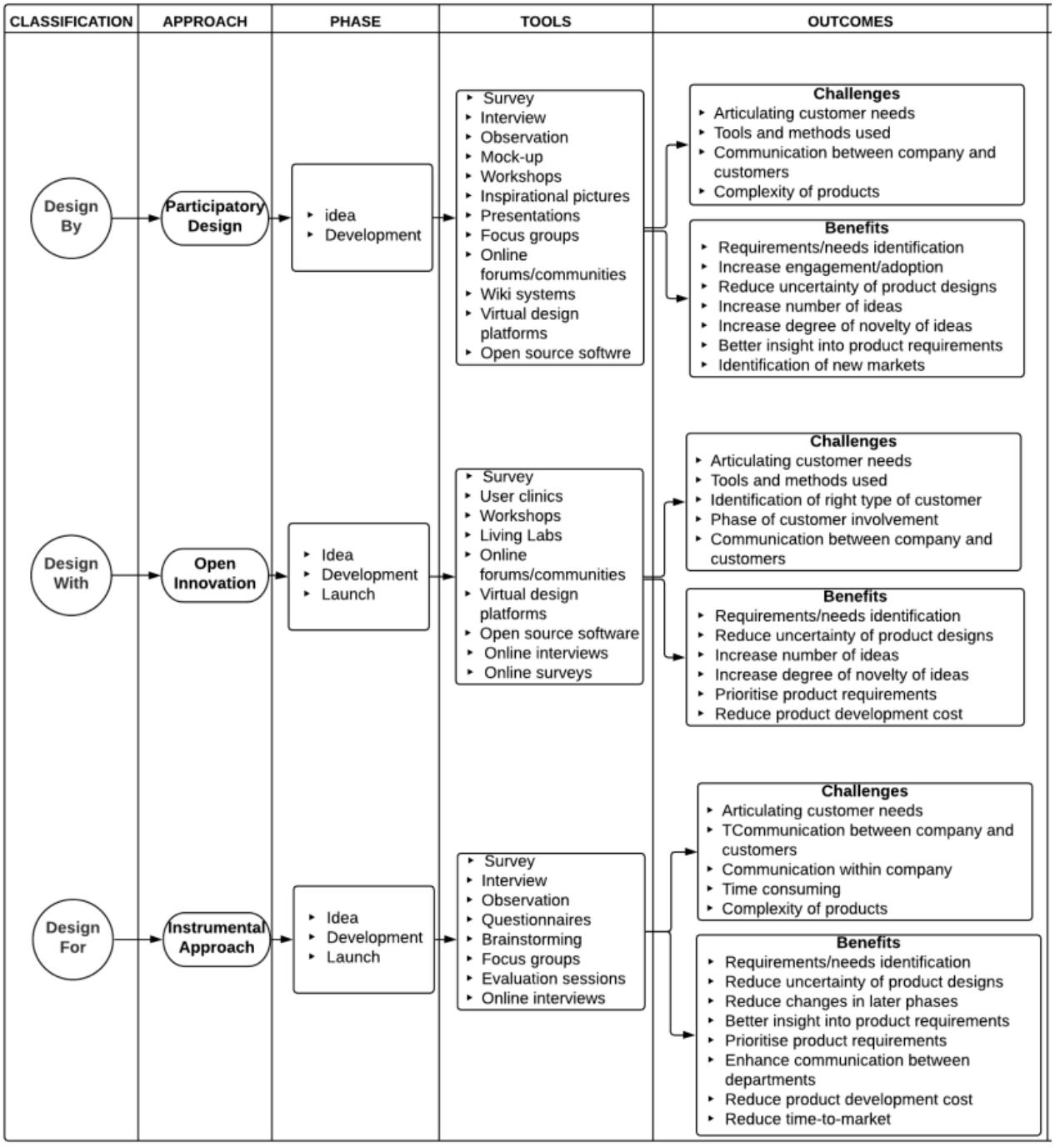

Figure 2.2 Holistic overview of the three approaches of end-user involvement

Source: Author's development

OI can be implemented in every phase of NPD and relies mostly on web-technology based tools for involving end users in the NPD process. Moreover, end-user involvement in OI is aiming at reducing development costs and time-to-market as well as increasing the number of new ideas generated. Nevertheless, successful

implementation of OI is mostly dependent on the selection and use of the right tools and right type of end users at the right time, though conclusive evidence is missing for this inference. PD is mainly used during the early development phases of NPD although studies indicate that it could be used during other phases as well. Its successful implementation is to a high degree dependent on the relationships between designers and end users and uses a broad range of different tools to this purpose. Moreover, end-user involvement in PD during NPD brings benefits such as identification of new markets, increased number of different ideas and better insights into product requirements, but it also raises concerns on an appropriate selection of tools and which of these tools is best suited for specific design questions. IA is reported to be applicable mostly during the initial phases of NPD, and in a very few studies, it has been discussed for later stages of NPD. It makes use of 'indirect' tools and it is explicitly used for improvements of already existing products. Furthermore, it follows a systematic way of thinking that results to better planning of product requirements, better market analysis, enhanced communications within the company, reduction of development costs and time-to-market but it is stressed to be time-consuming and it is not recommended for complex products. In addition to having distinct patterns for engaging with end users and involving them during the NPD process, the three approaches also seem to have different potential in terms of which tools suit best for which design questions.

Figure 2.3 displays the conceptual framework which synthesises the concepts and provides an overall picture and integrated understanding of the findings drawn from the systematic literature review. New product development is presented as a transformation process with end users being the transforming resource and the end product being the output. The tools employed for involving end users may influence the NPD process, which in turn will have an effect on the benefits and challenges emanating from end-user involvement.

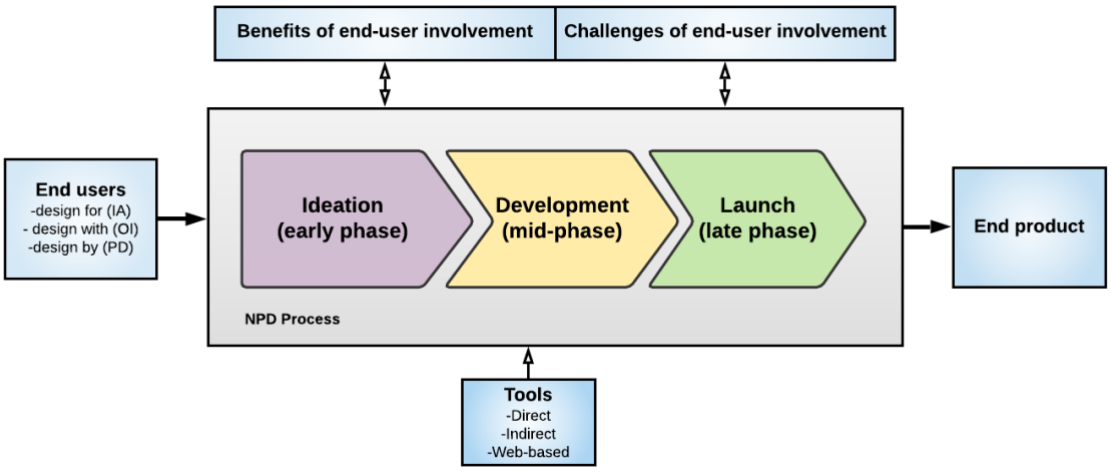

Figure 2.3 Conceptual framework

Source: Author's development

2.8 Chapter Summary

The purpose of this systematic literature review was to find out the state of the field on how end-user involvement is best embedded in NPD. To achieve this, three different approaches – OI, PD and IA – were compared on the impact of the interaction with end users during the successive and iterative phases of NPD. The analysis of the 99 retrieved papers showed that OI, PD and IA could successfully identify end-user needs and requirements, albeit using distinct methods each, but articulating and translating these into product characteristics is a very challenging task. Furthermore, the systematic literature review provides an overview of the use of different tools and articulation across NPD phases (see figure 2.2) and provided the basis for generating the research questions of the study. Finally, the systematic literature review outlined certain critical limitations that are evident in the existing body of literature. The most important ones include the limited number of empirical studies examining the impact of end-user involvement in NPD, the neglection of discussing challenges of end-user involvement in NPD and the limited evidence on how and when to involve end users for developing successful new products.

Chapter 3: Positioning the Study

This chapter presents and discusses the main concepts and theoretical perspectives that have served as drivers for this research study. The chapter starts by framing the concepts of NPD and end-user involvement. The point of departure is the new product development, and the first section of this chapter starts with defining NPD and its process according to the context and purpose of this study; reviewing different NPD processes; and highlighting challenges associated with NPD processes. The second and final section is built around the notion that greater end-user involvement in NPD may be essential for mitigating some of the stated challenges. In that sense, end-user involvement as a form of co-creation in NPD is discussed and different degrees of end-user involvement in NPD are presented.

3.1 New Product Development (NPD)

Considering its multidisciplinary nature and its importance to the success of a business, NPD has been acknowledged and studied from many different perspectives (e.g. strategy, marketing, operations and innovation) (Lewis, 2001). Thus, depending on the domain, the terminology used to describe NPD may have varying emphasis (Craig and Hart, 1992). For instance, whereas 'NPD' is the term most commonly used in marketing and management fields (e.g. Cooper, 2019; Ogawa and Piller, 2006), those from an engineering domain may refer to it as 'product design' (e.g. Hollins and Pugh, 1990) or R&D people may call it 'product innovation' (e.g. Rothwell et al., 1974). However, this is not always the case as research studies with management or marketing focus also use the terms 'design' and 'innovation' (e.g. Danneels, 2002; Lukas and Ferrell, 2000). For the purpose of this study, literature from different domains was reviewed, and therefore, all the above terms were taken under consideration under the umbrella term of 'NPD'.

Krishnan and Ulrich (2001: 1) broadly define NPD as "the transformation of a market opportunity into a product available for sale". Similarly, and more precisely Kahn et al. (2013: 458) support that NPD is the "overall process of strategy, organisation, concept generation, product and marketing plan creation and evaluation, and commercialisation of a new product". From these definitions, it becomes clear that NPD is about new ideas and their transformation to new

products. However, how the terms ‘new’ and ‘product’ have been discussed in the literature is not consistent. As seen in previous studies (e.g. Mahr et al., 2014), it is not uncommon for the term ‘product’ to include services too. For clarity purposes, it should be highlighted that the term ‘product’ in this study does not include services and it stands for physical (tangible) as well as for digital goods.

Various definitions and meanings of the term ‘new product’ and its boundaries have been made in the literature (e.g. see Crawford and Di Benedetto, 2011). NPD practices have been generally discussed as including original products, product improvements and product modifications. A widely accepted standard was originally presented by Booz Allen and Hamilton (1982) who developed six different categories and classified new products according to how new they are to the market and how new they are to the company. Building on it, Kleinschmidt and Cooper (1991) distinguished between three categories of products innovativeness: i) highly innovative products (new-to-the-word products or product lines), ii) moderately innovative products (new-to-the-company products or product lines) and iii) low innovativeness products (modifications to existing products, redesigns, and repositioning). Nevertheless, even in these days, many empirical studies neglect to report on the ‘newness’ of the products under investigation (Montoya-Weiss and Calantone, 1994). At the same time, radical (new-to-the-world) products seem to attract the interest of academics (e.g. McDermott and O’Connor, 2002) and several studies have been conducted in different contexts, comparing radical and incremental products (e.g. Song and Swink, 2002; Verworn et al., 2008). This study, although investigating the effects of end-user involvement in NPD and the end-product, it was not conducted with the purpose to draw conclusions between different degrees of products innovativeness. Hence, when reviewing extant academic literature, designing the empirical study, and collecting empirical data, the ‘newness’ of the products was loosely framed to include highly innovative (new-to-the-world) and moderately innovative (new-to-the-company) products.

With all of the above in mind, it is important to highlight that although previous academic studies have used different terminologies, in this study, it was decided that when discussing new product development (NPD) the author refers to ***the***

(design) activities carried out to conceive, develop, and deliver a product that may be highly or moderately innovative.

3.1.1 The New Product Development Process

The development of a new product is a multi-stage process that typically begins with the identification of a market need and ends with the launch and commercialisation of a product (Frishammar and Ylinenpää, 2007; Ulrich and Eppinger, 2012; Urban and Hauser, 1993). Depending on the complexity of the product under development, the industry, and the company, the NPD process and its complexity may differ enormously (Booz Allen and Hamilton, 1982; Hart et al., 1999). Subsequently, a common agreement among researchers is that there is no single 'right' way to perform NPD, and no definite set of NPD activities or steps that will be appropriate for all companies (Calantone et al., 1995; Cooper, 1994). This is evident in the plethora of different NPD models with a varying number of stages and phases that have been proposed in the literature; for examples see Cooper (1994), Ulrich and Eppinger (2012), Crawford and Benedetto (2011). In 1984 Saren assessed the available NPD models and classified them into five categories: i) department-stage, ii) activity-stage, iii) decision stage, iv) conversion process and v) response models (see Appendix I for illustration and a summary of the research and practical usefulness for each of these models). However, he (Saren, 1984: 23-24) suggested that although each of these models may be useful in specific settings and for specific aims (e.g. if examining risk management, the focus is on decision making), there is need for a more general NPD model which would accurately capture all the occurrences during the process of innovation in companies. Following this suggestion and influenced by the technological advancement and the increasing global competition, some researchers (e.g. Cooper, 1994; Jenkins, 1997; Noke and Radnor, 2004) proposed that modern stage-gate methodologies, product and cycle-time excellence and total design are leading examples of advancement in NPD processes which aim at improving product success. However, more recently, the review by Owens (2009) on the five most common and progressive general NPD models (including stage-gate models, multiple convergent process, product and cycle-time excellence, total design and third-generation NPD process) concluded that there is a lack of NPD models for generating, capturing and showing customers' information and stressed that specific attention to customer during the NPD process is minimal.

Subsequently, attempts have been made for evolving NPD models to take into account not only activities carried out within a company but also activities including external partners (such as users and customers). The NPD models proposed by Cooper (2017) and Gruner and Homburg (2000) may act as a good example. More specifically, the newest version of Cooper's (2019) stage-gate model proposes that a strong market orientation should prevail throughout the NPD process and puts emphasis on the importance of end-user involvement from beginning to the end (Figure 3.1).

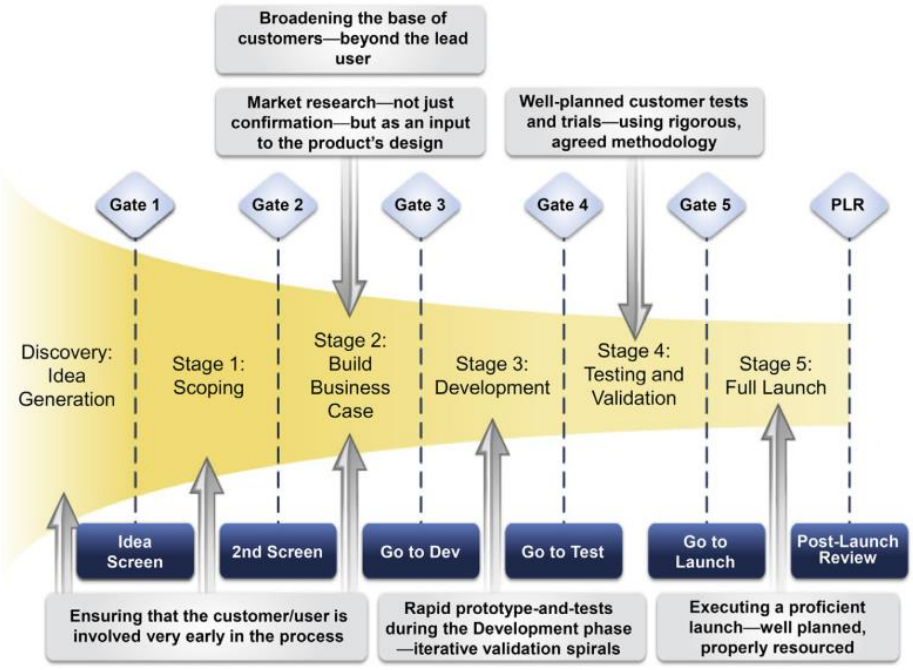

Figure 3.1 NPD process with a strong end-user focus from beginning to end

Source: Adopted from Cooper (2019)

However, when discussed in the literature, current research associated with end-user involvement in NPD (Chang and Taylor, 2016; Cui and Wu, 2016; Ernst et al., 2010; Frishammar and Ylinenpää, 2007; Lagrosen, 2005) tends to distinguish between three main phases of NPD: ideation (or early) phase; development (or mid-phase); and launch (or late) phase. Following this logic (in line with prior research on related topics) and for reasons that many of the research papers reviewed in this study (i) do not specify the phase of involvement for end-users or (ii) are using terms that are too generic to define the phase (e.g. early design phases in Pals et al. (2008: 290)) or (iii) investigate end-user involvement in different industries or different settings and therefore make use of different NPD

models, it was decided that in this study NPD would be divided into three broader phases namely: ideation, development and launch. Although in reality a NPD process may entail parallel steps and iterations of activities (Hauser and Dahan, 2007; Unger and Eppinger, 2011) for simplicity purposes the NPD process is illustrated as sequential and linear. Figure 3.2 illustrates a simplified version of the NPD process and summarises the activities included in each NPD phase.

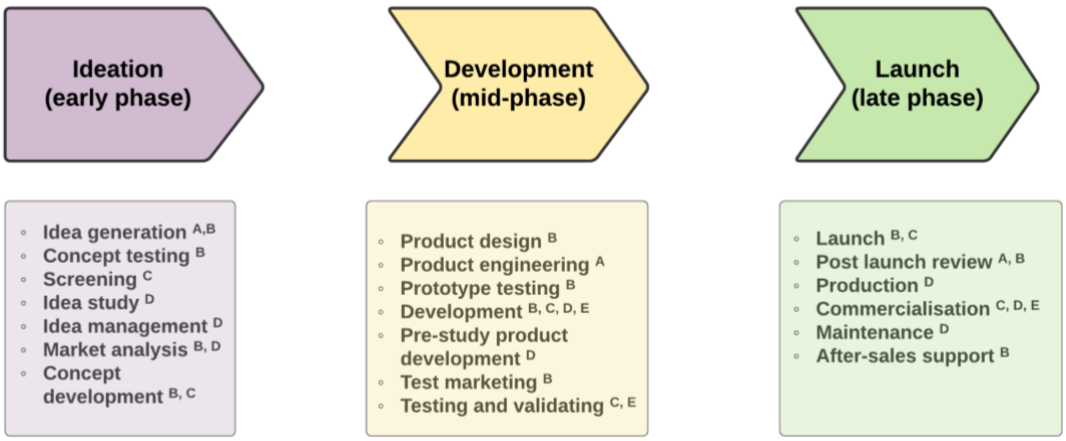

Figure 3.2 Simplified NPD process

Source: Amalgamation from A: Chang and Taylor (2016); B: Ernst et al. (2010); C: Frishammar and Ylinenpää (2007); D: Lagrosen, (2005); E: Zahay et al. (2004)

3.1.2 Challenges for NPD

In the last decades, research in new product development has received considerable attention from academics, and its importance and contribution to business growth and success are well documented in the literature (Brown and Eisenhardt, 1995). New product development has been discussed to be central to business prosperity (Frishammar and Ylinenpää, 2007), with contributions to increased competitive advantage (Lin and Huang, 2013; Tzokas et al., 2004), sustained corporate growth and market leadership (Barczak and Kahn, 2012; Craig and Hart, 1992) and profitability (O'Hern and Rindfleisch, 2010). Nevertheless, successful NPD is still a complex and challenging task. Especially in today's fast-paced environment which is characterised by short product life cycles, global competition and quick technological developments, NPD is a very risky and uncertain process (Bhuiyan, 2011; Cooper et al., 2000; Cooper and Kleinschmidt,

1987). Poorly managed NPD processes may result in products not meeting end users' expectations and consequently have a high chance of failing after launched into the market (Booz Allen and Hamilton, 1982; Matzler and Hinterhuber, 1998). More specifically, Castellion and Markham's (2013) investigation on published empirical studies revealed a failure rate of new products (that have been launched to the market) between 35-48% (Table 3.1). In support, in a more recent study, Cooper (2019: 36) suggests that "about 40% of new products are estimated to fail at launch, even after all the development and testing work; and out of every 7 to 10 new-product concepts, only one is a commercial success". This shows that irrespectively of the attention paid by researchers and practitioners on improving NPD processes, NPD remains a risky and uncertain process with relatively high product failure rates. Hence, companies continue to search for ways to improve their NPD ability which may favour their survival and growth.

Table 3.1 References to empirical studies of new product failure rates

Reference	Failure Rate
Crawford, C. M. 1977. Marketing research and the new product failure rate. *Journal of Marketing* 41: 51–61.	35%
Crawford, C. M. 1987. New product failure rates: A reprise. *Research Management* 30 (4): 20–24.	35%
Booz, Allen, & Hamilton. 1965. Management of new products, New York, NY: Booz, Allen, & Hamilton.	33%
Cooper, R. G. 1979. Identifying industrial new product success. *Industrial Marketing Management* 8: 124–35.	48%
Cooper, R. G. 1980. Project newProd: Factors in new product success. *European Journal of Marketing* 14 (5/6): 277–92.	40%
Cooper, R. G., and E. J. Kleinschmidt. 1986. An investigation into the new product process: Steps, deficiencies and impact. *Journal of Product Innovation Management* 3: 71–85.	39%
Cooper, R. G., and E. J. Kleinschmidt. 1993. Uncovering the keys to new product success. *Engineering Management Review* 11: 5–18.	33%
Cooper, R. G. 1993. *Winning at new products: Accelerating the process from idea to launch.* Reading, MA: Addison-Wesley.	24–45%
Griffin, A. 1997. PDMA research on new product development practices: Updating trends and benchmarking best practices. *Journal of Product Innovation Management* 14: 429–58.	40%
Page, A. L. 1993. Assessing bew product development practices and performance: Establishing crucial norms. *Journal of Product Innovation Management* 10 (4): 273–90.	42%
Adams, M. 2004. Findings from the PDMA Research Foundation CPAS Benchmarking. http://www.pdma.org/shop_pdma_description.cfm?pk_store_product=25	24% for top performers, 46% for the rest of the sample
Barczak, G., A. Griffin, and K. Kahn. 2009. Trends and drivers of success in NPD practices: Results of the 2003 PDMA Best Practices Study. *Journal of Product Innovation Management* 26 (1).	41%
Product Development Institute, 2010. http://www.stagegate.com/newsletter/article_feb_2011.htm	38% for top performers. 55% for bottom performers

Source: Adopted from Castellion and Markham (2013: 978)

A long list of detailed reviews and research papers are available on success and failure NPD topics and on how to improve NPD performance (e.g. Cooper, 2011). However, the intention here is not to cover in great depth all the cited factors and reasons affecting NPD performance; rather the author attempts to condense some of the findings which are relevant to the discussion of NPD and the need for

end-user involvement in the process. These will be discussed in the following paragraphs of this subsection.

It is widely accepted that the development of commercially successful new products demands accurate information and understanding of end users' needs (Cooper, 2011; Rothwell et al., 1974; Trott et al., 2015). Thomke and von Hippel (2002) support this by stating that whereas companies have problem-solving capabilities, the end users are the ones holding the needs-related information. More recently, it is suggested that end users may contribute not only to needs-related information (i.e. end users' input about their needs and preferences), but to solution-related information and knowledge as well (i.e. end users' input about potential ways to solve problems) (Poetz and Schreier 2012). Traditionally, a company will use market research techniques to acquire and use needs-related information from end users to develop new products. Nevertheless, a high number of companies are often missing a market orientation by neglecting to undertake market assessments and to invest money on (before-launch) marketing activities (Cooper, 2019). Even when companies do conduct market research, they most likely rely on traditional market research approaches (e.g. surveys) that are guided by specific and direct questions (Goffin et al., 2010). As such, end users may not have the opportunity to properly express and articulate their needs and therefore have mainly a passive role in NPD processes (Carlgren, 2013; Goffin et al., 2010; Prahalad and Ramaswamy, 2000). Furthermore, when developing a new product, companies may face the challenge that end-users often hold an essential but rather 'sticky' portion of information (Jeppesen, 2005). This means that end-users may hold implicit and unconscious needs and desires which are difficult to express if they are not actively engaged in the NPD process (Füller and Matzler, 2007). Hence, sticky information reinforces companies' propensity to cooperate with end-users in the NPD process (Sánchez-González et al. 2009). However, acquiring, transferring, and using "sticky" information in a new location is a costly task (von Hippel, 2005). This makes it challenging and costly for companies to foresee and fully understand end users' needs. Hence, both challenges (inadequate market research techniques and stickiness of information) call for closer interaction and engagement of end users in the NPD process.

In addition, a general trend towards more heterogeneous end-user needs coupled with fast-changing market trends, and the globalisation of markets, makes NPD increasingly difficult (Cooper, 2011; von Hippel, 2001; Ogawa and Piller, 2006). When companies engage in costly market research, they assume homogeneity of end-user needs within a market segment (Jeppesen, 2005). Consequently, in markets with rather heterogeneous needs, many end users may become dissatisfied with a company's products (Lüthje and Herstatt, 2004). This issue has been addressed by Franke and von Hippel (2003) who found that a large share (about 50%) of the total variation in end-user needs will typically remain unaddressed in within-segment variation. In a similar note, Cooper (2011) supports that a global approach to NPD is necessary for developing successful products. Therefore, market research with end-user engagement should happen in multiple countries. Finally, the rapid changes in end users' preferences supported by changing technologies may add extra cost and time on a company's NPD process and may result to the development of less relevant products (Chang and Taylor, 2016; Lakhani et al., 2014). As a result, timely and reliable knowledge about end-user preferences and requirements is very important for successful NPD.

Overall, the NPD process has been in the focus of academic and practitioner interest for decades and has been approached from many different perspectives and domains. Subsequently, many NPD models have been proposed in the current literature which their appropriateness may depend on factors such as industry or complexity of the product under development. There is no disagreement that successful NPD is crucial for the growth and sustainability of companies, and action should be taken to mitigate the challenges associated with this process. The stated challenges of NPD discussed in this section include inadequate market research techniques; sticky information as difficult and costly to acquire; heterogeneous end-user needs; globalisation of markets; and fast-changing end-user preferences. It is suggested by many (e.g. Cooper, 2019; Griffin and Hauser, 1993) that by actively involving end-users in the NPD process, the stated challenges can be minimised. With this in mind, the next section will provide an overview of the role and impact of end-user involvement in NPD.

3.2 End-user Involvement in NPD

Traditionally an internal activity of companies, NPD is in the last decades expanding beyond organisational boundaries to actively involving end-users (Cui and Wu, 2017). End users have long been believed to be able to provide needs and solution related information that a company may lack (Chang and Taylor, 2016; Griffin and Hauser, 1993). Subsequently, researchers (e.g. Barzack and Kahn, 2012) suggest that end-users should be part of the NPD processes of a company, and they should be actively working with a company for developing new products. Following this notion, customers are regarded to play an active and valuable role as co-creators of products, contributing to product design and product development activities (Nambisan, 2002; Piller et al., 2011; Ramirez, 1999). End-user involvement in NPD is also beneficial for obtaining specific information about needs and desires that a company would not be able to acquire otherwise (Kaplan and Haenlein, 2006) and to help overcome the issue of sticky information (von Hippel, 2001). Hence, successful NPD calls for an intensive integration of customers in NPD processes. The next sections will attempt to frame end-user involvement and the different forms it can take within an NPD process.

3.2.1 Defining End-user Involvement in NPD

The last decades end-user involvement in new product (and service) development has been researched through the lenses of different disciplines and perspectives. In many cases, end-user involvement in NPD has being discussed as a form of co-creation where companies actively collaborate with end-users with the aim to increase the likelihood of successful new products (or services). The next two subsections aim to identify and assess the different definitions of end-user involvement and attempt to develop a definition that would fit the purpose of this thesis.

3.2.1.1 End users and Co-creation

In a broad sense, co-creation refers to any act of collective creativity where two or more parties (e.g. people or companies) are involved with the aim to create something new (e.g. a product or service) (Sanders and Stappers, 2008). Hence, it is important to note that the term co-creation in this study is always used to

discuss the outcomes and value created from the collaboration between companies and end-users (Prahalad and Krishnan, 2008). Since the term of co-creation was coined (Kambil et al., 1999), it has attracted considerable attention and has generated much academic discussion. Although the current literature contains a plethora of different definitions on co-creation (e.g. Ranjan and Reed, 2014; Zwass, 2010) the term remains elusive (Rajah et al., 2008; Ramaswamy and Ozcan, 2018: 196). Co-creation activities have been approached from different theoretical perspectives in the business management literature (Galvagno and Dali, 2014: 650) including marketing studies and service science (Vargo et al., 2008), culture and economy (e.g. Potts et al., 2008), social and economic politics (e.g. Zwick et al., 2008), and innovation studies (e.g. Saarijarvi et al., 2013). In most occasion co-creation is related to the service marketing literature on new service development (Vargo and Lusch, 2004). Given that the focus of this study is on end-user involvement in NPD, the research on service-dominant logic is beyond the scope of this chapter. Subsequently, the literature review is limited to the application of end-user co-creation to the specific context of NPD referring specifically to end-user involvement in NPD.

Von Hippel's (1986) seminal work has been one of the first to challenge the view of end-users as passive recipients and to suggest and emphasise that end users, and more specifically an elite group of end users commonly referred to as 'lead-users', may help to generate ideas and to improve productivity by being active participants in the NPD process. Whereas this stance is supported by others as well (e.g. Seybold, 2006) it has a somewhat limited focus to co-creation activities between companies and a very specific group of people. Nevertheless, Prahalad and Ramaswamy (2004) were the ones to popularise the term of co-creation as the interactions between informed, empowered, and active end-users and companies for co-creating value. In this sense, they discussed the importance for companies to involve end-users for co-creating an experience with the product that would lead to the delivery of unique co-created value (Prahalad and Ramaswamy, 2004:16). These experiences occur through social interactions between the end user and the company, and they result in creating common meaning between both parties (Ind and Coates, 2013). Hence co-creation can be characterised as an active, creative and social process based on collaboration between companies and end-users.

Co-creation as the active collaboration between end-users and companies has also been discussed in the context of NPD (e.g. Hoyer et al., 2010). More specifically, studies related to NPD and co-creation process put emphasis on the active involvement of end-users into the NPD process through activities and social interactions that have been initiated by the company (Cooper, 2011; O'Hern and Rindfleisch, 2015; Piller et al., 2010). It is important to note that co-creation is different from conventional market research in NPD where existing customer information (e.g. sales data) is analysed by companies or where customers are observed, surveyed and asked to provide feedback on specific statements or propositions made by the company (Dahan and Hauser, 2002; Dolan and Matthews, 1993; von Hippel 1978; Piller et al.,2012). Customisation is also another term that should not be confused with co-creation. In customisation, the end-users have a reactive role and are restricted to the end of the NPD process for making suggestions to complete prototypes or products (Kristensson et al., 2004). Hence, in customisation, the end user may have a less active role than in co-creation.

Overall, in the context of NPD end-user involvement is seen as a form of co-creation which is characterised by collaboration between end users and companies, and by the active involvement of end users in the NPD process.

3.2.1.2 End-user Involvement as defined in the literature

Long before customer involvement was identified as a form of value co-creation in the academic literature, Lovelock and Young (1979) talked about the concept of customer involvement in new product and service development and its opportunities for improving productivity. A 'customer' can be defined as an individual, company, or other entity that receives a product or service in exchange for something of value (Reizenstein, 2004). A customer may or may not be a consumer or user. Whereas a 'user' is the individual who actually uses a product or experiences a service, an individual who has both purchased a product (or service) and has been using (or experiencing) it, is referred to as a 'consumer'. However, the terms 'customer', 'user' and 'consumer' are often used interchangeably in the literature (e.g. in Kaulio, 1998). In this thesis, ***'end-user' refers to a single individual who receives (purchases) and uses a product***. Subsequently, companies or organisations and services or experiences (discussed

in section 3.1) are excluded from the above definition and the overall discussion as they are out of the scope of this thesis.

The term 'involvement' may have several meanings such as to take part, to include, or to engage in an activity as a participant. This already indicates that in the context of NPD where the focus is on observable behaviour and activities, end-user involvement in an activity can have different degrees of intensity. Researchers may use different terms or concepts for end-user involvement. Some of these include customer participation (e.g. Chang and Taylor, 2016; Fang et al., 2008), user involvement (e.g. von Hippel, 1986; Kujala, 2003), customer involvement (e.g. Cui and Wu, 2017; Kaulio, 1998) co-development (e.g. Neale and Corkindale, 1998; Stock et al., 2017), customer integration (e.g. Lau et al., 2010), co-creation (e.g. Gemser and Perks, 2015; Roberts and Darler, 2017), co-production (e.g. Haumann et al., 2015), and crowdsourcing (e.g. Zhu et al., 2017). Table 3.2 provides an overview of definitions for the above terms and concepts; although it should be noted that in current literature explicit definitions are sometimes absent (a case in point in the work of Cui and Wu (2017)).

Table 3.2 Overview of end-user involvement definitions

Author	Term	Definition
Chang and Taylor (2016: 48)	Customer participation	The customer knowledge provision phenomenon whereby customers share their needs- and solution-related inputs in the firms NPD process.
Kujala (2003: 1)	User involvement	A general term describing direct contact with users and covering many approaches.
Lau et al. (2010: 763)	Customer integration	Customer integration processes include several business processes that integrate customers with a manufacturer.
Kaulio (1998: 148)	Customer involvement	The interaction between customers and the design process.
Stock et al. (2017: 201)	Co-development	The joint development of new products with customers through interaction and participation at various stages of the new product development process.
Haumann et al. (2015: 19)	Co-production	Customers' active participation in the creation of the core offering itself within parameters defined by the focal organisation and independent of direct employee involvement.

Author	Term	Definition
Zhu et al. (2017: 600)	Crowdsourcing	The process of knowledge creation, sharing, and integration, whereby the crowd provides needs- or solutions-related knowledge of different subtasks.
Gemser and Perks (2015: 664)	Co-creation	A process in which customers consciously and actively engage in a firm's innovation process, taking over innovation activities traditionally executed by the firm.

All the above definitions (Table 3.2) share the idea of interaction between companies and end users with aim the development of new products (or services). However, in these definitions, there are two aspects which have been overlooked. First, all definitions (exception is Stock et al., 2017) seem to ignore the different NPD phases in which end users may get involved. In practice, companies may choose to involve end users only in specific NPD phases (e.g. in fuzzy-front-end) or throughout the NPD process. Second, the definitions do not specify who (the company or the end user) initiates and controls the involvement activities. Third, most definitions neglect to state the purpose of end-user involvement.

Considering the previous discussion, and building on the definition of O'Hern and Rindfleisch (2015: 86) in this study end-user involvement in NPD is seen as a form of co-creation and is defined as ***a set of collaborative activities that are initiated and facilitated by the company and in which (current or potential) end users may contribute at various NPD phases and may select or provide suggestions on the content of a new product offering, to create (new) superior products, improve new product success and to gain competitive advantage***.

3.2.2 End-user Involvement Roles and Intensity

After defining the concept of end-user involvement, the discussion will turn to the different roles end users have in co-creation and NPD, and the intensity or different degrees of end-user involvement.

3.2.2.1 Roles of End-user Involvement in NPD

End-user involvement in NPD can be distinguished by the roles end users can play. Bringing together perspectives from strategic management literature, quality management literature, new product development literature, and design studies,

researchers have identified five main roles for end-users in value creation. These include the end-user as resource (or information source), co-creator (or co-producer, co-developer, or partner), buyer, user (or consultant), and product (or subject) (Cui and Wu, 2017; Damodaran, 1996; Lengnick-Hall, 1996; Nambisan, 2002; Olsson, 2004; Sanders and Stappers, 2008). The first two end-user roles (resource and co-creator) are at the input side of co-creation activity, whereas the other three are at the output side of the process. The end user as a buyer and as the product are less relevant to the active involvement of end users in the NPD process and the NPD context in general (Nambisan, 2002). Hence, the focus of this section will be on the end users' role in NPD as resource, co-creator, and user.

End users as resource serve mainly as a supplier of information and wealth to companies (Damodaran, 1996; Lengnick-Hall, 1996). To listen to end-users and gather information about their needs, an NPD team may employ different market research methods (such as interviews and market surveys) (Griffin and Hauser, 1993). In this sense, end users' input into the NPD process may be in terms of new ideas and work procedures or production activities (Lengnick-Hall, 1996; Nambisan, 2002; Olsson, 2004), values and experiences (von Hippel, 1986), competences, skills and knowledge (Cui and Wu, 2017; Prahalad and Ramaswamy, 2000) and solutions, (Lilien et al., 2002; von Hippel, 1986). However, in this role, the interaction between end users and the company is limited (in time and occurrences) and driven by enquiries to obtain specific information (Cui and Wi, 2017). Hence, end users usually have a reactive stance. In support, some (Nambisan, 2002; Olsson, 2004) argue that when acting as a resource, the end users' role is largely passive and restricted to answering specific questions which limits the richness and frequency of their contributions, resulting to little or no influence on the product.

End users may also play a valuable role as co-creators of new products. In this instance end users have a very active role, where NPD becomes a collaborative process and end users may act as members of the NPD team and influence decisions (Cui and Wu, 2017; Damodaran, 1996; Neale and Corkindale, 1998: Sanders and Stappers, 2008). End users as co-creators can contribute in a variety of ways including evaluation of a new technology or work practice and exploration of product requirements (Anderson and Crocca, 1993), problem-solving (Cui and

Wu, 2017), designing activities and specifying product requirements (Nambisan, 2002) and taking part in decision making regarding product features and development process priorities (Lengnick-Hall, 1996). Moreover, end-users may interact and collaborate with the company throughout the NPD process and share information on both needs and solutions that may satisfy their needs (Cui and Wu, 2017; Lilien et al., 2002; von Hippel, 2001). In the past, the role of end-users as co-creators was perhaps more evident in industrial contexts (Nambisan, 2002) where for example, in the software industry customer-companies would be invited to help in the development of new products (Prahalad and Ramaswamy, 2000). However, there is also evidence from a consumer context where end users act as co-creators and are engaged in activities such as concept testing (Page and Rosenbaum, 1992), ideation, prototype development and commercialisation (Hoyer et al., 2010; Roberts and Darler, 2017).

Finally, the role of end users as users is related to the receipt and actual use of products. In this sense, end users are asked to provide feedback and suggestions on a predefined product (Damodaran, 1996). Nambisan (2002) supports that in this role end users can create two valuable outcomes: product testing and product support. Previous studies (e.g. Dolan and Mathews, 1993) have established the highly productive role end users can play in product and prototype testing. More specifically, end-user involvement in testing may help companies to detect issues and product flaws early in the NPD process, as well as to provide a better understanding on how the product is used and perceived from a variety of end-users (Nambisan, 2002). As users, the end users are also uniquely qualified to provide the NPD team with crucial information about what worked (Lengnick-Hall, 1996) or to even support other end-users based on their knowledge on various aspects of usage (Nambisan, 2002). In the last decades, the advancement of technology has provided more opportunities for interaction between end users and for sharing experiences, knowledge and tips (Füller et al., 2008). However, in the study of Olsson (2004), it is supported that in many cases when end users act under the user role may have little or no influence on the product.

Overall, the different roles end users can take during the NPD process differ in a number of ways and entail some contrasting attributes. Whereas some end users may provide information about possible solutions, other end users may be better

suited to evaluation of concepts or to get involved in the refinement of a prototype. However, all of the different roles are important for improving not only the NPD output (i.e. end-product) but also for improving the overall NPD process (e.g. reducing costs). Furthermore, if circumstances allow it, a company may be able to engage end users from the three different roles, in different phases of the NPD process.

3.2.2.2 End-user Involvement Continuum

Whereas access to end-user information is a basic requirement for successful NPD (Cooper, 1993), end-user involvement in NPD is a multifaceted phenomenon. The option of involving the end user as resource, user, and co-creator in various NPD activities and phases can be utilised to various degrees of involvement. This subsection will discuss the degree of end-user involvement in NPD and will argue that it is an important aspect for understanding this multifaced phenomenon.

In the past end users were seen as having a passive role in the NPD process and very minimal interaction with NPD teams (von Hippel, 1978). In the last decades this view has been changed. Prahalad and Ramaswamy (2000) were the first to describe the evolution and transformation of end users and illustrate how their role has changed from passive buyers to active players (see Table 3.3).

Table 3.3 Evolution of end users

	Passive Audience			Active Players
	Persuading predetermined groups or buyers	Transacting with individual buyers	Lifetime bonds with individual customers	Customers as co-creators of value
Timeframe	1970s, early 1980s	Late 1980s and early 1990s	1990s	Beyond 2000
Nature of business exchange and role of customer	Customers are seen as passive buyers with a predetermined role of consumption			Customers are part of the enhanced network; they co-create and extract business value. They are collaborators, codevelopers and competitors.
Managerial mind-set	The customer is an average statistic; groups of buyers are predetermined by the company	The customer is an individual statistic in a transaction	The customer is a person; cultivate trust and relationships	The customer is not only an individual but also part of an emergent social and cultural fabric
Company's interaction with customers, and	Traditional market research and inquiries; products and services	Shift from selling to helping customers via help desks, call	Providing for customers through observation of users; identify solutions	Customers are codevelopers of personalised

development of products and services	are created without much feedback	centres, and customer service programs; identify problems from customers, then redesign products and services based on that feedback	from lead users, and reconfigure products and services based on deep understanding of customers	experiences. Companies and lead customers have joint roles in education, shaping expectations, and cocreating market acceptance for products and services
Purpose and flow of communication	Gain access to and target predetermined groups of buyers. One-way communication	Database marketing; two-way communication	Relationship marketing; two-way communication and access	Active dialogue with customers to shape expectations and create buzz. Multilevel access and communication

Source: Adopted from Prahalad and Ramaswamy, 2000

This shift is mainly due to technological advancements and particularly the internet which helps end users to be better informed and better connected with each other and with companies and to become a source of competence (Prahalad and Ramaswamy, 2000). Following this notion, the intensity of end-user involvement can be represented on a continuum based on the degree of end-user involvement. This spans from passive listening to end users' needs to a very active and intense involvement where the end user is part of the NPD team. More specifically, this continuum captures how deeply end users are involved in the various phases of the NPD process and the roles they have when interacting with the NPD team.

Jeppesen (2005: 349) has suggested an example of end-user involvement continuum that lists three different modes according to their degree of opportunities for end-user involvement, which is defined as "the level end users are allowed to influence the development of a product". The three different modes are as follows: First, 'listening to consumers' which is the weakest form of end-user involvement and is limited to that of a simple information provider who delivers feedback voluntarily (e.g. through complaints) or when asked to do so (e.g. through interviews) by the NPD team. Second, 'interaction with advanced users' includes lead users, who are users that "present strong needs that will become general in the marketplace months or years in the future" (von Hippel, 1986: 796). It also includes expert users who are typically able to spot errors and mistakes in prototypes during testing. These advanced users can recognise benefits and shortcomings faster and more accurately than typical end users. Third, the strongest mode of end-user involvement comes through the 'use of

toolkits for innovation'. These toolkits assist end users to carry out specific need-related tasks (e.g. through workshops or user idea contests). As a result, problem-solving tasks and activities are allocated to the users which allows them to carry out design work (Jeppesen, 2005). These three modes as described by Jeppesen (ibid), have two shortcomings. The first one is that there is no mode considering no opportunities for end-user involvement in NPD. This automatically leads to the assumption that all companies involve end users in the development of new products; which may not be the case in reality. The second shortcoming is that whereas the first mode is focusing on very minimal end-user involvement in the NPD process, the other two modes have been focusing on very active end-user involvement techniques (i.e. lead user and innovation toolkits). As a result, some other more middle ground ways for involving end users in the NPD have been ignored.

Similar to Jeppesen (2005) but with more precise emphasis on the end users' role and action (or no action) in the NPD process, Kaulio (1998) and Piller et al. (2010) have proposed another three-levelled categorisation on the degree of end-user involvement. While different terminology has been used to refer to the levels of end-user involvement (Kaulio (1998) has taken a designer's perspective whereas Piller et al. (2010) have taken a broader NPD view), the descriptions and arguments are identical and for that reason, they will be discussed together. More specifically, the three levels of end-user involvement as proposed by Kaulio (1998) and Piller et al. (2010) include:

Design for/Listen to: refers to an NPD approach where products are designed on behalf of the end user (Kaulio, 1998; Piller et al., 2010). Companies mainly use existing end-user information from diverse input channels (e.g. feedback from sales), or research reports from third parties (Dahan and Hauser, 2002). Companies may also analyse statements posted by end users on online communities (Kozinets, 2002) or information gathered by engineering-based methods like quality function deployment (Akao, 1990). End-users are consulted, but do not actively participate in the decision-making process and do not significantly influence or change the design and the final product (Bergvall-Kåreborn and Ståhlbrost, 2008). It is rather the NPD team that has the active and controlling role (Kanstrup and Christiansen, 2006) as they initiate, stage, and run

the NPD process, and create 'the solution space' (von Hippel 2001). There is some iteration process between the NPD team and the end-users where the NPD team creates something and the end-users comment upon it. However, the end-users play a relatively passive role and it is the NPD team that act as experts and represents end users' interests.

Design with/Ask: the company gathers and utilises data on end-user needs and preferences as in the 'design for' level. However, what is different is that end users are given the opportunity to react to different proposed solutions (Kaulio, 1998; Piller et al., 2010). In this sense, in the early NPD phases surveys, interviews or focus groups may be utilised for capturing end users' need and preferences (Piller et al., 2010). In the later NPD phases, the company may present different concept testing solutions to end users and ask for their opinion and suggestions (Kaulio, 1998). In this level of involvement, the sharp distinction between end users and the NPD team has lost its edge but there are still noticeable differences in their roles and responsibilities. More specifically, whereas the NPD team still has the more active and controlling role (especially in relation to initiating, staging, and running the process), the end users have a strong voice; especially when it comes to the control over form and content and to some degree the solution space (Bergvall-Kåreborn and Ståhlbrost, 2008). Hence, the end users are empowered with control and in their most active role they may strongly influence the design and the final product. In this sense, the NPD team supports the end users and ensures that when necessary, they have the opportunity to make suggestions that are important to them.

Design by/Build with: whereas in the previous two levels the end user is mostly isolated from the company, in this level the end users are actively involved in the design or development of new products (Kaulio, 1998; Piller et al., 2010). This is aligned with the notion of co-creation as discussed earlier (subsection 3.2.1.1) where end users are actively involved and take part in the development of new products. Subsequently, through the end users' input, the company gathers information about needs, applications, and solutions (Piller, 2010). In this level of involvement, the end users may design and develop parts or ideas for a product working with and supported by the designers and by different kinds of tool kits. In this way, the end users inspire the NPD team, which takes over and shape and

finalise versions of the end users' products (Kanstrup and Christiansen 2006). Here, it is important to note that the lead user approach is included in this level of end-user involvement but is seen as an extreme where end users may take the role of a sole developer in the NPD process.

The categorisation offered by Kaulio (1998) and Piller et al. (2010) is selected as most relevant for the purpose of this thesis for two reasons. First, the levels proposed on this continuum are detailed and thorough as they range from no or passive user involvement approaches to approaches promoting richer knowledge exchange between end users and NPD teams and thus a very high degree of end-user involvement. Second, although the literature on service development offers insightful categorisations on the degree of end-user involvement (e.g. see Vargo and Lusch, 2004), it is out of this study's scope. Hence, it was more appropriate to consider studies that focus explicitly on NPD practices. To avoid confusion and for clarity purposes, the thesis will adopt the terminology proposed by Kaulio (1998) (design for; design with; design by). Putting it all together, Figure 3.3 illustrates the end-user involvement continuum together with the different roles end users can take. At one extreme of the continuum, the NPD team makes assumptions about needs and requirements and may even ignore end-user input. At the other extreme of the continuum, end-users design and develop products with the NPD team. However, at this point, it is questionable if the degrees of end-user involvement and the roles end users can take in NPD should be seen as discrete categories. It is then expected that the empirical findings of this thesis may shed some light concerning the continuum.

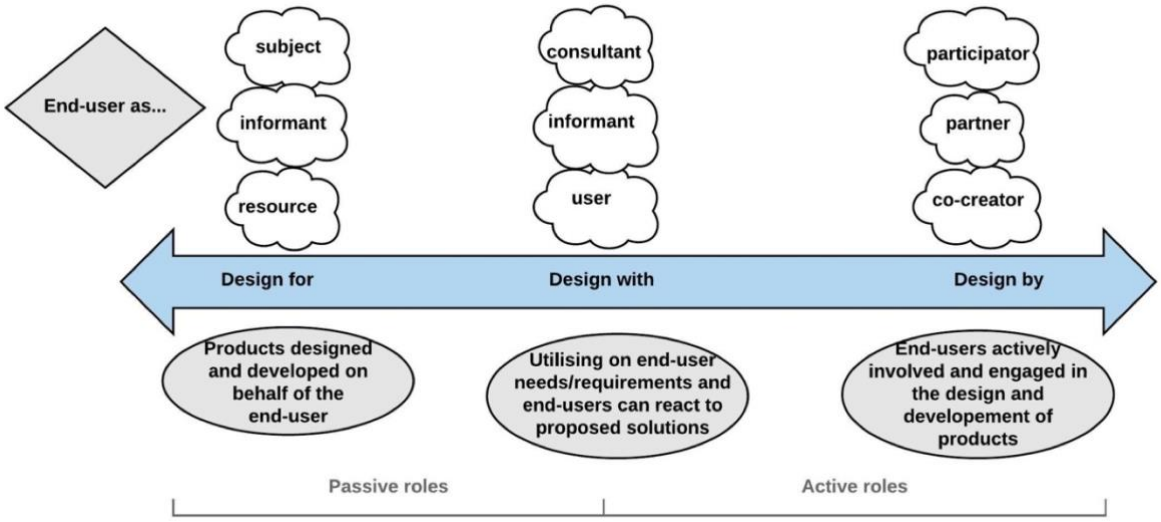

Figure 3.3 End-user involvement continuum

Source: Author's development

3.3 Chapter Summary

The purpose of this chapter was to position the study and frame the concept of end-user involvement within the existent literature. The chapter was divided into three main sections. First, it discussed the importance of the NPD process to the survivability and success of companies. It also highlighted challenges for successful NPD which are relevant and can be addressed in relation to end-user involvement. The second section provided definitions of end users and end-user involvement and discussed the different roles of end users and their impact on the NPD process. Finally, an end-user involvement continuum was presented to better understand end users' roles with the NPD process.

Chapter 4: Research Methodology

This chapter introduces and discusses the research approach employed in this exploratory research on end-user involvement in NPD. Considering the research aim and research questions, the study follows a qualitative case study methodology with semi-structured interviews as the main instrument for data collection. Table 4.1 provides an outline of the research methodology and process. The sections below justify the methodological choices and outline the philosophical foundations, overall design logic, data collection and data analysis.

Table 4.1 Outline of research methodology and process

Philosophical Orientation (ontological, epistemological, axiological positions):
Subjective view following interpretivist, social constructivist approaches with the researcher being relatively engaged
Research Strategy and Research Design:
Qualitative multiple case study
Data Collection Instruments:
Interviews, focus group, documents, observations
Data Analysis:
Thematic analysis
Research Quality Criteria:
Confirmability, dependability, transferability, credibility, and adequacy

4.1 Philosophical Orientation

Having established a set of research questions, the next step will be to devise ways to answer them. How this will be done depends not only on the nature of the questions but also on the researcher's philosophical orientation about the world. That is what Guba (1990: 17) describes as a 'basic set of beliefs that guide action' or what other academics have been referring to as paradigms (Burell and Morgan, 1979; Lincoln et al., 2011), worldviews (Creswell and Creswell, 2018), philosophical assumptions (Bryman, 2012) or more simply, epistemologies and ontologies (Crotty, 1998; Gray, 2014; Grix, 2010). Understanding and choosing the appropriate philosophical orientation is a crucial step for any research study as it will influence the research design and methods used (Crotty, 1998; Easter-Smith et al., 2018: 61; Grix, 2010: 65). The way we think the world is (ontology) influences what we think can be known about it (epistemology), how we think it

can be investigated (methodology and methods) (Fleetwood, 2005: 197) and how our own values influence the research process (axiology) (Saunders et al., 2016: 124). These concepts constitute the framework that defines the philosophical orientation of a researcher as well as the research process (see figure 4.1) and will be discussed in the following subsections.

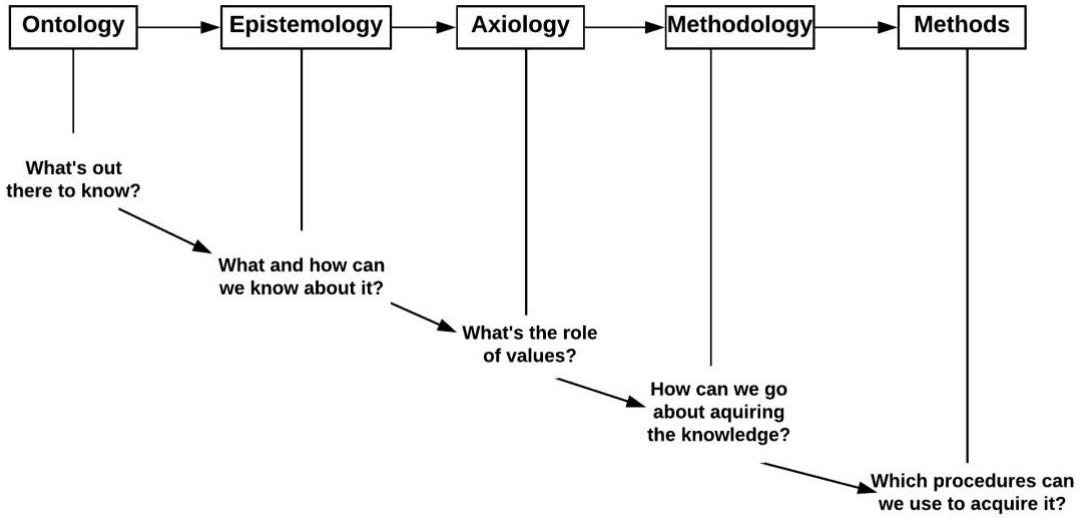

Figure 4.1 Interrelationship between concepts of the research process

Source: adapted with some modification from Grix (2010: 68)

4.1.1 Ontological Position

Ontology refers to assumptions about the nature of reality, and it is the starting point of the research, followed by epistemology and (the less discussed by social researchers) axiology. There are four leading ontological positions (see Table 4.2) with the two opposing positions being realism (or extreme objectivism) and nominalism (or extreme subjectivism) (Easterby-Smith et al., 2018: 68).

Returning to the research study at hand, its main aim is to understand why and how end-users get involved in and impact the NPD process of firms. According to the outcomes of the literature review, there are different levels of end-user involvement and an array of methods and tools for the firms to collaborate with them. End-user involvement and engagement in the NPD happen through the social interactions of designers/managers and end users and different versions of this

interaction are experienced by different individuals (O'Gorman and MacIntosh, 2015: 57). Therefore, designers and NPD managers may interpret the situation they are in differently and they may base their decision of involving end-users or not in specific phases of the NPD process, in their own personal view of the world. This may as well mean that designers and managers also can change their views and decisions (regarding if, when, and how to engage end-users) through interaction (Eriksson and Kovalainen, 2008). Hence, a subjective view of the situation will help to better understand all these different realities of the designers/managers and to make sense of their motives and perceptions; hence the researcher adopts a **relativist** (social constructionist) position.

Table 4.2 Main ontological positions

	Realism/Objectivism	**Internal realism**	**Relativism**	**Nominalism/Subjectivism**
Truth	Single	Exists but is obscure	Many truths	No truth
Facts	Exist and can be revealed	Concrete but not directly accessed	Depend on viewpoint of observer	Are all human creations

Source: adapted from Easterby-Smith et al. (2018: 68)

4.1.2 Epistemological Position

Epistemology is concerned with what constitutes acceptable, valid and legitimate knowledge, how we can produce or acquire this knowledge, and how to communicate it to others (Burrell and Morgan, 1979; Moon and Blackman, 2014). Epistemological perspectives, similar to ontological perspectives, can be positioned on a philosophical continuum. That means that epistemological discussions and debates are centred on the grounds of objectivity and subjectivity. Table 4.3 illustrates the philosophical assumptions of positivism, pragmatism, and social constructionism.

Table 4.3 Philosophical assumptions of Positivism, Pragmatism, and Social Constructionism

	Ontological beliefs (What is reality?)	**Epistemological beliefs** (How reality is known?)	**Axiological beliefs** (What is the role of values?)	**Possible research study's goals**
Positivism	There is a single reality or truth.	Reality can be observed and measured.	Value-free. Researcher is detached, neutral and independent.	Discover contributors to probability within situations of cause and effect.

Pragmatism	Reality is dependent on a flux of processes, experiences, and practices. Reality is what is useful, practical, and 'works'.	Focus is on problems, practices, and relevance. Reality is known through using many tools of research. Best method is one that solves the problem.	Value-driven. Research initiated and sustained by researcher's doubts and beliefs.	Find solutions to real-world problems.
Social constructionism	There are multiple realities that are constructed through experiences and interactions with others.	Reality is co-constructed between the researcher and researched, and needs to be interpreted.	Value-bound. Researcher's interpretations are key to contribution.	Understand the world in which we live and work.

Source: Amalgamated from Creswell and Poth (2018: 34-35); O'Gorman and MacIntosh (2015: 70); Saunders et al. (2016: 136-37)

Positivism is rooted within the realist/objectivist ontology and advocates that social phenomena should be studied using methods of natural sciences (Bryman, 2008; Bryman and Bell, 2003). However, whereas a positivist approach gives great emphasis on explanation of measurable facts and phenomena (Crotty, 1998; Grix, 2010), the aim of this research is to understand how NPD managers and designers construct social reality and how this is affected by their own and others' actions. Hence, adopting a positivist epistemological position would not be a sensible option.

Pragmatism is often seen as a compromise between extreme objectivism and subjectivism, because it does not accept that there are predetermined theories that shape knowledge and truth, nor does it accept that people could construct their own truths out of nothing (Easterby-Smith, 2018: 83). Since the interest of this research is to develop an understanding of a complex overall situation (how and why end-users get involved in the NPD process) where there are multiple viewpoints and experiences, it appears that pragmatism epistemology would not be a good fit to fulfil this.

Differently to pragmatism and in contrast to positivism, social constructionism emphasises that the world is socially constructed, and is determined by people rather than by objective and external factors (Easterby-Smith, 2018). Instead of taking knowledge for granted, social constructionism seeks to understand how seemingly 'objective' features (e.g. industries, organisations) are constituted by subjective meanings of individuals (Eriksson and Kovalainen, 2008). Walliman

(2006) suggests that to achieve that, a researcher is not just observing phenomena from outside the system but is inextricably bound into the human situation which he or she is studying. That means that the researcher takes into account the multiple realities which are constructed by the perspectives of different individuals and the context of the phenomenon under investigation (O'Gorman and MacIntosh, 2015). These different constructions of reality 'are not more or less true in an absolute sense, but simply more or less informed and/or sophisticated' (Guba and Lincoln, 1994: 111). However, it is also the researcher that plays a key role in this approach to research as he or she becomes the vehicle by which the reality is revealed. Verification of what actually exists in the social and human world depends on the researcher's interpretation; the researcher's background (personal, cultural and historical experiences) and beliefs could influence their interpretation of the different realities (Creswell and Creswell, 2018; O'Gorman and MacIntosh, 2015). Considering all the above, the social constructionist paradigm is the most suitable to accommodate this exploratory study and the researcher's overall philosophical position. More specifically, in this study is necessary to access the different perspectives of managers and designers on end-user involvement in NPD in order to develop an accurate reflection of reality (Easterby-Smith et al., 2018).

4.1.3 Axiological Position

Axiology (figure, 4.2) is the philosophical study of values and ethics within the research process (O'Gorman and MacIntosh, 2015: 69). Easterby-Smith et al. (2018) distinguish axiology between detached and engaged. The former suggests that the researcher should strive to be independent or 'detached' from what he/she is studying and the latter suggests that there is a positive value in getting closer to the objects of one enquiry, to be 'engaged' with the research (ibid). Because the purpose of this research is to understand the end-user involvement in NPD through the eyes of different participants, the researcher places great importance on data collected through personal interactions and adopts a relatively engaged axiological position.

Hence, considering all the above points, the philosophical orientation of this study is positioned as ontologically **relativist**, epistemologically **social constructivist** and axiologically **relatively engaged**. In adopting this position, the study would

need to be designed, such as to collect rich data from multiple sources and perspectives. The chosen research approach and research design will be discussed in the following sections.

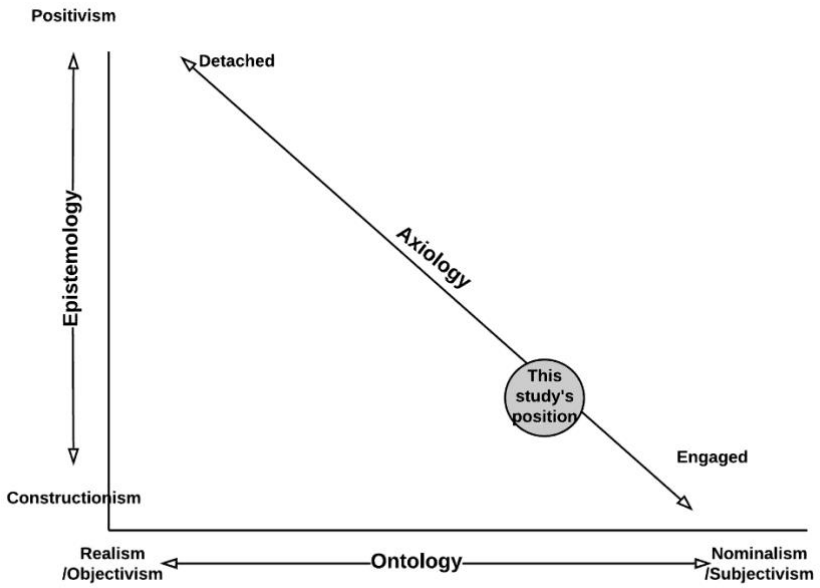

Figure 4.2 Philosophical orientation of the study

4.2 Research Strategy

Having defined the philosophical orientation of this study, the next step is to consider the overall research strategy and direction for answering the research questions of this study. The next sections will discuss different ways of reasoning (inductive and deductive) as well as approaches to enquiry (qualitative and quantitative).

4.2.1 Deductive and Inductive Reasoning

Considering the nature of the research questions, this thesis adopts mainly an inductive research logic. Deductive reasoning is where existing theory informs and shapes the research process (Grix, 2010: 114). Deductive theory commences with a hypothesis (or hypotheses) which are deduced from the theory and they drive the process of gathering data (Bryman, 2008). Inductive reasoning is opposing to deductive reasoning; it begins with observations and seeks to find patterns and

construct relationships and generalisations between them (Bryman and Bell, 2015; Gray, 2014). So, deductive reasoning follows a theory-driven approach to research, as opposed to inductive reasoning which is a data-driven approach and seeks to derive theories from empirical evidence. However, while the distinction between deductive and inductive reasoning is a simple way to differentiate kinds of social research, in reality, most research frequently uses a mixture of the two (with more emphasis on one) (Grix, 2010; Ragin, 1994, p. 47). It is unlikely that a research study could be purely deductive or purely inductive as it is not possible to go completely theory-free into any study (Perry 1998: 788; Richards, 1993: 40). Accordingly, Bukve (2019: 136) and Miles et al. (2014: 20) support that all researchers have a pre-understanding of a situation and therefore it would be wrong to think of interpretative research as following a purely inductive approach. Therefore, it is suggested that 'both extremes are untenable and unnecessary' (Parkhe, 1993: 252) and that depending on one's specific research requirements, a simplistic inductive (or deductive) approach should be avoided (Silverman, 2010: 86).

Aside the generic notion that end-user involvement is of paramount importance to successful NPD, current literature has approached the phenomenon with a diversity in foci (section 2.1). As such, a number of different (theoretical) perspectives (e.g. resource-dependence theory or knowledge management view of the business) have been employed for investigating and addressing end-user involvement in NPD. However, a single or narrow theoretical view would be against the exploratory nature and philosophical stance of this study and it could result in inadequate and sparse findings. This reasoning is in line with Eisenhardt's (1989: 536) suggestion that preordained theoretical perspectives or propositions may bias and limit the findings and hence the research should start as close as possible to the ideal of no theory under consideration and no hypotheses to test. This study also follows Coviello et al. (2018: 88) and Pratt's (2008: 497) suggestions and argues that end-user involvement in NPD is a complex (social) system and as such it should be approached with an open (theoretical) frame. In addition, the findings from the systematic literature review (section 2.6) indicate that a limited number of studies have looked directly at the impact of end-user involvement in NPD and most studies have not provided sufficient detail or adequate evidence base to support their findings regarding the impact of end-user involvement in

NPD. In particular, extant literature has in large neglected to discuss associated risks and challenges related to end-user involvement and in many cases, it has focused on investigating end-user involvement on specific NPD phases (most commonly the FFE). Ozcan and Eisehardt (2009: 249) support that inductive studies are especially useful for developing theoretical insights when research focuses on areas that extant theory does not address well and when a process is under investigation (in this study that is the NPD process). Considering all the above, it was decided that an inductive approach would be most appropriate for exploring how end-user involvement impacts the NPD process and its outcomes and for the process of developing theory by means of identifying emerging patterns.

However, as discussed earlier, it should be recognised that irrespectively of philosophical or methodological decisions, all researchers have a pre-understanding of a situation and especially in areas where some understanding has been achieved it is important to consider and use this 'restructured research' (Milles and Huberman, 1994: 17). Neglecting to consider existing findings from current research might lead to drifting away from the topic under investigation or even 'rediscovering' what is already known (Carson et al., 2005: 99). The existing literature on the topic and the findings and constructs developed from the systematic literature review (see figure 2.2) were taken into consideration when framing the research designing and when analysing the empirical data from the case studies.

Overall, for the purpose of this particular study, there is no strong prior research or theory to base the study on, and hence an inductive approach will be more suitable in order to establish new concepts and to explore how end-user involvement in NPD affects firms. At the same time, the study also purposes to investigate and clarify the characteristics of the different degrees and approaches to end-user involvement in NPD. More specifically, the research will merely follow a deductive approach by using the evidence gathered from the systematic literature review (see conceptual framework in subsection 2.7) to examine the characteristics of each one of the approaches (e.g. tools, phases). This will be followed by an inductive approach, whereas based on observations and data

collected from specific cases, general conclusions will be drawn regarding the true effects that end users have on the development of new products.

4.2.2 Qualitative and Quantitative Approaches to Research

Quantitative research generally attempts to operate under the assumption of objectivity and is, therefore mostly associated with positivism (Saunders et al., 2016). In a broad sense, it is a type of empirical research which with the use of numbers and statistics aims to test a theory and explain or predict phenomena of interest (Creswell, 1994). According to Grix (2010: 117), quantitative research has three steps including identifying variables for concepts, operationalising them, and measuring them. In contrast, qualitative research is typically concerned with understanding subjective experience and is often associated with interpretivism. Qualitative empirical research is characterised by detailed observations (which take place in the natural setting of the phenomenon under investigation) and is based on words or pictures rather than numbers (Miles et al., 2014; Silverman, 2010). Overall through qualitative research, the researcher can explore, understand, and present the multiple perspectives and views of individuals ascribe to a social phenomenon (Creswell, 2009; Denzin, 1994). Opposite to quantitative research, the researcher is not detached from but positively interacts with the object of the study (Grix, 2010: 121).

A qualitative rather a quantitate approach to research was chosen as most suitable for the present study. This decision was based on the following reasons: Firstly, as previously noted (see outcomes of SLR), little research has investigated the effects of end-user involvement throughout the NPD process. Qualitative methods have the possibility to provide a rich description of complex phenomena, illuminate the experience and interpretation of events by actors with different roles and conduct exploration to develop theory (Sofaer, 1999: 1101). Since this study intends to gain a better understanding of how and why end-users get involved in NPD, a qualitative approach should be the most suitable option. Secondly, if a quantitative approach were to be followed, there would be the risk that participants would not be able to provide accurate and rich information required for getting an in-depth understanding of the complex phenomenon under investigation. Therefore, qualitative research will help to acquire a more complete portrayal of the phenomenon under investigation.

4.3 Research Design

So far, the philosophical orientation and the research strategy have been considered, and it has been decided that the study will follow a mainly inductive qualitative methodology based on social constructionist philosophy. Building on this foundation, the next step will be to design what data will be gathered, how, and where from (Easterby-Smith, 2018). There are several approaches to qualitative research (e.g. ethnography, grounded theory) however, it is not in the intention nor the purpose of this thesis to discuss and analyse each one of them. Rather, this section will focus on the case study methodology. As it will be argued in the next sections, this is identified to be the most suitable methodology for investigating complex phenomena as the one presented in this study (Meredith, 1998; Voss et al., 2002). Hence, the next sections will rationalise the selection of case study methodology and the decisions that should be made by the researcher while designing a case study methodology, including the number of cases; selection of cases; methods for data collection; and research quality (Eisenhardt, 1989; Yin, 2009).

4.3.1 Case Studies

A case study has been defined in a variety of ways in the literature (for example see George and Bennett, 2004: 17; Miles and Huberman, 1994: 25; Stake, 1995: 237). According to Yin (2009: 18) "A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident". Case studies usually make use of a plethora of data sources such as interviews, observations and archival data (Eisenhardt and Graebner, 2007: 28). This ensures that the issue is explored through different perspectives and thus, the phenomenon can be better revealed and understood (Baxter and Jack, 2008: 544).

4.3.1.1 Why (Multiple) Case Study

Yin (2009: 2) suggests that case studies should be preferred as a method (i) to answer "why" or "how" questions, (ii) when the researcher cannot manipulate the behaviour of those involved and (iii) when the focus of the research is on a contemporary phenomenon with a real-life context. Case studies are suitable for

exploring (new) processes or behaviours and offer the researcher the opportunity for a holistic view of processes or real-life events (Hartley, 2004: 325; Patton and Appelbaum, 2003: 63; Yin, 2009: 4). In the same way, according to Eisenhardt (1989: 548), the deployment of case studies is particularly appropriate when little is known about a phenomenon, or current perspectives or existing theory seem inadequate because they have little empirical substantiation. Furthermore, multiple case studies in contrast to single cases, allow for cross-case analysis and the extension of theory and they offer a rich natural setting for building theory that is more accurate and more generalisable (Benbasat et al., 1987: 372; Eisenhardt and Graebner, 2007: 27). Finally, the findings of (multiple) case studies can: have powerful impact and lead to new and creative insights, have high validity with practitioners, broader the exploration of research questions and theoretical elaboration, and develop accurate and testable theory (Eisenhardt, 1989: 547; Voss et al., 2002: 195-196).

Considering all the above, it becomes apparent that the appreciation of different settings and complex dynamics of end-user involvement in NPD requires focusing on cases of particular firms in order to be confident that all the levels of end-user involvement have been investigated. Additionally, end-user involvement and engagement in the NPD process involves many different individuals, different organisational departments, and depends on different (organisational or individual) cultures and attitudes. Hence, such a multiple case study methodology matches this study's comparative research where an intimate understanding of what concepts mean to people, the meanings attached to particular behaviours and how behaviours are linked is essential (Hartley, 2004: 325). It has therefore been decided that a multiple case study methodology will be followed. The case studies design will be presented in the following sections.

4.3.1.2 Cases Design and Selection

Case selection for this study followed theoretical replication. To start with, multiple case studies should be considered as multiple experiments and thus, should follow a replication design (Yin, 2009: 53). This logic involves (i) literal sampling in which the cases are chosen to predict similar results or (ii) theoretical sampling in which the cases are chosen to produce contrary results but for predictable reasons (Eisenhardt, 1989: 537; Yin, 2009: 54). Since the purpose of

this research is to enhance understanding and develop theory by investigating different levels and approaches of end-user involvement in NPD, the case selection is based (mainly) on theoretical replication. More specifically, theoretical replication logic is followed to ensure that the selected for investigation cases provide settings of different levels of end-user involvement in NPD (covering OI, PD, and IA approaches). However, within the boundaries of each of these different levels (approaches), literal replication is employed to include a range of cases where end-user involvement happens in a similar level; and thus, to allow more robust outcomes (see figure 4.3).

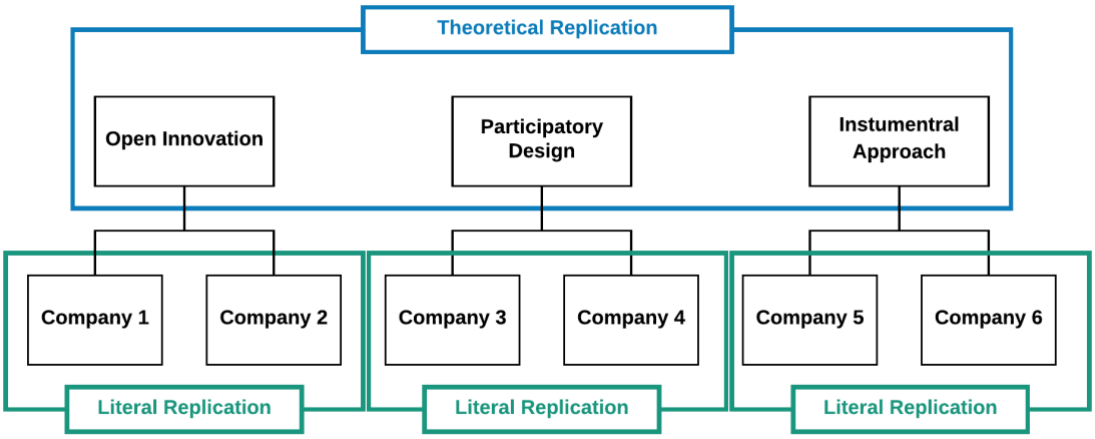

Figure 4.3 Case selection logic and number of cases

Considering the number of cases, Perry (1998: 792) suggests that several case studies should be conducted because they allow cross-case analysis to be used for richer theory building. Case selection should be mostly depended on the purpose, usefulness, credibility and the availability of resources; but while there are no rules on the number of cases, analysing between four to ten cases is advisable (Eisenhardt, 1989: 545; Patton, 1990: 184). Moreover, more than fifteen cases will yield too many data that analysing it will be extremely difficult and unwieldy (Miles and Huberman, 1994: 30). The sample size of this research study was relative and depended on the purpose of the study. In that sense, a multiple case approach was deemed necessary to compare and contrast observations and findings in various settings which would allow to 'develop a more elaborate theory' and 'draw a complete theoretical picture' (Eisenhardt, 1991: 620).

Therefore, it was decided to carry out a total of six in-depth case studies within six companies. This number of cases will give better opportunities for covering all the different levels and approaches (PD, OI, and IA) of end-user involvement and for providing the information needed to ensure meeting the purpose of this study. If the case studies were three or less, it would be very challenging to identify general patterns and build generalisation. If the cases were more than six, the depth of data collection and analysis would suffer making the results less meaningful and the complexity caused by the large amount of data would make it difficult to identify similar or contrasting patterns among the cases (Eisenhardt, 1989). Hence, six in-depth case studies will assist to attain a balance between the depth and the broadness of the study.

Following the replication logic across the cases, the sampling strategy was purposeful rather than random (Eisenhardt, 1989: Yin, 2009). Selection of appropriate cases was based on the individual characteristics of the firms, as well as the overall composition. Eisenhardt (1989: 537) advises that "random selection of cases is neither necessary nor even preferable". Patton (1990) lists sixteen strategies of "purposeful sampling" (instead of "random sampling") and similarly, Flyvbjerg (2006) lists four strategies based on information-oriented selection, which can be used to identify appropriate cases. Following the above suggestions, the six in-depth cases in this study are selected to represent polar positions with maximum variation cases. To this regard, the criteria through which the cases were identified as being appropriate for inclusion in the research are as follows: First, each of the companies must fall within the spectrum of the three identified different approaches to end-user involvement in NDP; that is design by (PD), design with (OI) and design for (IA). Second, the companies must have a minimum of five years of experience with end users in order to have a more complete collaboration-experience and an established portfolio of end user involvement activities to research. Whereas case Delta at the time of data collection had just under five years of experience with end users, it was still selected as appropriate for the case study sample. This is because (i) all of Delta's interview participants have prior experience of working with end users from activities and projects before the formation of Delta and (ii) the company has been very open to share information and experiences which allowed for gathering rich and in-depth data. Third criterion for including a case is that ideally, companies should also have

experience with projects that did not involve end users. This would allow participants to provide a more complete view and more precise comparisons when discussing benefits, challenges, and impact of end-user involvement in the NPD process. Case Gamma is excluded from this as it is a company that was founded and established based on ideals that fall exactly in the 'design by' philosophy and therefore it would not be possible to fit this criterion. A fourth criterion is that all selected companies needed to be involved in the development of consumers' products. In that sense, companies that have been developing industrial products and their end users are other companies (rather than consumers) were excluded from the study. Fifth, a balance should be achieved in selecting companies that fall into different sizes. This would allow for comparisons between same size companies as well as comparisons across different sized companies and would foster generalisability of findings. Finally, a loose but preferable criterion is that the companies would be operating in different countries. That way, the impact of cultural characteristics on decision making and managerial practices will be minimised and again, this would allow for broader generalisability of findings. The selection criteria and characteristics of each case are summarised and presented in table 4.4.

Table 4.4 Case selection criteria and companies' characteristics

Selection criteria	Alpha	Beta	Gamma	Delta	Epsilon	Zeta
Fall within one of the end-user involvement approaches	Design by	Design with	Design by	Design with	Design with	Design for
Experience with end users (>5 years)	>5	>10	5	≥ 5	7	>5
Have worked on projects that did not involve end users	Yes	Yes	Not applicable	Yes	Yes	Yes
Work on development of consumer products	Product development agency	Publishing	Clothing	Food	Water heaters	Food
Size variety	Medium	Large	Small	Small	Large	Medium
International sample	UK	Greece and Russia	UK	UK	France	France

The last decision regarding the design of the case studies had to do with whether to use an embedded or holistic design. For multiple case designs, Yin (2009: 46) identifies two design structures: (i) each case is investigated as a whole (holistic)

involving a single unit of analysis, or (ii) in each case different subcomponents can be investigated (embedded) involving multiple units of analysis. In order to allow comparisons and cross-analysis between the cases, the study adopts a holistic design with NPD projects as the unit of analysis. The NPD project as the unit of analysis was selected because it aligns with previous academic studies and would, therefore, help to investigate and understand how the phenomena are linked to existing knowledge. While reviewing the literature, it became apparent that a generic NPD process model can be identified among firms irrespectively of their sector (see subsection 3.1.1). Considering that, the case studies were selected first and foremost based on the collaboration structure between the companies and the end-users –that is, different approaches and level of involvement. Therefore, the six cases presented in this thesis were selected to fall on the spectrum of OI, PD, and IA (figure 2.2 provides an overview).

All in all, the study follows a multiple, holistic case study design including six cases with NPD projects as the unit of analysis across the cases. Next, the selected methods for data collection will be discussed.

4.3.2 Vignette of Case Studies

4.3.2.1 Case Alpha

Alpha is a product design and engineering consultancy company founded in 2002 and employs ten people. By working with companies that want to create innovative products, the team in Alpha use their expertise to provide solutions and develop products (based on existing or new technologies) that people would like to use. Alpha creates products for a range of clients in a variety of industries (e.g. medical devices, industrial products, consumer products). For all discussed projects during the data collection, clients would go to Alpha with only a broad idea for a product. That means that Alpha was involved in a strategic role, contributing from the very start of the project (e.g. market research), rather than being a mere executor of design briefs. This allowed studying the NPD process and the end users' potential contribution in depth.

Although working in developing a number of different kinds of products, the NPD process in Alpha remains roughly the same for every type of project. New product

development can be concerned with a completely new product or with a massive redesigning of an existing product. Alpha has developed a variety of products throughout the years from computing accessories to children's market to medical devices. Alpha is responsible for designing the products and in some cases, could also manufacture a small batch if the client requests that. For the last five years, independently of the project and the product's nature end users are always invited to be involved in the NPD process. Therefore, end-user involvement is embedded in the NPD process of Alpha. The length of the NPD process depends on the project and could take from a couple of months to up to two years. At the time of the researcher's visits in Alpha's facilities, the company was working on five different projects, all in different development phases.

4.3.2.2 Case Beta

The second case study, Case Beta, is investigating the NPD processes of the Russian subsidiary department of company Beta. Beta is a large, family-owned multinational publishing company founded in Italy more than 100 years ago. Beta is a leader in the partworks market where it offers a wide range of series of magazine issues that run for a determined time (called partworks). It has a presence in several countries all over the world, and its publications are issued in thirteen languages. The company entered the Russian market in 2004 and since then has published more than 90 collections of partworks. All subsidiaries of Beta, including the one in Russia, follow a lean structure where the core management team is employed by Beta and everything else is outsourced to specialised companies. For example, whereas the core management team in Russia can reach the 60 people, the printing is outsourced in companies in Ukraine and Romania and the collectables (items that may come with the magazines) come from partners specialised in developing these items and can be in from China, Spain, or Italy.

The core product of Beta is partworks, which may have two forms: i) a magazine only or ii) a magazine and a collectable item. The partworks collections can be related to a number of diverse themes including geography, history, science, modelism, educational courses, etc. Each partwork issue is available for sale to the consumers weekly or fortnightly and have an average lifecycle of 18 months. The company develops launch portfolios based on the different target groups and

segments. They aim is to always have a product in the market for each one of their target groups (e.g. according to age and gender) and target segments (according to other characteristics e.g. collectables, books, educational courses). At the same time, in order to reach the maximum selling potential of each product and to avoid cannibalisation among different products, they take care not to have products overlapping. For example, they would not have two products targeted for female 18-44 years old simultaneously at the market. Therefore, once the product has made its cycle in the market, meaning that all the issues of the magazine have been launched into the market, Beta should be ready to launch the next product.

Beta has the potential to launch up to 12 partwork collections per year, but after the global financial crisis, this number has been reduced to 5 to 6 partwork collections per year. Half of their projects are local (Russian) developments and half are international projects. The ideas for the international projects either come from the mother company or subsidiaries in other countries and are based on partworks that have been successful in other markets. Beta would select some of these partworks, put them through a concept-screening phase to understand which one is the most appealing to end-users, and the most successful ones will go through a market test to access their selling potential in the Russian market. The process followed for the local projects is slightly different in the sense that Beta is responsible for all the NPD process and end-users may be involved from the beginning (idea generation) to the end (pre-launch). This research study focused mainly on the development of local projects and therefore from now on and for the remaining of this section, the discussion will be based on information about new local projects only.

When Beta is developing a new local project, the NPD process takes an average of 18 months; from idea generation to market launch. Although Beta wants to reduce that to 12 months, it is very difficult if all the NPD phases are to be followed properly. Because a partwork collection is a limited product; meaning that it has a defined beginning and a defined end, Beta needs to have a very fast NPD process to be able to launch new collections frequently. Also, Beta needs to be fast enough to develop a product and launch it before any of the competitors.

End users get involved in almost every NPD project and during various phases of the NPD process. The decision for end-user involvement mainly depends on the uniqueness and the innovativeness of the product. The only case where end-users are not involved in the development of a new product is when the product is familiar to the company. This either can happen because a product has already been successfully launched in a number of other markets (different countries) or more rarely, because the product under development is very similar to a product previously launched by Beta. Therefore, end-user involvement is embedded in the NPD process of Beta, and it is not something that they only recently started doing. This is also supported by the fact that all participants of the study have more than ten years' experience within Beta and they have stated that they have always been working with end-users.

4.3.2.3 Case Gamma

Gamma is a small textile company, specialising in prototyping, sampling and small-batch production of a range of garments and textile-based items. The company has been operating for four years and employs six people. Its clients range from small businesses and start-ups to independent product design engineers and emergent fashion designers. Gamma follows and promotes ethical business practises; meaning that it only works with cruelty-free, plant-based and eco-conscious materials.

In the case of Gamma, the business is structured in such a way that the end-users have the central role in the NPD process. Gamma offers its facilities, expertise and experience to end-users who want to turn their designs into wearable garments or any other kind of tangible object that involves sewing two pieces of cloth together (e.g. seating for wheelchair users or kids travel systems). Hence, Gamma primarily undertakes and works on projects that are proposed by end-users. In that sense, the end-users are the ones who lead the project and the ones who take all the decisions; as long as those decisions meet the quality standards set by Gamma. Thus, the role of end-users in case Gamma falls within the description of lead-users as they have been defined by von Hippel (1986). For this reason, the following discussion on case Gamma will include both lead-users (in this specific context this refers to end-users who propose and manage the project) and ordinary end-users (as they have been defined in the Glossary).

The projects undertaken by Gamma could be in different phases of development; from a very initial phase with a rough idea on a paper to more developed concepts coming from end-users who are accomplished within the clothing industry and want to develop and test prototypes. Additionally, every individual project may vary in complexity and duration. At the time of the researcher's visits in Gamma's facilities, the NPD team was working on fourteen different projects.

4.3.2.4 Case Delta

Case Delta is investigating the NPD process followed by a UK-based multidisciplinary research group for developing a therapeutic diet for people suffering from chronic gastrointestinal disorders. The research project is led by a UK university, and the research team consists of academics, researchers, and clinicians (including gastrologists, nurses, and clinic consultants). The main aim of the research team is to develop and evaluate the effectiveness of a novel, regular solid food-based diet to improve clinical outcomes in adults and children affected by active gastrointestinal diseases. In achieving that, ready-meals were designed, developed, and prepared according to the treatment-diet requirements and eventually were tested with end-users. This is the first project for Delta and therefore more details on the company's NPD process will be discussed together with the project under investigation in Chapter 5.

4.3.2.5 Case Epsilon

Case Epsilon is a French heating systems company developing a range of heating solutions including water heaters, electric heaters, solar water heaters, and more. Epsilon has more than 50 years of experience in the industry and has a global image as an expert for heating solutions. It has 25 manufacturing sites located across 10 countries, more than 8,000 employees worldwide and distribution of products in more than 70 countries. For the needs of this research study the researcher travelled to one of the manufacturing sites that is located in France, it has approximately 220 employees and is specialised in developing and manufacturing water heaters for domestic use.

Water heaters are from their nature very standardised products. Hence, one of the first topics to discuss with the participants was regarding the decision for

developing new products. It was explained that every five years, the Marketing department, in collaboration with the R&D department, would set the plan and direction of the company. Essentially, the decision of developing a new product will be taken for either meeting new regulations (e.g. new environmental regulations) or for meeting new objectives as identified by Epsilon (e.g. substantial price reduction or meeting end users' needs such as environmental consciousness). A new product development can be concerned with a completely new product or with a massive redesigning of an existing product. Depending on the project, the NPD process can take between eighteen months to five years; that is including the certification needs which take six months.

It is important to note that Epsilon has two kinds of end-users. First is the installer which may be requested by a consumer to offer consultation on the best heating solution, buy the water heating system, and install it; and second is the consumer who may buy the water heating system directly from Epsilon. When developing a new product, is mostly the installers and less the consumers that are invited to participate in the process. This is because the installers are certified by Epsilon to install and maintain their products. Hence, they are the ones who have the knowledge, the experience and the power to direct consumers in buying Epsilon's products. Nevertheless, involving end-users (installers and consumers) in the NPD process is a practice that Epsilon started to follow in the last seven to ten years. Whereas previously the products were tested with the employees of the company, the management of Epsilon felt that involving end-users will offer a more objective view and would lead to more successful products. In summary, installers and consumers are both considered end-users of Epsilon's products, and they are involved in the development of every new product. It was approximately ten years ago when Epsilon took the decision to involve end-users in its NPD process. This decision was based mainly on the assumption that in the digital age the end-users are becoming more aware and better informed of Epsilon's products and therefore have higher purchasing power.

4.3.2.6 Case Zeta

The sixth and final case study, Case Zeta, is a medium-size charcuterie located in France, with more than 60 years of experience in producing deli meats. Zeta employs 105 people and produces more than 4,200 tons of meat per year. It has a

number of product lines (e.g. bacon, mortadella, salami) with chorizo products being its main product line, representing almost half of Zeta's production volume (2,300 tons/year). Most of the products are sold through French and international distributors (e.g. supermarkets, hypermarkets, hard-discounts) and to out-of-home catering (e.g. restaurants of large companies, schools). Zeta also has a part of the sales represented by exportation in 14 countries worldwide including Germany, Canada, Lebanon, etc.

Before presenting the findings of case Zeta, first, it is important to have an overview of the food industry in France and how it works. As the participants discussed, the decision and overall power of what product is developed and launched in the French market lies mainly with the distributors of the market (e.g. supermarkets). More specifically, the distributors advised by their marketing team, are the ones to decide what kind of a new deli meat product will be launched next. They will prepare a document[4] including all the specifications that should be met for the new product and they will circulate that to charcuteries around France (amongst them Zeta). The charcuteries will compete and the one that manages to develop the desired product within the specifications set by the distributors will be the one to secure a deal with the distributor for producing the product. As a result, this practice has implications on the NPD process of the companies and as it will be discussed in Chapter 5, may also impact end-user involvement.

Zeta's products are divided into two categories: dry meats (e.g. chorizo) and cooked meats (e.g. mortadella). The drying process of the meats can take from eight days to three months and therefore the overall NPD process is longer for dry meats than for cooked meats. The production planning is also different between the two product categories including differences in quality standards, machinery, and packaging conditions. However, Zeta mainly focuses on producing dry meats and therefore, all the discussion and information acquired during the interviews was based on this product category.

[4] A document like this was presented to the researcher during one of the interviews. The document was 15 pages long and included information ranging from the ingredients of the product (e.g. meat consistency, salt, colour, shape, nutrition) to packaging specifications (e.g. size, material).

As already mentioned, the distributors of the industry have a central role in decisions regarding the launch of new products. Therefore, the decisions for new products are mainly taken by the distributors, meaning that they are the ones to initiate the NPD process. Involving end-users in the NPD process is a requirement set by the distributors and it happens for every project, but it does not happen very frequently throughout the process. Hence, in general, Zeta does not rely much on end users' suggestions, feedback and opinions. In addition, end-user involvement depends on the product. As participants supported, only premium quality products will be tested by end-users. Nevertheless, the two reasons end-users are invited to get involved into the NPD process are (i) because Zeta wants to test the taste of the product and validate its characteristics (e.g. taste, colour, appearance) before launching it into the market and (ii) because it is an obligation towards the distributor. This practice is different from the one followed in the Chorizo Sticks project.

4.3.3 Data Collection Methods

Data collection involved a number of methods for gathering rich and insightful data. These included semi-structured interviews with individuals from different departments (e.g. production, marketing, designing), focus group, secondary data (e.g. product development documents, online information), participant observations. This indicates that information on end-user involvement in NPD was approached from multiple sources of evidence and did not rely on a single method. This technique of collecting data from different sources is referred to as 'triangulation', and it helps to gain a fuller picture of the situation, reduce uncertainty, establish credibility, and increase the robustness of the collected data (Creswell and Poth, 2018; Easterby-Smith, 2018; Myers, 2013; Stake, 2005). The data collection in each of the companies was repeated until saturation was reached and a complete picture emerged of:

- The NPD phases in which end-users get involved and the tools that are used for engagement with end-users
- The criteria to decide whether to involve end-users in the NPD process
- The effects that end-users have in specific phases of NPD of a project
- The benefits and challenges of end-user involvement

The period of all data collection lasted from March 2017 to January 2019. The data collection happened mainly through face-to-face semi-structured interviews. Although not all companies are based in the UK, the researcher decided to travel to the location of the companies in order to be able to create a more holistic picture of the case under investigation (through observations, participation in formal and informal events within the companies' facilities). The only exemption is Case Beta albeit an international company; the case was centred on their subsidiary based in Russia. In this instance, the researcher had a face-to-face interview with the general manager in Greece, and the rest of the interviews were conducted through Google+ video-calls. It should also be noted that Case Alpha was the only one to participate in a focus group. This is because in the following case studies, the objectives of the research were covered through the interviews and the researcher decided that all important relevant information was gathered. An overview of case characteristics and the main instruments for data collection is provided in Table 4.5. A more detailed discussion regarding the selection and the process of each of the data collection methods follows in the next sections.

Table 4.5 Cases characteristics and main data collection instruments

Case	Field	Size	Location of the units interviewed	Participants profiles and pseudonyms	Interviews		
					Number of interviews	Length of each interview	Type of interview
Alpha	Product development agency	Medium	UK	General manager (A1) Project manager (A2) Designers (A3, A-FG1 to A-FG6)	3 & 1 (90-minutes) focus group with 6 participants	60-90 minutes	Face to face
Beta	Publishing	Large	Russia & Greece	General director (B1) Marketing director (B2) Group product manager (B3)	3	70-110 minutes	Face to face and Google+
Gamma	Textile	Small (<50 employees)	UK	CEO (G2) General manager (G3) Shop floor employee (G1) Shop floor employee (G4)	4	50-90 minutes	Face to face
Delta	Medical food	Micro (<10 employees)	UK	Research team Lead (D1) Principal investigator (D2) Research assistant (D3)	3	60-110 minutes	Face to face
Epsilon	Water heaters	Large	France	R&D manager (E1) Marketing & product innovation manager (E2) Project manager (E3)	3	60-80 minutes	Face to face
Zeta	Food	Medium (<250 employees)	France	General manager (Z1) Project consultant (Z2)	2	110-140 minutes	Face to face and Skype

4.3.3.1 Semi-structured Interviews

Interviews are claimed to be one of the most important data collection methods for any kind of qualitative research (either positivist, critical, or constructivist) (Bryman and Bell, 2011; Myers, 2013). Especially in case study research, interviews are central and particularly useful (Voss et al., 2002; Yin, 2009) because they allow the researcher to enter the participant's perspective and gather their views and stories (Patton, 2002). In support, Kvale (2007) also suggests that (qualitative) interviewing is a powerful method for exploring the ways which participants experience and understand their world. Considering the main purpose of this study is to explore and understand why and how end-user involvement happens in NPD, interviewing with managers and designers (which are directly involved with NPD processes) was selected to be the main method of data collection.

There are three main types of interviews, namely (i) unstructured, (ii) structured, and (iii) semi-structured (Myers, 2013; Robson and McCartan, 2016) (see Table 4.6). The last type, semi-structured interview, was decided to be the most suitable for the purpose and context of this study. This decision was based on two reasons. First, semi-structured interviews align well with the interpretivist nature of this study where 'the objective is to explore the subjective meaning that respondents ascribe to concepts or events' (Gray, 2014: 386). In this study, it is essential to understand the participants' different perspectives and views on end-user involvement in NPD and hence, a semi-structured interview would offer the opportunity for probing answers where the participants can elaborate more and develop their responses (Saunders, 2016). The second reason for selecting semi-structured interviews is because although there is a list of issues and questions to be covered, the interview is not entirely standardised (Gray, 2014). That means that there is a balance between the very formal approach of structured interviews and the informal conversation approach of unstructured interviews. Consequently, depending on the setting (e.g. participant profile, company profile, interview flow) the researcher has the flexibility to change the order of questions, and even skip questions or include additional ones in order to pursue unexpected lines of enquiry (Gray, 2014; Grix, 2010). In general, whereas participants answer the same questions and hence increasing comparability of responses (Patton, 2002),

semi-structured interviews also allow for their answers to be explored in more depth, and to possibly uncover new insights (Easterby-Smith, 2018).

Table 4.6 Interview types

Interview types	Characteristics
Structured	• Use of pre-formulated questions • strictly regulated order of questions • sometimes regulated with regard to time available
Semi-structured	• use of pre-formulated questions • but no strict adherence to them • new questions may emerge during the interviews
Unstructured	• few, if any pre-formulated questions • participants have free rein to say what they want • no set time limit

Source: Adopted from Myers (2013: 121)

So, this study included in-depth semi-structured interviews which lasted between 1 hour and 2.5 hours. Whereas the researcher was careful not to exceed the agreed time limit for the interview, most participants responded to the questions with enthusiasm and without consideration of time constraints. This allowed for more probing and laddering questions (see Easterby-Smith, 2018: 188), which in turn elicited the discussion of more related concepts and enhanced the depth and the detail of the participants' views.

The participants were selected to be people who were directly involved in the NPD processes of the participating companies and had worked in projects involving end-users. Moreover, participants of each case study would be coming from different departments (e.g. R&D, marketing, production) and different hierarchical levels (e.g. high managers, middle managers, designers). Where possible, participants would be working in the same company for a long period of time (>10 years). This would allow them to develop experiences from different perspectives (as through the years they have been promoted to higher positions or different departments), and thus while in the interview, to provide rich data and discuss situations and concepts from a broad view.

The interview questions were open-ended to allow participants to express their views and opinions freely, using their own words and statements. An interview protocol (Appendix III) was created to include all the subjects to be discussed and

to assist the researcher during the interviews. The interview protocol consisted of three main parts covering: (i) warm-up questions and general information about the company and the participant, (ii) discussion about end-user involvement in NPD, and (iii) discussion and examples of specific NPD projects with end-user involvement. To ensure that the questions were clear and relevant, three pilot interviews were conducted with people working in two different NPD companies. Subsequently, some changes were made to the interview protocol (regarding the structure of the questions and wording in the questions) in order to ensure that the questions would be clear to participants from different industries. However, as this is mainly an inductive study, the interview protocol remained flexible meaning that if a new theme emerged from one interview, then this could be included as prompt in following interviews.

Prior to the interviews, a gatekeeper from each company would be contacted with the main information about the study and if interested, an initial visit to the facilities of the company would be arranged. In this first visit, the researcher would discuss with the gatekeeper about the aim of the research and the objectives of the study as well as the requirements and obligations for participation in the study. In the cases that the companies were based outside of the UK (Case Beta, Case Epsilon and Case Zeta) the above discussion would happen online through email or Skype (or Google+) communication. The gatekeeper would usually be someone working in a senior managerial position in the company, and therefore would be able to identify appropriate participants within the company and sometimes even arrange for the practicalities of the interview. All interviews took place in each company's facilities, except for the interviews conducted online through video-calls (mainly Case Beta). The interviews were audio-recorded (with participants' permission) and transcribed by the researcher alone so that a complete and accurate record of the interview could be obtained and later on analysed (for data analysis see Chapter 5). Finally, during the interviews, notes were taken in order to highlight key points and important or unexpected information.

4.3.3.2 Focus Group

A focus group is another type of interview where the researcher aims to gather collective views from a group of people on a defined topic (Myers, 2013: 123).

However, the logic behind a focus group is to spark dialogue between group members and hence, the researcher has a slightly different role than in an interview setting (Grix, 2010). That is, the researcher will have to act more as a moderator or facilitator (e.g. guide the topics, control the group dynamics) and less as an interviewer (ibid). More specifically, the 'interview' process will have to be well managed otherwise there is the danger that extreme views may dominate, conflicts between participants may arise and less articulate participants may not share their views (Robson and McCartan, 2016). Nevertheless, through focus groups participants can be stimulated to think beyond their own thoughts, group dynamics can help in focusing on the most important topics, more sensitive topics (that might be left out in an interview) can be discussed, and participation from people who do not want to be interviewed in their own may be encouraged (Gray, 2014; Myers, 2013; Robson and McCartan, 2016). In addition to these advantages, Robson and McCartan (2016: 299) suggest that focus groups, similarly to questionnaires, are an efficient way of generating substantial amounts of data from several people at the same time. Accordingly, this is the foremost reason that a focus group was conducted in this study.

Whereas there were already arrangements with the company of Case Alpha for three one-to-one interviews to be conducted, in addition to these a focus group was organised. The purpose of this focus group was to have the chance to collect opinions from all of the company's designers in a less distracting way possible (as they had a hectic schedule). The focus group took place after the first interview with one of the founders of the company was conducted and before the rest two interviews take place. This arrangement proved to be very helpful for two reasons: (i) the researcher had already developed a general picture of the company from the first interview and therefore could more accurately moderate the discussion in the focus group, and ii) two of the participants of the focus were also the interview participants meaning that the researcher could ask for more detailed information and clarification on topics that came up in the focus group but there was not enough time to discuss. So, the focus group consisted of six designers (with different focus and responsibilities in the company) and lasted approximately one hour. Because of the limited time, the researcher decided to include the four following topics for discussion: (i) benefits of end-user involvement in NPD, (ii) challenges of end-user involvement in NPD, (iii) NPD

phases for end-user involvement, and (iv) tools and method for involving end-users in NPD processes. The discussion started with a topic (i) and every fifteen to twenty minutes the researcher would start turning the discussion to the next topic. For the first two topics (benefits and challenges of end-user involvement in NPD) the participants were asked to take two minutes to think and write down on a post-it note the three most crucial things that came to their mind when thinking about benefits (and later challenges) of end-user involvement in NPD (see Appendix IV). Similarly to the interviews, the focus group was also audio-recorded (with the participants' permission), transcribed by the researcher alone and analysed together with the data from the interviews.

4.3.3.3 Observations and Documents

Since this study is following a case study methodology, subsequently, the researcher has the opportunity to experience the natural settings of the cases and to use observations as another, supplementary method for data collection (Robson and McCartan, 2016). Observations can help to understand the feelings and attitudes of participants and to validate or corroborate data gathered through other methods (Robson and McCartan, 2016; Walliman, 2011). Furthermore, observations can range from casual (unstructured) to more formal (structured, e.g. use of observation protocols or checklists) with two main types including 'participant observations' and 'non-participant observations' (Eriksson and Kovalainen, 2008; Yin, 2009). The difference between the two types lies in the degree of involvement of the researcher in the context being observed. In participant observation, the researcher becomes fully involved in the culture or context being observed, whereas in non-participant observation the researcher holds a passive role who does not directly involves events, but still observes mainly interactions (Collis and Hussey, 2014; Grix, 2010). In this study, a non-participant observation approach was followed. The researcher mainly observed how participants were responding to questions, interactions between participants, NPD processes during workshop/shop floor visits, and occasionally, interactions between participants and end-users. It should be noted that in all cases, participants and people who were observed they were informed about it and they recognised that the researcher was conducting academic research and she would take notes at any point.

A final source of data collection in this study was reviewing documentation relevant to the phenomenon under investigation. According to Yin (2009: 101), documentary information is likely to be appropriate for every case study topic. Analysis of documents can provide evidence to corroborate and supplement evidence obtained by interviews and observations alone, and to verify spellings and names mentioned in an interview (Myers, 2013; Yin, 2009). O'Leary (2014) has proposed three primary types of documents which include: public records (e.g. annual reports, policy reports, webpages); personal documents (e.g. emails, scrapbooks, blogs); and physical evidence which include objects found within the study setting (e.g. flyers, posters, training materials). This study used mainly copies of companies' presentations, reports, minutes of meetings, designs, materials from workshops and focus groups with end users, and images. In the case of the images, these would be either photographs or images created by the companies for using them during the end-user involvement, or photographs taken by the researcher while in the grounds of the companies. The documents were mainly used to verify and clarify some of the data collected in the interviews. The photographs which were taken by the researcher included designs during several phases of the NPD, mind-maps, prototypes, and room settings. As Denscombe (2010) has suggested, these photographs were valuable for recording events which in this specific case are NPD processes. However, due to confidentiality and non-disclosure agreements, it will not be possible for the photographs to be included in this thesis. Nevertheless, all the documents collected during the research contributed to building a richer and more detailed picture of the phenomenon under investigation. An overview of the observations and documentation gathered in each of the cases can be found in Table 4.7.

Table 4.7 Observations and documentation per case

Case	Observation	Documentation
Alpha	Tour in company's facilities, workshop visits, attendance in a workshop, interactions between participants, body language and behaviours during interviews	Company's presentations, company's reports, online articles, company's webpage, pictures
Beta	Body language and behaviours during interviews	Company's presentations, company's reports, online articles, company's webpage
Gamma	Tour in company's facilities, workshop visits, interactions between participants, body language and behaviours during interviews	Company's reports, online articles, company's webpage, pictures
Delta	Tour in company's facilities, interactions between participants, body language and behaviours during interviews	Company's presentations and publications

Epsilon	Tour in company's facilities, attendance in company's meetings, interactions between participants, body language and behaviours during interviews	Company's presentations, company's reports, online articles, company's webpage
Zeta	Interactions between participants, body language and behaviours during interviews	Company's presentations, company's reports, online articles, company's webpage

To consolidate, this study used a number of different methods for collecting relevant data (interviews, focus group, observations, and documents) in efforts to achieve the research aim and questions. The next section will discuss the approach to the analysis of the collected data.

4.3.4 Ethical Considerations

A key aspect of the research design was to ensure adherence to the access agreements with the case-companies, centred on the successful University ethical application and approval. Specifically, the following ethical principles and issues were taken into account. First, the research had the approval of the Adam Smith Business School Ethics Committee (Appendix V). Second, prior to interviews and focus group taking place, all participants were provided with a plain language statement (Appendix VI) which informed the participants on the aim of the research and what will be required from them. Third, during the data collection process (at the beginning of each interview and focus group), an informed consent form (Appendix VII) was handed to all participants and requested their signatures. Finally, in addition to the above, non-disclosure agreements were signed between the researcher and some of the companies. All the above enabled the participants to be open and on sharing their personal beliefs and experiences and NPD project information.

4.4 Approach to Data Analysis

Having discussed all the different methods of data collection employed in this research, the focus now will be placed on decisions on how these data were analysed. Data analysis can be described as a process that requires the researcher to organise the collected data, code them, analyse them, interpret their meaning, discover and uncover findings, and draw meaningful and relevant conclusions (O'Leary, 2004, p.184-185). However, it is important to note that data analysis must not be seen as a linear process; instead it is a recursive and iterative process

which should begin at the early stages of data collection (Braun and Clarke, 2006; Miles et al., 2014). Indeed, in this research study, once the data collection for Alpha was completed and saturation was ensured, the process of data analysis started. This was an ongoing and iterative process followed for each one of the six cases and lasted until the formal writing up of the research.

Depending on the purpose of the research and the data collection methods utilised, qualitative data analysis can take many forms; and therefore, does not follow a standard process (Denscombe, 2010; Patton, 2002). Consequently, academics have been proposing various approaches for qualitative data analysis such as thematic analysis, narrative analysis, grounded theory, and visual analysis (Easterby-Smith, 2018; Flick, 2018; Gray, 2014; Myers, 2013; Saunders et al., 2016). In line with the nature of this research's aim and questions, it was decided to follow a thematic analysis approach to analysis. In the following sections, the thematic analysis approach and the process of data analysis will be discussed in detail.

4.4.1 Thematic Analysis

Thematic analysis is one of the most common approaches to qualitative data analysis, yet poorly branded and rarely acknowledged (Boyatzis, 1998; Braun and Clarke, 2006; Bryman, 2012). According to Braun and Clarke (2006: 79), thematic analysis is a method for identifying, analysing, and reporting patterns (themes) within a data set while at the same time, it minimally organises and describes the data set in (rich) detail. Moreover, it is a flexible approach that can be used within different theoretical frameworks (ibid). Subsequently, thematic analysis complements the philosophical orientation of this study as it is a useful method for investigating perspectives coming from different participants and multiple sources and identifying similarities and differences between and across them (Braun and Clarke, 2006; King, 2004; Nowell et al., 2017).

Ryan and Bernard (2003: 85) emphasise that identification of themes in the data is the basis of (social science) research and one of the most fundamental tasks in the thematic analysis. According to Boyatzis (1998: 4), 'a theme is a pattern found in the data set and at minimum describes and organises the possible observations, and at maximum interprets aspects of the phenomenon'. The importance of a

theme does not necessarily depend on how many times it appears in the data but rather, on whether it captures something important in relation to the overall research question(s) (Braun and Clarke, 2006; Gray, 2014). Differently, a code refers to the most basic element identified in the data that appears interesting to the researcher and can be accessed in a meaningful way (Braun and Clarke, 2006; Boyatzis, 1998). Themes and codes can be theory-driven (derived from existing theory or literature) or data-driven (derived from the data) (Braun and Clarke, 2006; Miles and Huberman, 1994; Ryan & Bernard, 2003; Saunders et al., 2016). However, irrespectively of the themes and codes coming (deductively) from a theory or coming (inductively) from raw data, in both cases, the researcher can move towards theory development (Boyatzis, 1998: 29). In this study, the recommendation of Miles and Huberman (1994) was followed that codes should be related to the conceptual framework of the study and deduction and induction should be used simultaneously in data analysis. Therefore, the researcher first followed a deductive approach where themes and codes were created according to the conceptual framework of the study. After that, an inductive approach to analysis was followed to identify themes and codes emanating from the raw data which were based either on the judgement of the researcher (latent codes) or the actual terms used by the participants of the study (in-vivo or semantic codes) (Flick, 2018; Saunders et al., 2016) (figure 4.4). When developing themes, the researcher followed the recommendations by Ryan and Bernard (2003) and looked mainly for one of the most common criteria for identifying a theme: repetitions (Bryman, 2012). The search of repetitions would happen within each case, as well as across cases and could be recurrences within an interview or repetitions across interviews. In general, the thematic analysis of the data followed the strategy suggested by Braun and Clarke (2006) which is outlined in the following subsections.

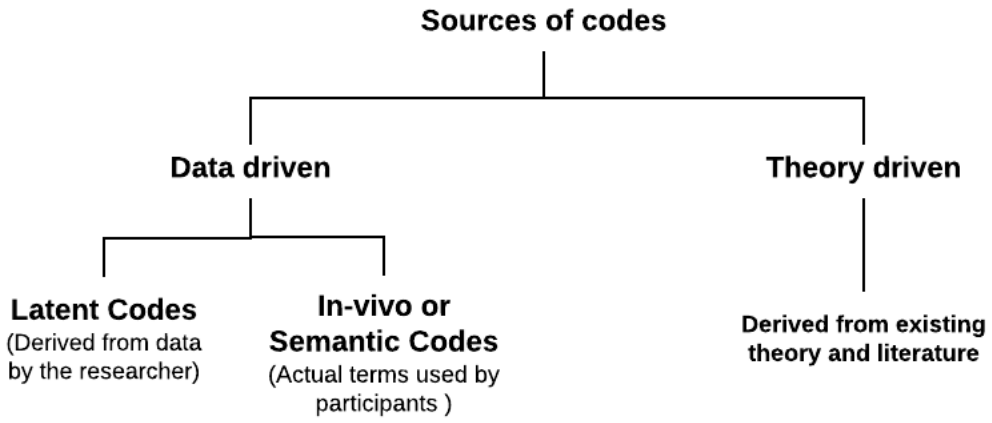

Figure 4.4 Sources and types of codes

Source: Adapted with modification from Saunders et al. (2016)

4.4.1.1 Familiarising with Data

After each interview was conducted, the researcher ensured to transcribe the interview in a timely manner. Although this was a time-consuming job, it enabled to draw inferences within and across the data at an early stage of the research process. The interview transcriptions were read and re-read and notes were taken about initial ideas and repetitive or unique patterns within the data. This process facilitated the identification of some key themes and uncovered initial similarities and differences among the interviews of each case. After all the interviews across the six cases were transcribed and read, relevant secondary data for each case was read and assessed, aiding the initial development of individual case summaries with thick description of the data.

4.4.1.2 Generating Initial Codes

After getting familiar with the data, the coding process was undertaken. This included reading the data again (interviews, focus group, observation notes, documentation) and coding anything that could be of interested. Specifically, the transcripts were read line by line and initial codes were produced based on (i) the developed conceptual framework (figure 2.3) and (ii) on data that appeared interesting to the researcher. Table 4.8 shows a sample of codes applied to a short segment of data.

Table 4.8 Sample of data extract with codes and sources of codes

Data extract	Coded for	Source of codes
We are usually talking to people that are much more qualified in their area, and they've got much more experience about what they are doing than we'll ever have. So, they give us their insights into how they work and how this whole industry works which could provide insights into new areas…	• Gain knowledge from end users • End users as experts • End users may provide insight to new areas/markets	Data driven
So, for example, sometimes it's very hard to really understand what end users need or what they say it might not be really what they have in their mind	• Difficulty in articulating end users' needs	Theory driven

4.4.1.3 Searching for Themes

Once all data were coded and collated the analysis were re-focused on the broader level of themes. This included sorting and clustering all the different codes into potential themes. The relationship between codes, between themes and between different level of themes was assessed and resulted in a collection of themes and subthemes (figure 4.5 represents an example).

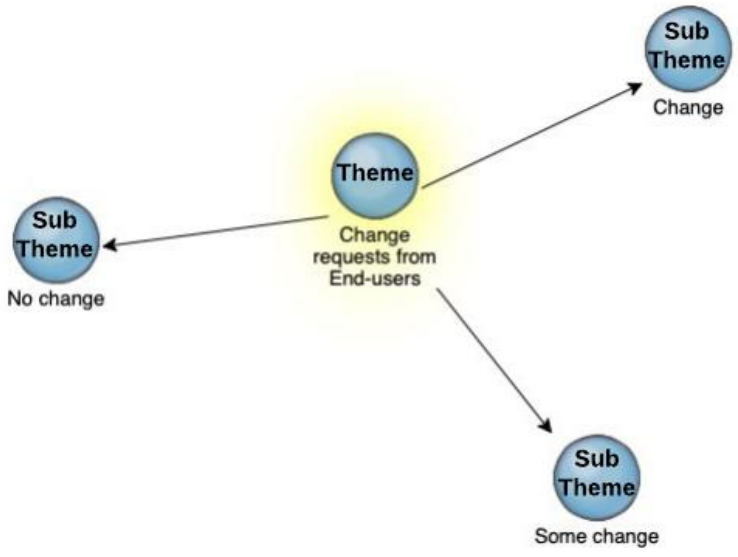

Figure 4.5 Themes and subthemes

4.4.1.4 Reviewing Themes

In this phase, the developed themes and subthemes were reviewed and refined. The themes were reviewed to ensure that all the subthemes and codes form a coherent pattern within each case study and across all the cases. This resulted in some subthemes to be discarded or to be merged under a different theme.

4.4.1.5 Defining and Naming Themes

As the last step, all themes were defined and further refined to double-check the appropriateness of the contained subthemes. Table 4.9 provides a sample of themes, subthemes and codes identified and developed during the data analysis.

Table 4.9 Sample of themes, subthemes, and codes

Themes	Subthemes	Codes (examples)
End-user characteristics	End-user selection criteria; number of end-users; types of end-users	Early adopters
		People who are eager to try new technology
		Already purchasers of the products
		As many people as possible
Phases for end-user involvement	Idea generation and concept development; design development and design testing; pre-announcement and market launch; throughout NPD	Prototypes
		Early stages
		Screening research
		Later stages
		Every single stage

4.4.1.6 Use of NVivo

In recent years the importance and usefulness of using computer-assisted qualitative data analysis software (commonly referred to as CAQDAS) have been discussed by many (e.g. Easterby-Smith et al., 2018; Ghauri, 2004; Miles et al., 2014). The main benefits for using CAQDAS include speed in handling and managing qualitative data, increasing quality of the analysis and enabling consistency in the coding process (Flick, 2018; Welsh (2002). In this study, NVivo12 was used to help in facilitating the thematic analysis of the transcripts produced from the

interviews and focus group, as well as the documents. Moreover, through NVivo12 memos were created which were linked to specific sections of text or specific codes and themes. Overall, NVivo12 assisted in an efficient and transparent approach to code, organise, and display the data.

4.4.2 Within-Case and Cross-Case Analysis

Although analysing big amount of data is not an easy task, it is in the heart of building theory from case studies (Eisenhardt, 1989: 539). To ease the analysis process, have more robust findings, and enhance transferability in other contexts, the researcher employed both within-case and cross-case analysis techniques (Miles et al., 2014; Yin, 2009). First, a within-case analysis was conducted for each of the six cases in order to provide descriptions of each case and themes within the case (Creswell and Poth, 2018). This also helped to gain a deeper understanding and rich familiarity with each case which in turn helped in accelerating the cross-case analysis and increased the likelihood of more powerful explanations (Eisenhardt, 1989; Miles et al., 2014). While the researcher was analysing the different cases, similarities and differences in the data were identified and notes were taken. However, as Miles et al. (2014: 101) emphasise, each case should first be understood in each own terms and therefore, no formal cross-case analysis was conducted until the within-case analysis for all six cases was completed. Once this happened, a cross-case analysis was conducted. The researcher made cross-case comparisons and looked for themes that were similar or different across the cases (Creswell and Poth, 2018; Eisenhardt, 1989; Miles et al., 2014). Yin (2009) highlights that cross-case analysis is appropriate for building a general explanation that fits each of the individual cases, even though the details of each case differ. Hence, by looking for similarities, continuities, differences or discontinuities across the cases, relationships within and across themes were identified and interpreted. For example, aspects such as the size of the company, experience of managers and designers, the culture of the company, and so on, were identified and interpreted as being important for affecting decisions on whether and how end-users get involved in the NPD process. Overall, the cross-case analysis enabled the researcher to see beyond initial impressions and facilitated deeper understanding and identification of findings that exist in the data set but otherwise may have been overlooked (Eisenhardt, 1989).

4.5 Research Quality

Continuously evaluating and ensuring the quality of the research study is one of the challenges comforting any researcher (Eriksson and Kovalainen, 2008). However, while everyone would agree that the evaluation of a research study is necessary, there is little consensus about the explicit evaluation criteria that should be used in qualitative research (Corbyn and Strauss, 2015). As Flick (2018: 384) supports, 'the problem of how to assess qualitative research has not yet been solved'.

Qualitative research, opposite to quantitative research, aims to capture the multiplicity and complexity of a specific context (Eriksson and Kovalainen, 2008). Hence, many qualitative researchers argue that the standards of accessing qualitative research must differ from those of quantitative research and thus they have been attempting to develop alternative criteria for assessing qualitative research (Bryman, 2012; Flick, 2018; Maylor and Blackmon, 2005). Reliability and validity are evaluation criteria that originate from quantitative research, are most commonly used in social sciences (Bryman, 2012; Eriksson and Kovalainen, 2008; Saunders, 2016), and are particularly important for case study research (Voss et al., 2002: 184). Yin (2009) partially adapted these to better fit to qualitative research by proposing construct validity, internal validity, external validity and reliability to be the key criteria for assessing the quality of research designs. However, other researchers (e.g. Eriksson and Kovalainen, 2008; Karlsson, 2016; Mayan, 2009) have suggested that in interpretative inquiry, trustworthiness is more important than concerns of validity and reliability. A major reason for that is because reliability and validity presuppose a single (social) reality, which is different to the interpretivist researchers' logic who argue that there are multiple (social) realities that have to be revealed (Bryman, 2012). In this regard, Lincoln and Guba (1985) suggest credibility, dependability, conformability and transferability as the elements forming the concept of trustworthiness and which should be used for assessing qualitative research. Nevertheless, Long and Johnson (2000: 31) have argued that the concepts of reliability and validity have the same essential meaning as Guba and Lincoln's (1985) trustworthiness and there is no gain on changing labels. In support, Miles et al. (2014: 311) have paired Yin's (2009) traditional terms with those of Lincoln and Guba (1985) and these can be seen in Table 4.10.

Considering the philosophical position and methodological decisions of the current study, and following the advice of Eriksson and Kovalainen (2008, p. 6) that particularly in constructivist research trustworthiness is regarded to be the 'goodness' criteria for research, it was decided to follow the evaluation criteria suggested by Lincoln and Guba (1985) and to substitute reliability and validity with the concept of trustworthiness. In addition, the concept of adequacy, as proposed by Morse et al. (2002: 18) was decided also to be included in assessing the quality criteria of this research. Adequacy happens when saturation has occurred in terms of the amount of data collected (rather than just the number of participants). Accordingly, because of this research aimed at investigating and comparing different levels and approaches of end-user involvement in NPD, achieving adequacy in this research was seen as particularly important. All in all, the quality of this interpretative, qualitative research study was assessed against the criteria of confirmability, dependability, transferability, credibility, and adequacy (Table 4.10).

Table 4.10 Research quality assessment

Quality Criteria	Meaning	Source	Solution
Confirmability (or objectivity)	Ensuring that the research situation is independent of the researcher.	Bryman, 2012; Miles et al., 2014; Lincoln and Guba, 1985	Although complete objectivity is not possible in a qualitative study, the study's methods for data collection and analysis are described in detail and competing rival conclusions have been considered.
Dependability (or reliability/ auditability)	Process of the study is consistent, reasonably stable over time and across methods – 'auditing' approach adopted.	Bryman, 2012; Miles et al., 2014; Lincoln and Guba, 1985; Yin, 2009	Complete record kept of all phases of the research process including: interviews and focus group audio recordings, transcripts, field notes, data analysis process and decisions.
Transferability (or external validity/fittingness/generalisability)	The degree to which a study's findings are generalisable in another context.	Bryman, 2012; Miles et al., 2014; Lincoln and Guba, 1985; Yin, 2009	Thick description produced (i.e. rich accounts of the details of context) to enable readers to assess potentially transferability of findings on different settings.
			Sampling of cases is theoretically diverse enough, but limitations have also been considered.
Credibility (or internal validity/authenticity)	Analysis and interpretation related to the meanings and experiences lived and perceived by the research participants.	Bryman, 2012; Gray, 2014; Eisenhardt and Graebner (2007); Miles et al., 2014; Lincoln and Guba, 1985; Yin, 2009	Research findings distributed to some interviewees to confirm relevance and appropriateness.
			Triangulation followed by using multiple (and complementary to one another) data collection methods.
			Use of various knowledgeable informants from different hierarchical levels who 'view the focal phenomenon from different perspectives'.

Quality Criteria	Meaning	Source	Solution
Adequacy	Sufficient data to account for all aspects of the phenomenon have been obtained.	Morse et. al, 2002	Selection of cases until saturation from multiple sources attained.
			Interviews were conducted until interviewees (even from different companies) started repeating the same information and therefore saturation was reached.

4.6 Research Limitations and Challenges

The methodological choices for this research were not made without considering its limitations. Some of the limitations and challenges were common to qualitative and case study methodology in general, and some were a result of the selections made in the research design.

4.6.1 Criticism on Qualitative Case Studies

To start with, one of the major criticisms and contentious issue of qualitative case study approach is that one cannot generalise the research findings (Blaikie, 2010; Flybjerg, 2006; Miles et al., 2014; Stake, 2005). In response to that, Blaikie (2010: 193) suggests that a key element (for allowing generalisability) is the cases sampling method. More specifically, the strategic selection of cases can increase generalisability (Seawright and Gerring, 2008). Accordingly, in this research six cases within different contexts were studied in order to strengthen the basis of generalising the results (ibid). However, others (e.g. O'Leray, 2004; Lincoln and Guba, 1985) suggest that in qualitative research where the goal often is for findings to be applicable to other settings, achieving transferability is more appropriate element than generalisability. Therefore, by providing sufficient detail on how the case(s) were conducted and how the findings compare with other cases may enhance transferability and generalisation of findings (Denscombe, 2010). Accordingly, this research attempted to provide thick descriptions to enable case transferability.

Another major concern associated with qualitative case study methodology is the possibility of bias from the researcher (Blaikie, 2010: 191). Because in a (qualitative) case study methodology researchers are an integral part of the data collection and analysis, they are especially vulnerable to this issue (Corbin and

Strauss, 2015; Yin, 2009). It is therefore, imperative that researchers remain aware of their biases and assumptions and take measures to minimise these. In the current research, interview transcripts and findings reports were shared with some of the participants for reviewing, data collection and data analysis processes reported as transparently as possible (within the boundaries of ethical concerns), and the researcher remained open to contrary or different outcomes from the case studies.

Another concern about (qualitative) case studies is that they can be remarkably challenging and time-consuming to carry out (Gray, 2014; Patton and Appelbaum, 2003: 67; Voss et al., 2002: 195). However, Yin (2009: 15) supports that case studies take less time than other research methods (e.g. ethnography) and he advises that when writing a case study report, the outdated, lengthy narrative can be avoided. Furthermore, Eisenhardt (1989: 536) suggests that a research focus and a priori specification of constructs will help the researcher to avoid becoming overwhelmed by the volume of data. Similarly, Miles et al. (2014: 20) propose that no matter how inductive the research strategy is, building a conceptual framework is very helpful in deciding what information should be collected and analysed. Accordingly, the conceptual framework developed for this research (see subsection 2.7) assisted the researcher to begin the study with a clearer picture of the main things to be investigated and the interrelationships between them.

4.6.2 Further Challenges and Limitations

Apart from the limitations that are common to every research following a qualitative case study methodology, some other challenges and limitations are explicitly associated with the current research study.

Whereas the identification of appropriate case studies was not a very easy task (in most cases companies would not publicly discuss whether they engage end-user and how), the most challenging process of this study was securing access in the selected companies. Several techniques were used to identify, approach and access relevant companies including participation in practitioners' events, general searches on Google, search on databases (e.g. Amadeus, LinkedIn, The Network[5]),

5 The Network is the University's social platform with access restricted to alumni only

identifying possible participants through the University's Alumni database, and approaching academics, other PhD students and personal contacts working in industry. However, the process was considerably lengthy as it could take between six to ten months from the first contact to the beginning of data collection.

Another limitation was the interview timings and locations. Case Epsilon and Case Zeta are based in France and therefore, the researcher had to travel there and to conduct the interviews within a very tight timeframe of seven days. Fortunately, good organising and good communication between the researcher and the participating companies prior to arrival in France resulted in a smooth, nevertheless intense data collection process. Also, because Case Beta is based in Russia, it was not feasible in terms of time and financial resources for the researcher to travel there. Therefore, it was not possible to experience and observe the NPD processes happening in the facilities of the company. However, the researcher had the chance to travel to Greece and conduct a face-to-face interview with the general manager of the company while he was on break and was visiting the country.

4.7 Chapter Summary

This chapter discussed the philosophical and methodological selections according to the aim of this exploratory study on end-user involvement in NPD. An overview discussion was provided on philosophical approaches, research strategies, research design, data collection methods, and approaches to data analysis. At the same time, each section offered justification on the logic for selecting and adopting an interpretative qualitative multiple case study approach for this study. Moreover, the chapter discussed the thematic analysis technique used for presenting and interpreting the collected data. Finally, the methodological rigour of the study was discussed. The next chapter will present and report on the key findings of the empirical data from the six case studies.

Chapter 5: Data Analysis and Findings

The previous chapter discussed and justified the methodological selections of this research study. This chapter aims to present the findings of the analysis of the six case studies. The following sections are concerned with "within-case analysis" (Yin, 2009; Miles and Huberman, 1994) and therefore provide a detailed analysis and descriptions of each of the six cases. The chapter is divided into seven sections with the first six providing the findings for each case study and the final, section 5.7 to provide a chapter summary. Each case analysis follows the format illustrated in Table 5.1.

Table 5.1 Case analysis format

1	Company overview
2	The typical NPD process of the company • Phases for end-user involvement • Tools and methods for end-user involvement • End-user selection process
3	Analysis of NPD Project • NPD process • Change requests from end-users
4	Benefits and challenges of end-user involvement in NPD
5	Additional interesting findings including: • Importance of end-user involvement in NPD • End users' roles and experts • End-users and novelty
6	Summary of case findings

5.1 Case Alpha

5.1.1 Phases for End-user Involvement

Alpha has a very structured NPD process which has evolved out of years of the company's operation (Figure 5.1). The main outline throughout the NPD process is to have many iterations in each of the phases, which will result in better and more relevant to end users' needs outcomes. Participant A1 commented:

> "So, the process will be roughly the same for each type of project, so it doesn't matter what you're designing. The core is always the same; testing things, not assuming anything and also getting users involved as much as possible in the process." (A1)

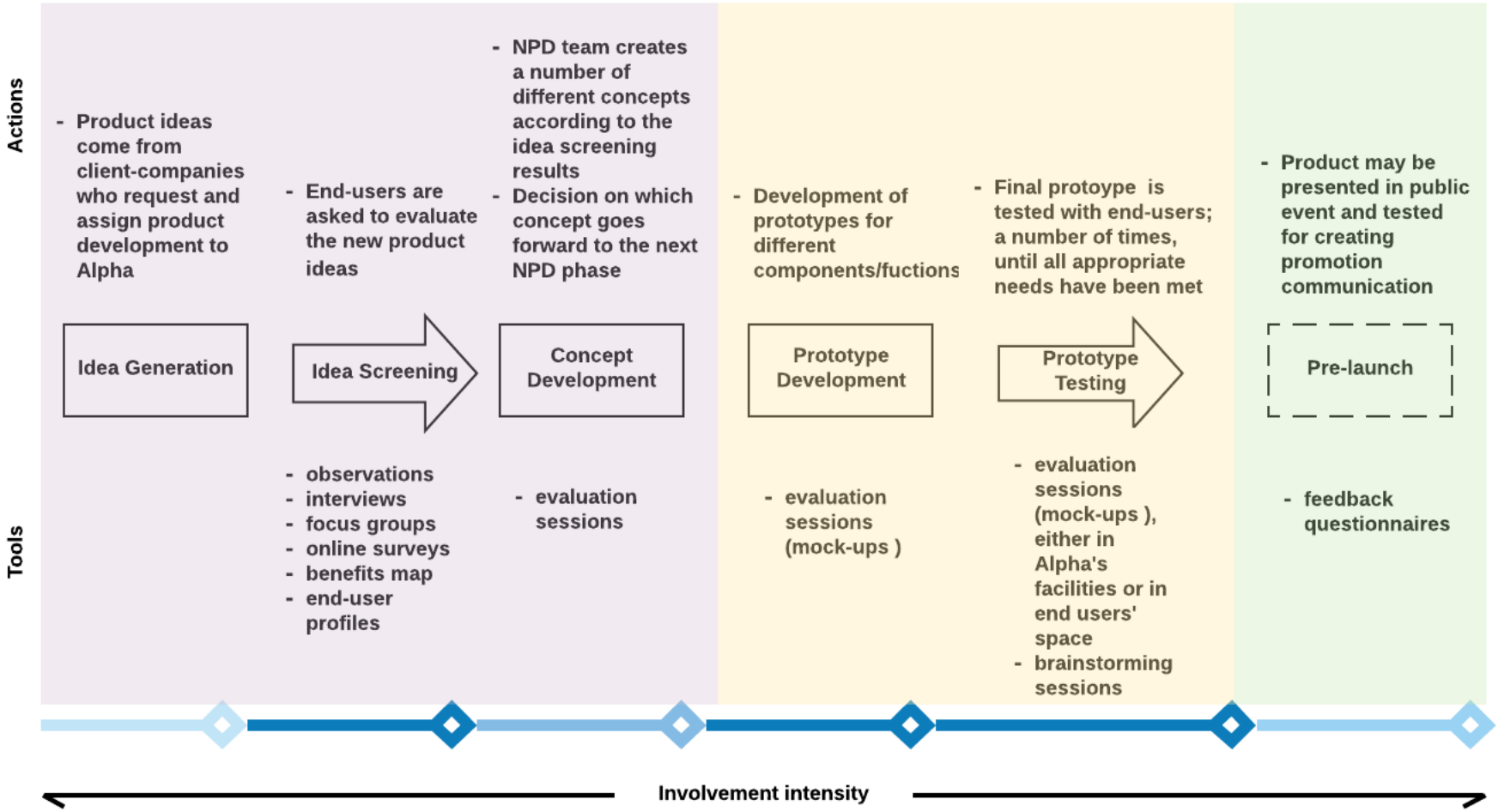

Figure 5.1 Alpha's typical NPD process

Most of the participants agreed that ideally end users should be involved throughout the NPD process. This view was echoed by participants A-FG1 and A-FG2 specifying that a lot of contact with end-users is required at the initial phases and the early development phases, and less towards the end when the prototypes are almost finalised and close to start manufacturing. Another participant suggested that although end-users should be involved throughout the NPD process,

> 'it is difficult to put a sort of a number against who, to quantify how beneficial it is to speak to end-users at the beginning and at the middle and at the end'. (A2)

Nevertheless, the closer the prototype gets to its final version and once it is defined, end-user involvement is not as desired as in earlier stages. Whereas even after an initial batch is manufactured end-users get to test and give feedback on the product, this happens for promotional and marketing reasons and is, therefore, an activity that concerns mostly the marketing team.

Taken together, these findings suggest that whereas end users get involved throughout the NPD process, their input is more preferable in the early phases of NPD, including idea generation, concept development and early prototype testing.

5.1.2 Tools for End-user Involvement

In case Alpha, a variety of tools are used throughout the NPD process. These include evaluation sessions, observations, focus groups, 3D printing, mock-ups, prototype testing, interviews and development of a benefits map and end-user profiles. More specifically, the benefits map is a tool that Alpha has developed and assists to identify and map out the benefits that all stakeholders will have from the project. Similarly, end-user profiles are used to categorise the people that will be using the product (doctors, patients, children, parents, etc.) according to their different needs, expertise and characteristics. These two tools begin to be developed at the very start of the project and they evolve as the designing team gathers more information for identifying and meeting end users' needs. An overview of the tools used in different phases of NPD can be shown in Table 5.2.

Table 5.2 Overview of Alpha's tools for end-user involvement in each NPD phase

NPD Phase	Tools for end-user involvement	Characteristics
Idea Screening	– Observations – Interviews – Focus groups – Benefits map – End-user profiles – Online surveys	– Direct – Indirect
Concept development	– Sketches – Evaluation sessions	– Direct
Prototype development	– Mock-ups – Evaluation sessions – 3D printing	– Direct
Prototype testing	– Evaluation sessions – Brainstorming	– Direct
Pre-launch	– Feedback questionnaires	– Indirect

Interestingly, all participants showed a strong preference on tools and methods that involve direct interaction with end-users. As one of them stated, the reason behind that is because

> '…when people are present with something that they need to write and they don't have any interaction with somebody else to talk, like out loud, they just tent to write as little as they can' (A-FG4)

Another participant added that

> 'there is an element of work when you are writing; when you are talking there is not this extra effort' (A-FG6)

In support of the notion that direct interaction with end-users is preferable, two other participants emphasised that because surveys are very structured and usually anonymous, there is no interaction with the end-user. This leads to three main shortcomings for the NPD team: (i) there is no possibility to make follow up questions, (ii) body language or facial expressions cannot be observed, and (iii) a profile of the end users cannot be identified. However, most of the focus group participants agreed that in the future they would like to try again using (online) surveys. Moreover, it is worth noting, that participant A3 indicated that the ideal situation is to visit end-users into their environment and hence, see how they interact with the product or prototype under natural settings and circumstances. In summary, Alpha makes use of a variety of tools for involving and engaging end users in the development of products. The range of tools used as well as the

discussions show a clear preference to the adoption of tools that have direct interaction with end-users.

5.1.3 End-user Selection Characteristics

In general, Alpha has quite open criteria for selecting end users. Depended on the project, the selection may be based on three criteria. First is to approach a convenient sample of end users; that is when end users who have previously worked with Alpha or its client, or the NPD team's friends and family may be invited to participate in some NPD phases. However, Alpha acknowledges that friends and family is a group of end users who may be positively biased and may not provide the most accurate feedback or evaluation. Second, and most commonly, end users are selected according to demographic criteria. In this case, Alpha looks for a wide range of profiles who meet different age ranges, lifestyles, education levels and so on. A third criterion when selecting end users may be related to the expertise of people. Specifically, in projects which require some technical expertise Alpha ensures to involve end users who have some kind of expertise on using the product. For instance, in the medical device project end users who were involved throughout the NPD process included doctors, nurses, and patients. In addition, participant A2 was the only one to distinguish between early adopters and 'sceptical people' and comment that in order to have accurate feedback and insight both these types are needed to be involved in the NPD process. He explained:

> 'we call them the early adopters, people that they want to be ahead and are interested on all latest things and are really excited and are interested in what you say to them but there are others are really setting their ways and like you know twenty years ago I was trained on this machine and I am really good at using this machine and the new technology will de-skill me or something like that. We really want to get both the early adopters and the people who are really sceptical of new technology and speak to both of them.' (A2)

Hence, although there is some recognition of different types of end users, Alpha selects end users mainly according to demographic characteristics, convenient of getting access to them, and expertise levels.

5.1.4 Medical Device Project

For case Alpha the project under investigation is a large and complex medical device for cervical exams. The client company was already selling a similar existing product, but due to its high price and complexity in its use it was not very successful in the market. Thus, Alpha was ordered to design and develop a new medical device that would replace the one that was already in the market, and that would better meet the end-users needs. In this specific project end users included doctors, nurses and patients and their involvement took place throughout the NPD process. Three of the designers (A1, A2, and A-FG6) were involved from the start until the end of the project whereas the rest of them were involved in specific phases according to their expertise and the needs of the project. The whole project lasted almost two years with the development phase taking eight to nine months.

5.1.4.1 NPD Process for the Medical Device

The first step was to investigate why the current medical device was not successful and to identify what the reals needs and requirements of the end users were. Visits took place in hospitals in the UK and the USA with two of the NPD team conducting interviews, focus groups and observations of pretend or (in the case of the US) real examinations. These aimed mainly at understanding how the device is used, and how it interacts with the doctor and the patient. These visits were video and/or voice recorded and notes were taken. The end users included doctors, nurses, and patients. Following that, and back into their workshop, the NPD team reviewed and analysed their data and had several meetings where a number of concept designs started to emerge. Ideas and concepts were categorised and during several visits to the UK hospitals and Skype sessions with the US, a final concept design was agreed. After this was presented to the client company and was made sure that they were happy with it, the NPD team moved to the next phase: prototype development. A pretend examination room was set up at Alpha's workshop and work started on developing small and semi-functional prototypes. At first, there were too many different prototypes for different components of the medical device and to decide final designs the NPD team were testing them themselves, pretending to be doctors. Prototypes varied from the frame of the medical device to different smaller components (e.g. certain

movement of arms). Once the prototypes were more defined and less in numbers, end users would go to the company's workshop to test them and give feedback and suggestions. In some cases, prototypes would be taken to the hospitals so they could be tested in the end users' real work environment. After many iterations of this process, the final prototype was developed, agreed with the end users, and presented and agreed with the client. Finally, an initial small batch of the medical device was manufactured and presented in medical shows or sent to hospitals in the UK and the US for end-user usability testing. Table 5.3 summarises all the activities that took place throughout the NPD process of the medical device project. Overall, as the above findings show and as it was reported from all participants, the end users were involved throughout the NPD process.

Table 5.3 Summary of activities that took place during the NPD of the medical device

Phase	Activity	Outcome
Idea generation	- Visit end-users that have been using the device currently in the market - Visit end-users that have tested the device before but chose not to use it - Visits to end-users that had not tested or used the current device - Interviews and focus groups - Observations of pretend and real examinations	End-user personas, benefits map, identification of end-users needs and requirements
Concept design	- Sketches on paper - Many different ideas generated and categorised - Concept ideas presented to end-users - New sketches designed according to feedback received - Iteration of the previous process until a final concept design developed	Final concept design
Prototype development	- Set up of pretend examination room - Development of small semi-functional prototypes - Mock-ups in the pretend examination room - Mock-ups in the end-users' working environment - Iterations for about nine months until final prototype developed	Final prototype
Pre-launch	- The medical device presented in medical shows - Few medical devices sent to hospitals for end-user testing	Promotion and feedback on usability

5.1.4.2 Change Requests from End-users

As seen from the previous section, end users were involved throughout the NPD process. Overall, participants emphasised that end-user involvement was very important, crucial and brought massive improvements to the design and development of the medical device. That became immediately evident from the

very start of the project; when the NPD team was trying to understand what the underlying needs for this product are and to define specific requirements, end-user involvement proved to be crucial. As participant A1 stated:

> "…if we hadn't done that [end-user involvement], if that hadn't been brought out by talking to people then we'd have just gone down the route of what they [client company] would tasked us to do. And they might not have had this outcome... so that's the thing, you know, like that kind of what brought out the whole user involvement" (A1)

In the concept design phase, participants reported that had too many ideas coming from end users, to the point that they had to hold several sessions with them in order to finalise a concept design that meets all the main requirements from end users as well as the client company. Furthermore, a number of important change requests took place during the prototype development and prototype testing phases. Whereas the NPD team was open to end users' suggestions and requests, it was not always possible to meet all of them. The following three-step process was followed for taking decisions on making changes: First, the NPD team had to assess how important the requested change would be to the overall scheme. More specifically, they had to make sure that what the end user is asking for is an actual underlying need and something that would improve the usability of the product. Second, they would try to figure out if this request was something that would cover the needs of a wide range of end users or if it was something applicable to only an individual need. As participant A1 explained:

> "There is a thing that you have to not be too influenced by the users because obviously, again, they are individuals and you're trying to look at a group of people. So, for example one of the doctors wanted to have like flames, you know, like a hot road car, as a joke, you know, I think that's obviously his personal taste. So, the market is made up of individuals, but they do have general requirements that you can design to' (A1)

Third, the NPD team would have to access and make a case on how much time it would take and how much money the proposed change would cost. Hence, in most cases, a change would be implemented if it was (i) to cover a real need that would have an impact to the usability of the medical device, (ii) applicable to a wide range of end-users and (iii) within the time and budget scope.

Moreover, a number of examples were discussed for successful change requests from the end users and for changes that were not able to be taken forward. More specifically, and among other refinements and changes that happened on the design and prototype, participant A2 supported:

> "…like if you see the device, everything is on arms and the screen is on arms, the camera is on an arm. The length of those arms changed a lot, from being quite small, to quite long; with many different elbows in it so it bends a lot of times, to then be what it is now just sort of one elbow. So yes, we refined the design quite a lot every time we went to see them [the end users]" (A2)

When change requests were not taking forward, that would be due to a number of reasons. Table 5.4 illustrates the types of reasons for changes that designers were not able to implement.

Table 5.4 Types of reasons for not implementing changes in Alpha

Type of reasons for changes not implemented	Illustrative quotes
Time and/or budget constraints	'But the fundamentals of it working, the functionality, they're sound and there will be a range of it that it's nice to have but for budget, time whatever constraints for all intents and purposes we're finished now' (A1)
Impact on the usability of the product	'…some changes cause a big impact further down the line. Some changes are very easy. So, for example, there's a couple of gas strut in the arm. And to say okay it needs a bit more power. That could mean going up the size of the gas strut and that would impact not just changing gas strut, but then that would be okay, I need more space for the gas strut. I need to expand the sift.' (A3)
End-user ideas regarded as not important	'…we had a lot of mad ones like a camera that would be attached to the doctor's seat and it would come over the top and then come with night vision and stuff like that; so, we had a lot of crazy ideas and obviously the crazy ones did not go forward' (A2)
Regulations	'I guess there was quite a lot of ideas that people had, and we could not take forward. For example, the monitor could not be an iPad, it had to be a medical computer with a medical screen, and it could not be wireless because the hospitals do not like wireless technology' (A2)
Phase of NPD	'I suppose part of that depends on what stage of the project those suggestions are getting in. So, there was a couple of suggestions that we were given closer to the end but we had already pursued something down a line that we couldn't really go back and change' (A1)

Overall, Alpha was not able to implement every change as this was requested by end users. Nevertheless, the findings on this matter provide great insight on the kind of changes requested by end-users and on the evaluation process and the reasons the NPD team chose on implementing these or not.

5.1.5 Benefits and Challenges of End-user Involvement in NPD

5.1.5.1 Benefits of End-user Involvement in NPD

When participants were asked about the benefits that end-user involvement can bring to the NPD process and the end product, they provided a range of answers. The overwhelming majority of them suggested that one of the most important reasons for end-user involvement and engagement is to ***identify their needs and requirements***. That is to say, to exactly understand what is that end-users need and then to make sure that they develop a product that is applicable to cover theses needs. Some other participants stated the positive impact that end-users have on the ***number of ideas***. Nevertheless, they also emphasised the importance of quickly categorising, merging or even abandoning less useful ideas and narrowing it down to one or two ideas to be taken forward to the next step. Two participants felt that although not often, sometimes, end-users can provide quite insightful and ***novel ideas***. Consequently, that led to remarks from designers about how important it is for them to be constantly evolving and learning from end-users. Therefore, another benefit from end-user involvement in NPD is the ***knowledge that designers can acquire*** through interaction and collaboration with end-users. Moreover, it was reported that this knowledge could also give insights and lead to the ***identification of new markets***. One participant reported that usually a product is designed to cover requirements for a number of different end-users and therefore by involving them in the process assists not only to identify but also ***prioritise product requirements***. However, in another interview, a participant argued that often product requirements get prioritised not only according to end-user needs but also to meeting certain regulations (e.g. such as in the case of the medical device). Finally, a number of participants alluded that when end-users get involved in the NPD process, they are more likely not only to become early adopters of the developed product but also to ***pass their excitement if the product to their friends and family***. All in all, a range of benefits for involving end-users in the NPD was identified through the discussions with the participants, with the most important to be the identification of end-user requirements and needs. A summary of all the benefits that emerged from the interviews and focus group is shown in Appendix X – Case Alpha.

5.1.5.2 Challenges of End-user Involvement in NPD

The discussions about the challenges the NPD team faces when it involves end users in the NPD process generated the most fruitful discussions (Appendix X – Case Alpha). In particular, challenges faced related to **articulating end-user needs** was the issue mostly discussed among all participants. More specifically, often the NPD team may have difficulties in interpreting what end users want because what they say it might not be really like what they have in their mind. Interestingly enough, most of the participants stated that although this is a constant challenge, articulating end-user needs can become less of an issue through experience, and learning to ask the right questions.

The second most significant challenge that emerged from the data is related to the process of **finding enough end users** that are willing to engage, and they have the time to do so. Finding a breadth of end-users to get involved in the NPD process is often a challenge for Alpha. However, even when there are enough end users, it sometimes may still be challenging to schedule meetings with them. More specifically, sometimes end users may not be as willing to engage, or they do not have as much time as Alpha would like from them, or during real situation observations, they feel that the NPD team is a hindrance to them.

Jumping directly to solutions is another challenge Alpha may come across when interact and engage with end users. A few of the participants stated that end users tend to focus on finding solutions rather than trying to understand problems, needs and requirements. Moreover, participants also discussed that depending on the **complexity of the product,** it may be less or more challenging to acquire accurate and appropriate feedback from end users. More specifically, more complex products (or product components) require a higher degree of imagination and flexibility from end users. In addition, the complexity of a product in combination with the fact that some end users may be used to certain ways of doing things, it may make it a very challenging task for the NPD team to **change end users' opinion** into something more functional or more feasible. Finally, a number of participants noted that sometimes may not be very easy to **manage communication** with end users effectively.

In summary, the findings have uncovered several challenges of involving end users in the NPD process with articulating end user needs being the most discussed among all participants.

5.1.5.3 NPD Cost and NPD Time

The time and cost resources associated with end-user involvement in NPD was a topic strongly discussed and debated among the participants. Whereas several times during the interviews and focus group it was mentioned that involving end-users in the NPD process is definitely time-consuming, all participants stated that it is worthwhile as it is a vital and necessary process for them. Specifically, participant A3 stated that as long as it is done efficiently (e.g. know when to stop collecting information), it should not be regarded as a major challenge. All other participants agreed that:

> "It's definitely quite resource heavy in terms of time. It is worth it. But it is time consuming yes" (A-FG4)

In a similar tone were also the perceptions on the cost associated with end-user involvement in NPD. In the words of participant A2:

> "…it might be more expensive for you to develop something with the end-users, but at the end the product is much better" (A2)

Hence, the findings show that although Alpha has been recognising that end-user involvement in NPD is a time consuming and costly process, all participants unanimously suggested that is a necessary process for developing appropriate products.

5.1.6 Importance of End-user Involvement in NPD

Independently of the project and the product's nature, involving end users in the NPD process is seen by Alpha as being of vital importance for the development of appropriate and successful products. This is to say that if a potential client is not interested in spending resources for involving end users in the development of the product, Alpha will most likely not agree to undertake the project. This stance was reflected in all discussions through both interviews and the focus group. For instance, participant A-FG4 explained:

> "I think there's a way of working attitude here that you almost could not do what we try to do without involving the end user." (A-FG4)

In a similar tone, participant A2 strongly suggested that products should be designed and developed with the input of the people who are going to use them. Although it was clearly recognised that end-user involvement in NPD is not an easy task, at the same time it was emphasised that it is highly important for better understanding end users' needs and therefore for creating more successful products. Participant A1 highlighted:

> '…it's critical because we can sit here and make a million assumptions about how people interact with things, what people like, what's acceptable, but until we've actually tested it with people that are going to use it then you can't really verify those. …and if you don't do that [end-user involvement] you don't have the most robust product, you don't have a commercially successful product because it's assumptions, it's all based upon this is what it should be, in our opinion' (A1)

Hence, the findings for Alpha suggest that end-user involvement in NPD is seen as vital and crucial for developing more appropriate and more successful products.

5.1.7 End-users Roles and Experts

As has already been discussed in the previous sections, end users' feedback and suggestions are very important for Alpha. Subsequently, in most cases, the NPD team works closely and frequently with end users who may fit into the role of a colleague or a co-designer. This was mainly discussed about projects that the invited end users have some kind of expertise or they have been using a similar product and would be directly affected by the new design. When wanting to illustrate the close collaboration between the NPD team and end users, most participants referred to the following project as an example.

> 'They worked here, with us, so we had a nurse and an engineer working in our studio for three weeks... So, the process was really changed drastically by having them here every day working as members of the team. …we set up an area and the project was to look at ways of holding IV drips in the back of land cruisers because that's what's used as ambulances and so they had lots of problems and they wanted to find solutions. …they were very involved on the process, to verify what we were designing and test, and refine and make it appropriate for market.' (A-FG3, A-FG5, A1)

In another way, participant A2 supported that when end users feel and act as part of the NPD team, they may also assist in other ways apart from testing and improving designs. For example:

> "Sometimes is a bit more difficult for us to get to talk to the patient but our doctor can do that, so actually we are getting more feedback. He is able to gather feedback for us from another end user that is difficult for us, for various reasons, to just to contact directly if that makes sense. So, they do in this instance become the partner." (A2)

Overall, the findings show that Alpha perceives end-users more as part of the NPD team rather than just customers. Whereas closely working with end users seems to be in Alpha's philosophy, this practice may also be related to the nature and complexity of the project.

5.1.8 End-users and Novelty

Alpha is a company who at the moment is not giving much consideration in developing highly innovative or radical new products. Subsequently, none of the participants seemed to be concerned with end users acting as a source of novel ideas. The two participants who very briefly discussed this matter were having a quite similar opinion. Specifically, participant A2 suggested that once in a while end users may come up with a novel or unusual idea. In a similar tone, participant A3 added that it is a sporadic occurrence for end users to come up with a novel idea or suggestion.

Hence, the findings suggest that the novelty of ideas coming from end users is not the focus for Alpha. This may happen because the company is mostly focusing on incrementally improving existing products and not with developing radically new ones.

5.1.9 Summary of Findings for case Alpha

Alpha follows a quite structured NPD process which independently of the product type it remains roughly the same for all projects. End users are invited to get involved throughout the NPD process with an emphasis on the concept design and on the prototype development phases. All participants in case Alpha strongly supported that end-user involvement is crucial for developing more appropriate

and more successful products. Even while recognising that end-user involvement in NPD may be a time-consuming and costly process, Alpha keeps the stance that it is a necessary practice. Therefore, the company works closely with end users and perceives them as part of the NPD team. In that sense, Alpha welcomes end users' input not only in testing and evaluating ideas and concepts but also in proposing new solutions. Nevertheless, a couple of participants questioned end users' ability to come up with very new ideas or products; the fact that the rest of the participants did not discuss this matter supports the stance of Alpha on focusing mostly on incremental product development.

Whereas a few participants recognised that different types of end users may offer different input to the NPD process, Alpha does not follow strict criteria for selecting end users. More specifically, end users are selected according to demographic characteristics, convenient for getting access to them, and expertise levels. End users are involved throughout the NPD process and to that purpose Alpha employees a number of different tools and methods. At the same time, the company shows a strong preference to mostly adopting direct tools (e.g. focus groups or mock-up sessions). One of the most important benefits for involving end users is to assist in the identification of end-user requirements and needs. Furthermore, whereas a number of challenges were identified, articulating end-user needs was the most discussed one among all participants. End users' change requests are always taken under consideration by Alpha. However, that does not mean that all of them will be integrated into the product designs. Specifically, in the medical device project, not all of end users' change requests appeared in the final product; despite its success. The most common reasons for not implementing end users' requests lie with time and/or budget constraints, impact on the usability of the product, end user ideas to be regarded as not important, regulations, and the NPD phase.

5.2 Case Beta

5.2.1 Phases for End-user Involvement

Beta has a very structured NPD process and a specific set of tools and techniques for end-user involvement, which is the same for all the products they develop (Figure 5.2). Whereas end-users get involved throughout the NPD process, the

engagement is more intense in the middle phases (concept screening to prototype testing) where through focus groups, the end-users take part in concept ranking, indicate the concept that would move forward to become a prototype and evaluate and give feedback on the prototype before it goes to market test. As this is a much-organised process, Beta has a predefined purpose for involving end-users in each of the NPD phases. As participant B1 indicated:

> 'In different stages, we have different objectives. In the very early stages, we want to understand the trends. What they like most, like for example let's say knitting or art of decoration or beads... You know, what are the things, the crafts, that they may be interested. And then when we have the prototype of the idea based on what they ask us, we engage them again to validate the idea, to shape it and make sure that what we created is actually what they were anticipating from us.' (B1)

Nevertheless, although end-users get involved throughout the NPD process, all participants emphasised the importance of engaging end-users as early as possible. More specifically, it was supported that early involvement may save them from mistakes whereas involvement in late phases may not have a significant impact to the end product as changes cannot be implemented due to time and finance limitations.

As already mentioned, Beta has a very structured and standard NPD process, and that also means that the frequency of end-user involvement is predetermined. Indeed, it is organised to happen only once for each of the involvement phases. The most apparent reasons for this decision are first that Beta aims to have very fast NPD process (from test to launch is maximum of three months) and second, to limit expenses. This, however, does not eliminate the option of having multiple focus groups happening in the same period. Hence, if managers felt that there is additional information needed to be obtained from the end-users, this would happen in the next focus group. In most cases, focus groups would be organised in such a way that senior managers may also be monitoring the research process (from a 'secret' room) and if necessary, would have the chance to communicate with the research agency to ask additional questions to end-users. Nevertheless, all participants supported that because the focus groups were very well organised, involving the end-users just once per phase was enough. In support of that, one of the participants emphasised the importance of having set certain boundaries on what will be discussed in the focus groups and specific objectives to meet. It

is also interesting to note that even when the end-users request ‘reasonable’ changes, these will be implemented and then the product will move to the next phase, without having the changes being tested again in another round of focus groups.

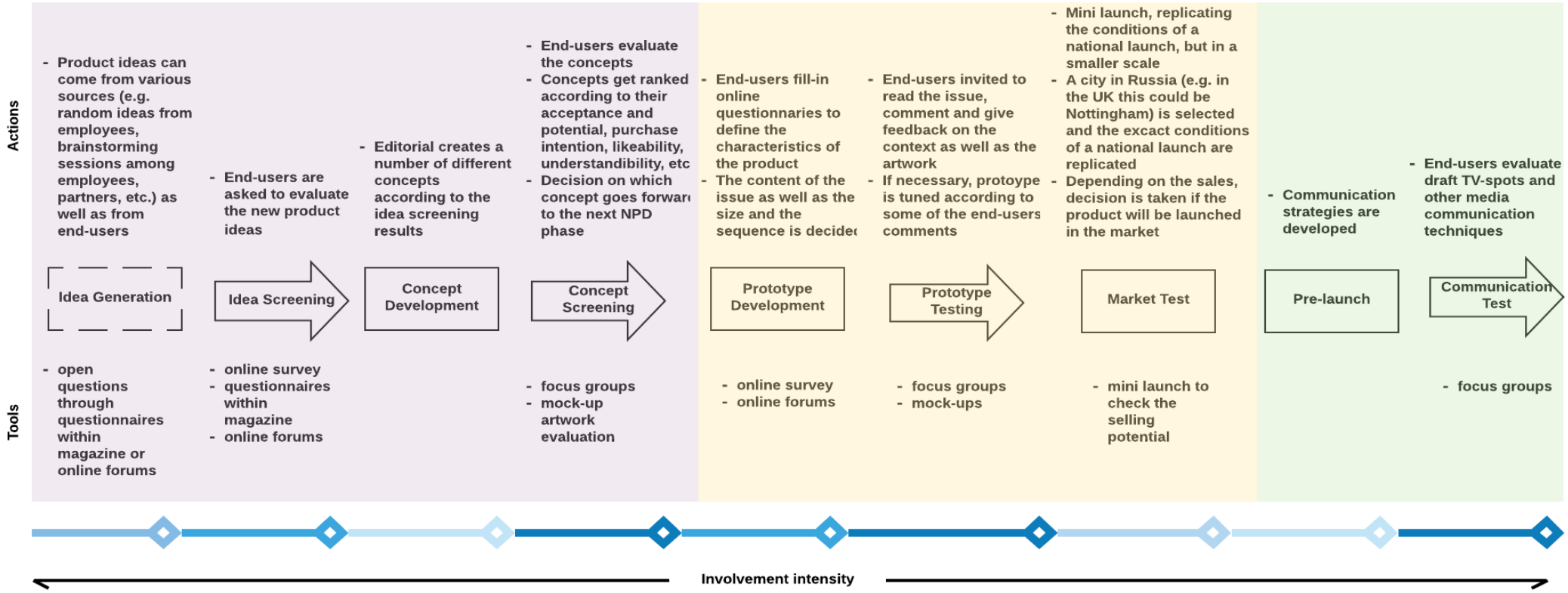

Figure 5.2 Beta's typical NPD process

Finally, after the product has been launched into the market, the end-users are invited to give feedback through questionnaires that are attached within the magazine issue. This feedback may be used to form specifications of a next partwork project but will not have an impact on the partwork currently in the market. Generally, once a partwork is in the market, there is usually nothing that Beta can do to modify it in order to meet end users' needs better.

> "When you go to the market actually, is already too late for us. Because we have noticed that when you launch something it's impossible, it's not like you know maybe an FMCG that you can do something, you can reduce the price, make a promotion, you know etc. In our business, when a partwork is launched, either you do it right or you do it wrong. If you do it wrong, then you can do nothing about it, nothing! Even if you reduce the price, even if you give them double the offer, you change the frequency, no matter what you're going to do, you will never change the result. So, either you do it right from the beginning or you suffer, you live with the consequences for years." (B1)

Overall, while end-users may be involved throughout the NPD process, more emphasis is based on their involvement through middles phases of NPD and most specifically during the concept and prototype phases.

5.2.2 Tools for End-user Involvement

Beta employs a number of tools for involving end-users in their NPD process. Depending on the purpose (trend identification, idea screening, prototype evaluation, etc.) and on the situation (available time, finance, product complexity, etc.) the tools may range in nature and on the level of interaction required between researchers and end-users. Online, as well as print questionnaires and focus groups, are the two main tools the company is using to engage end-users throughout the NPD process. As previously mentioned, Beta outsources many of its activities, including the research activities needed when developing a new product. More specifically, Beta's marketing team together with the editorial development team will set the specifications of each research activity and then they will brief these to a partner research agency, which will carry out all the research (focus groups, questionnaires, etc.). Nevertheless, representatives from Beta and usually form the marketing team are always present during the conduction of focus groups. The tools used by Beta are discussed in the following paragraphs and presented in Table 5.5.

Table 5.5 Overview of Beta's tools for end-user involvement in each NPD phase

NPD Phase	Tools for end-user involvement	Characteristics
Idea generation	– Magazine questionnaires – Online forums	– Indirect – Web-based
Idea screening	– Online survey – Magazine questionnaires – Online forums	– Indirect – Web-based
Concept development	-	-
Concept screening	– Focus groups – Mock-ups evaluation	Direct
Prototype development	– Online questionnaire – Online forums	Indirect
Prototype testing	– Focus groups – Mock-ups evaluation	Direct
Market test	– Checking selling potential	Indirect
Pre-launch	-	-
Communication test	– Focus groups	Direct

Focus groups is one of the most frequently used tools by Beta. End-users are invited to the facilities of the company where there are specifically designed rooms for conducting the focus groups. Whereas people from the research agency are the ones conducting the focus groups, through one-way mirrors, people from Beta can listen and see the end-users and if necessary, communicate with the researchers inside the room and direct them to for example expand more on a topic. This way, end-users feel more comfortable to express themselves (since to their knowledge there is no one from the company around) and their opinions remain as objective as possible. Provision of refreshments and a generally friendly and relaxed atmosphere in the room contributes to fruitful discussions with the end-users. Focus groups are employed mostly in the middle and later phases of NPD to mainly test mock-ups, and evaluate concept designs and magazine prototypes, but also to suggest changes and improvements, test different commercial scenarios and communication strategies, give insight in more general questions (e.g. website design) and if the magazine comes with a physical object, to test that.

> 'They read, they comment, and we adjust it to real consumers' needs. With the physical objects we do focus groups when we have a gadget, for example a figurine; we can call people and say listen this is a prototype, is that height, that weight, is it fine? And they can comment. But if it is a build-up part like a piece of the ship or a piece of a car, it doesn't make sense.' (B2)

The other most frequently used tool in questionnaires. Questionnaires could be either in print form and attached within the partworks or in an online form. When online, the end-users will be invited to fill in the questionnaires through the company's forums or by direct invitation from the company to existing consumers or by inviting consumers from a selected database that the research agency owns. However, for the case of online questionnaires, B1 expressed a slight concern mentioning that:

> "…you run the risk because you are not 100% sure if the people that answer are your consumers or not. Whereas, when there is a print form that you have only in the magazine you know that are the people who bought it." (B1)

That suggests that if the online questionnaire respondent is not a customer of Beta's product, there is a high chance that the answers may not be accurate. However, the last years the number of people purchasing the partworks online has been increased and that allows Beta not only to be sure that the person who fills the questionnaire is a consumer but also allows for access to more specific information and more specific questions if needed. In support, B2 has commented:

> 'With the online questionnaire they fill it and we know who they are, or we can ask them what else to you want? Do you want something else? Because many customers buy from us online so they leave their contact details, we can contact them and send them a link to short research.' (B2)

Either online or in print form, questionnaires may include both open-ended questions and Likert scale questions. They can be used throughout the NPD process, and they are a very important and very successful tool for engaging end-users and collecting their opinions. Through questionnaires, end-users may be asked to evaluate an existing product, suggest ideas for new products, evaluate new product ideas and rank product characteristics.

The digital age is requiring companies to have an online presence and Beta is no exception. Accordingly, Beta has active online forums where end-users can offer ideas for new products, exchange opinions and information, or as mentioned before participating in online questionnaires. Beta has dedicated people monitoring the online forums, 'listening' to what end-users are interested about. This is a low-cost and quick way to identify new trends which are then reported

to the marketing managers of Beta. However, one concern expressed by one participant about the online forums, is that when end-users are posting new ideas, there is a high risk that competitors may be monitoring and may steal the idea.

When participants were asked about their preference between direct and indirect tools for involving end-users (in this particular case that is between focus groups and questionnaires), they all agreed that different tools are used for different reasons. Considering both advantages and disadvantages of different tools types, it was suggested that questionnaires (indirect tool) are used as a fast and less expensive way to gather a massive number of opinions of end-users. Questionnaires, either online or offline, can be used for situations where the end-user is not required to have direct contact with the product and therefore the purpose is for concept ranking, idea screening or more general opinions.

> "If I want a massive opinion, let's say for price, for concepts ranking, something general that does not demand to have actual contact with the product, then I will choose the quantitative. Quantitative research is for ranking, for concepts ranking, for general opinions and ideas that you don't need a personal contact with the customer. So, it's different things you want from different ways of research." (B3)

In contrast, through focus groups (direct tool), Beta can ensure two things. First, that those participants are consumers (end-users) of their products, and second that they will hold the product in their hands, they would get a real understanding of what it is about, and they will provide more accurate and more profound insight and opinions. Participant B1 offers an illustrative example in support:

> 'Because for example we have a new line of business …and for example we have the regular size and we have the maxi. The regular size is 8-10 cm and the maxi is 12-14 cm. But how people can understand this 2 cm between 10 and 12? How important is for them? It's impossible to imagine you know, whereas if when they see the physical product, then they say, 'wow this is huge!' So, there are things that, you cannot do on the web.' (B1)

Similarly, participant B2 commented:

> "Because there is visual and there is description. When you read it, most people are not able to realise how it would be really looking. While if they see or hold a product in their hands they might say, 'oh my God I want this!' When they see visual in online research, sitting at home, with their computer, and they are tired, they just click yes or no." (B2)

Hence, for products that are more complex and for more complex questions, focus groups are selected as the most appropriate tool for involving end-users.

However, Beta seems to be open to exploring new ways and tools for supporting end-user involvement. Creating new, more accurate and faster ways and tools for involving end-users, is challenging, but it may be necessary for the fast-paced and digital future.

> '…find new ways of talking to customers considering the change of the customers itself. That they are mobile, then they are less approachable, they want to evaluate maybe video etc. So the methods have to be changed. …But to create new [tools] which are better, more accurate, faster… Let's say, instead of producing a lot of products for the market test, how can we make it visually, video, 3D, sing a song, I don't know, whatever, that consumer can understand exactly as they would have it in their hands.' (B2)

Overall, according to the above discussion, it becomes evident that the very structured NPD process followed by Beta can also be confirmed by the (limited) selection of reoccurring tools and the ways these are used for end-user involvement. Questionnaires are mostly used for ranking and screening ideas and concepts. Focus groups are more commonly used in the middle and later phases of NPD for getting a more profound understanding of end-users' specific needs and requirements.

5.2.3 End-user Selection Characteristics

Regarding the type of end-users chosen by Beta to participate in the NPD process, the selection criteria are very specific and identical in both direct and indirect types of tools (focus groups and questionnaires). The main criterion is that people invited to participate in the NPD process should already be partwork users or at least to be interested in collecting (as a hobby) and in buying the partworks. However, as already indicated in the previous subsection, when questionnaires are used, Beta cannot always be sure that the people filling the questionnaires are end-users of the partworks. Once the first criterion is met and depending on the partwork theme, the end-users are selected according to (i) demographics (gender, age), (ii) socioeconomic situation (education and income), and (iii) interests (e.g. hobbies, interests). Finally, Beta puts a restriction that the same

end-users cannot be invited to participate on a regular basis; no more than once per six months.

Following the above rules, the end-user selection and recruitment process happens solely by specialised research agencies, which hold databases of different types of consumers. Beta communicates the project requirements and the ideal end-user characteristics to the research agency and they, in turn, identify and select the end-users. In addition (as discussed in the previous subsection), these research agencies are also the ones that conduct the focus groups with the end-users. As participant B3 explained:

> "We didn't find them personally. This was the work of the research agency which were some of them multinational, some of them we worked with them for many years and they knew us and we knew them. So, the research agency has this role (of finding end-users). …We just brief them (the research agency) and discuss together what will be the optimum focus group content in terms of customers. We weren't selecting one by one the people."

In the case of focus groups and just before end-users are invited to participate, the research agency will follow validation methods (e.g. callbacks, asking confirming questions, self-completion screeners, ID checking on arrival) for ensuring that the selected end-users are the appropriate ones. Finally, in exchange for participating in a focus group, end-users may be paid a small fee and given a small gift.

Although no participants appeared to put too much emphasis on the selection criteria of end-users, the importance of identifying the right type of end-user, which fall into the simple but strict criteria set by Beta, was briefly stressed by participants B2 and B3 and more dynamically illustrated by participant B1:

> "You know honestly there are very, very, few cases that let's say the research led us to the wrong directions. So usually, our interaction with the customer helps us. I can recall only maybe, it was a striking example, fifteen years ago or something, when we tested XX (name of partwork) where the research gave us that the concept will not work but finally, we decided to launch it and it was a huge success. But again, it was not the consumers issue, it was in our design of the research and the selection of the people (end-users). Because we went to a younger group but actually the people that really bought it were older. So we

> missed the real target group when we did our research. It was a niche collection and we didn't find this."

Hence, the discussion with the participants shows that Beta selects its end-users according to simple traditional market research criteria (e.g. demographics). Nevertheless, it is very interesting to see how a slight inaccuracy when identifying appropriate end-users may affect the performance of the product in the market.

5.2.4 Fashion Project

For case Beta, the project under investigation is a partwork collection designed to communicate and depict various fashion trends; and to illustrate how these have changed through the decades. It is a magazine only issue (without a collectable item) and it consists of various fashion-related, thematic sessions (e.g. historical background, costumes in detail, daily life). End-users were identified according to criteria described in the previous section and were involved throughout the NPD. The next subsection provides a detailed overview of the NPD process of the fashion project.

5.2.4.1 NPD Process for the Fashion Project

The decision for developing the fashion partwork was taken when Beta identified that there was a need in the market for a magazine-only partwork targeting the female segment. The original idea for the fashion theme was proposed by the editorial team and was placed together with other ideas in an online questionnaire that was distributed to end-users. Through this idea screening phase, the fashion theme, (among other themes such as knitting), attracted the interest of end-users and progressed to the next NPD phase. The concept designs were created by the editorial team and this time through focus groups, presented to the end-users. During these focus groups, end-users had the opportunity to comment on and evaluate specific aspects of the different concepts. The main aim of this phase was to assess the overall potential of each of the concepts, including end-user acceptance, purchase intention, and end-user excitement and expectations towards the concepts. The fashion project was the one that scored very well in most aspects and therefore, was decided to be taken forward for further development.

Hence, the prototype development phase began. While the initial issue 0 (the prototype) was under development, an online questionnaire was distributed to end-users asking for opinions on the content and specific characteristics (e.g. issues sequence) of the magazine. Next, after some refinement (according to end-user feedback), issue 0 was finalised and given to a number of end-users to read. During focus group sessions with end-users the overall perception of the fashion partwork was discussed (e.g. most interesting themes to include) and the issue 0 was evaluated page by page. For example, price evaluation, name test, number of pages, number and quality of pictures, and magazine cover evaluation were among the themes discussed during these focus groups (for an example see Appendix VIII).

Following that the prototype was refined again, and a final version was created, called issue 1. Issue 1 is the first issue of the magazine, and it was launched and tested in the market. More specifically, Beta selected a city in Russia and did a mini launch, replicating exactly the conditions of a national launch but to a micro-scale. The Market Test was a defining point for the fashion project. This is because as it was explained by the participants, only 40% of projects that are tested into the market make it to the national launch. Nevertheless, the sales of issue 1 in this case were very good and Beta took the decision to launch the fashion magazine (and the whole fashion partwork collection) in the market, nationally. The final step then was to develop a promotional strategy for the product by creating a TV spot. The marketing team of Beta created a number of TV spots with different scenarios and end-users were invited to participate in focus group sessions and evaluate and rank the TV spot. After adjustments according to the end-user feedback, the final TV spot was developed and launched through national tv networks. That was the final time end-users were involved in the development process of the fashion project. Table 5.6 summarises all the activities that took place throughout the NPD process.

Table 5.6 Summary of activities that took place during the NPD of the fashion project

Phase	Activity	Outcome
Idea generation	– Identification of new product needs – The editorial team proposes the fashion theme	Partwork initial specifications including, for example: themes (craft, biographies, fashion, etc.), segment (female), type (no attachment)

Phase	Activity	Outcome
Idea screening	– Online questionnaires with end-users	Identification of the best-scoring ideas ('Fashion' among them)
Concept design	– Concepts are designed according to end-users' preferences (identified in the previous phase)	Concept designs ready to be tested with end-users
Concept screening	– Focus groups where different concepts are presented and evaluated – Mock-up artwork presented to end-users – End-user feedback, suggestions and ideas generated	– 'Fashion' selected to move to the next NPD phase – Identification of main end-user requirements
Prototype development	– The editorial team prepares prototype according to concept screening feedback – End-users are asked through online questionnaires to give their opinion on content and characteristics (e.g. size, sequence, paper quality)	Issue 0 (prototype) developed
Prototype testing	– Issue 0 is given to end-users to read it – Focus groups with end-users to give feedback	– Prototype tuned according to feedback – Issue 1 created
Market test	– Issue 1 is launched in a town in Russia – Sales monitored	Decision for Issue 1 and for the collection to go to a national launch
Pre-launch & Communication test	– Marketing develops media communication strategies – TV spots with different scenarios are developed – Focus group with end-users to identify the best scenario – TV adjusted according to feedback	Creation of TV spot

5.2.4.2 Change Requests from End-users

As seen from the previous sub-section, end-users were involved multiple times throughout the development of the fashion project. In the first NPD phases end users' opinions and insights were seen as very important for selecting the most appropriate partwork theme and for understanding and defining the focus of the fashion partwork collection.

> 'It has been a very challenging product to develop and this is where consumers helped us with their insights. …Because from the one side it was very difficult to cover different eras, different epochs in Fashion.

> To understand from their side what is more relevant and what they like more, Victoria, or Cleopatra let's say for example.' (B1)

Thus, end-user involvement in the first phases was perceived as very important for grasping end users' preferences and stirring Beta into the right direction for defining the magazine's content and characteristics. In the middle and later phases of the NPD process end users evaluated the prototypes and made suggestions for improvements.

> "And then when we have the prototype of the idea based on what they ask us, we engage them again to validate the idea, to shape it and make sure that what we created is actually what they were anticipating from us." (B1)

As reported by the participants, in these phases (prototype development and prototype testing) end-user involvement is essential for evaluating the prototype and for validating the company's assumptions. While conducting the interviews as well as while reviewing related documents, it became evident that a number of small changes were requested by end-users. For example, end-users asked for changes on the layout and content (e.g. table of content was regarded as not essential), and on the appearance of the magazine (e.g. cover, text size). All interview participants supported that for the Fashion project, all the changes requested by the end-users were implemented.

However, it is important to remember that Beta has a very structured NPD process, which also influences the process and outcomes of end-user involvement. This means that questionnaires and focus groups are designed in such a way that the information collected stands within very specific boundaries. To illustrate this, participant B2 commented:

> "…we communicate to the agency the limits of creativity. So, we would say that the product will be that way, it will cost that much, and it will have that parameters. You have flexibility in this and this and this. So can tell the people ok guys, or you see they have ideas or if everyone doesn't like that parameter, we will have to listen to them, and we come back and change it. But if it is talking just for talking then these 'creative' consumers are just stopped, and we continue. So, we don't allow them to distract the conversation just to say it, we need practical things."

Hence, most of the product's characteristics and a number of different options are already pre-set by Beta, and it is unlikely that end-users will suggest or ask for something very different than Beta is proposing. Considering this, participants were asked to think of and reflect on other projects where it was not possible to meet all end users' suggestions. All participants commented that in the case that a good number of end-users supports a new idea or suggestion, before taking any actions for changing the product, Beta would have to assess if the implementation of the idea would be worthy. The criteria for evaluating a new suggestion are based on a cost-benefit analysis considering how much it will cost to implement the suggestion versus how important this suggestion is for the end-users. Table 5.7 provides examples of reasons for not implemented changes.

Table 5.7 Types of reasons for not implementing changes in Beta

Type of reasons for changes not implemented	Illustrative quotes
Economic constraints	'…because of course the consumer is from one side and what they want but on the other side this has to be economically viable. For example, as you saw in the screening; people may feel very excited about headscarves for example, but when you ask them to pay 2000 rubbles, they say we cannot afford it. But in order for this to be profitable, it has to be sold 2000 rubbles, so you know, sometimes, things can be dropped because the price acceptance points of the consumer are below what would be profitable for the company to launch. So, for pure economic reasons, yes ideas are dropped.' (B1)
End-user ideas regarded as not important	"If it's red or deep red, it doesn't matter which red… nobody understands red or deep red… then we ask which red and they say 'I don't know, red' so it doesn't matter it means they cannot see a difference between red and deep red so it's not important." (B2)

Similar to the others, participant B3 also supported that it is absolutely necessary to research and assess all the needed product alterations before implementing any of the end user's suggestions. Additionally, she emphasised another parameter for deciding on possible changes, which is related to managers and designers' expertise:

> '…you cannot count on customers 100% because, you know your job better. You have experience, you cannot blindly follow the customers. Let's say some people in the research show this and I will have to follow it, you have to study this, to study the option and what it means. For example, people sometimes in order to be able to purchase everything, they told us I want this with 1 euro, you cannot follow this. Or I want

> this to be gold let's say, it would be great. Indeed, it would be great idea but cannot be done, technically and costly it cannot be done.' (B3)

Overall, the participants supported that any new ideas and suggestions provided by the end-users are always taken under consideration. The main two reasons for whether implementing or not these suggestions are related (i) to economic criteria and (ii) to the importance of the change. Specifically, in the case of the fashion project, although some adjustments were made according to end-user feedback, no significant or substantial changes were implemented. This is not to be viewed as a negative aspect; it is instead due to Beta's NPD process being very structured and very well designed. Consequently, in the initial phases of NPD (idea development to concept screening), Beta provides to end-users a good number of options and versions (e.g. different themes) to choose from and perhaps they are not many new suggestions coming from them. Similarly, in the middle and later phases of NPD (prototype development to prelaunch and communication) Beta creates and presents to end-users a number of options (e.g. different magazine covers, different TV spot scenarios). However, it is questionable if such a structured NPD process can fully exploit the end user's potential and if can leave space for innovation to flourish.

5.2.5 Benefits and Challenges of End-user Involvement in NPD

In line with the purpose of this research study, participants were asked to discuss the benefits and challenges of involving end-users in the NPD process. Participants expressed a number of different perspectives that will be presented in the following paragraphs.

5.2.5.1 Benefits of End-user Involvement

When discussing the benefits that end-user involvement may bring into the NPD process, all participants agreed that perhaps the most important benefit is that it can help to ***identify and better understand end users' needs***. As participants explained, relying solely on designers and managers experiences and views may prove very dangerous for the appropriateness and success of the end-product. In particular, the suggestions and views provided by end-users will be more suitable and relevant for the development of the product; because these people are the target group and are the ones anticipated to buy the product. For this reason,

participants emphasised the importance of involving end-users throughout the NPD process in order to be able to adjust and refine everything on the product according to end-users suggestions and needs. Another common view amongst participants was that end-user involvement could help Beta to gain a ***better insight into product requirements***. In other words, end-users may point out important characteristics that designers and managers have overlooked or have perceived as not necessary.

In fact, the combination of the above two beneficial aspects, (needs identification and better insight into product requirements) lead to a third beneficial outcome of end user-involvement in NPD, that is ***increasing the profitability*** of the product. Most participants supported that by engaging with end users, the end product is developed to be as relevant and attractive as possible and this, in turn, increases the margins of profitability for Beta. The same participants also emphasised that by involving end-users throughout the NPD process, it helps them to ***reduce the uncertainty of product designs***. This is rather expected if one considers that the framework created by Beta for end-user involvement is mainly concerned with identifying end-user needs and with validating designers and managers' assumptions (e.g. size of the magazine) about the end product.

Similarly, another logical outcome can emanate from the combination of identifying end-users needs and having better insight into product requirements. As one participant reported, end-user involvement in NPD may also ***increase the success rate*** of a product. Specifically, it can lead to more favourable success rates in the market test phase as well as when the product is launched into the market. This is particularly important when Beta introduces an entirely new product into the market and it, therefore, runs higher risks in terms of acceptability and profitability.

Another benefit of end-user involvement in NPD that came up during the interviews is related to the ***identification of new segments***. One of the participants explained that more often than not, every new collection Beta develops and launches creates a new market for the company; or more accurately, a new segment. For example, when some years back Beta launched a pocket-watches collection, there was no similar product in the market at the time. Despite that, this collection proved to be one of the most successful ones for Beta

and it created an entirely new segment of end-users. In that sense, most participants discussed how in some cases, end-users may give ideas or inspire the NPD team to develop products for entirely new segments.

Although not very strongly, most participants commented that in some ways, end-user involvement may ***increase end-user engagement and adoption of the product***. That rationale was based on two assumptions. First, when designing the media communication for the product, end-users can help create effective and attractive messages that would attract (new) consumers. Second, when invitations are sent to existing end-users for taking part in the NPD process, Beta makes sure to highlight to them the importance of their opinion and the trust the company has in them. Consequently, participants discussed that these two ways may assist in attracting more consumers and in strengthening the loyalty of current consumers.

Finally, participants expressed some contradictory views regarding the opportunity that end-user involvement provides for ***increasing the number of product ideas***. While all participants agreed that Beta is in many ways encouraging end-users to provide new product ideas, one suggested that in reality, it is very rare that the company will pursue and invest on a product idea that is proposed solely by end-users. Moreover, another participant suggested that although sometimes very interesting ideas come from end-users, not all of the ideas are regarded as useful. Additionally, usually for Beta to pursue an end-user idea, it has to be something suggested by a large number of end users. Therefore, whereas all participants agreed that end-user involvement could increase the number of product ideas, it would be more reasonable to consider how many of the proposed ideas are actually useful for Beta.

In summary, the most discussed and perhaps the most important benefits of end-user involvement according to the participants' views were identifying end-users needs and having better insight into product requirements. However, through the interviews it was identified that these benefits could accordingly lead to other beneficial outcomes for Beta, which are related to increasing profitability, reducing uncertainty of product designs and increasing (test) success rate. Moreover, some participants discussed how end-user involvement can assist in identifying new segments and how it can provide opportunities for increasing end-

user engagement with the product or with the company. At last, participants agreed that although end-users can increase the number of product ideas, it is not common for Beta to develop these ideas further. Appendix X – Case Beta shows a summary of all the identified benefits.

5.2.5.2 Challenges of End-user Involvement

Turning now to the challenges of end-user involvement in NPD, the interviews uncovered five main themes (see Appendix X – Case Beta). To begin with, it was a common agreement amongst all the participants that one of the most challenging things when involving end-users in the development of a new product is to ***articulate their needs***. One participant supported that this responsibility mostly falls upon the focus group co-ordinators (which come from the research agency) who should deliver precise data and information to Beta. However, another participant stressed that whereas it is important to listen to the specific things end-users say, it is equally important to screen and filter everything that is going on during the engagement with the end-users in order to get the 'feeling'. For example, positive body language (e.g. smiles, to want to touch the product) could give the managers and designers a positive feeling about the product. Additionally, another participant supported that when the end-users are kids, it is particularly challenging because it is challenging to enable them to express their needs. Overall, it is a common view among the participants that articulating end users' needs may be challenging; however it was supported that body language is equally important and can help mitigate this challenge.

The second most common challenge discussed by the majority of the participants was related to the ***complexity of the product***. However, how big of an issue the complexity of a product is, depends on the nature of the product. For example, as one of the participants described, it is much easier to explain to people a collection of classic literature (e.g. Shakespeare, Dostoyevsky) rather than explaining the different aspects and characteristics of a radio-controlled car collection. Moreover, another participant stated that the tools used for involving end-users may also add into how complex a product seems to be. This can happen because if for example the end-user if filling a questionnaire, it could be difficult to accurately imagine all the different characteristics and functions of the

product. Hence, how complex a product is or how complex it may seem to the eyes of the end-users could create challenges on effective involvement in the NPD.

Other challenges discussed by participants included cultural differences, managing end-user involvement, and identifying the right type of end-user. The participant with the most (international) experience among his colleagues suggested that the ***diverse cultural characteristics*** of a nation could be an additional challenge for successfully involving end-users in the NPD process. He explained that depending on where people are coming from, they may be more open and direct on giving opinions, or they may be more conservative. As a result, if the manager is not experienced in working with different cultures, this may lead to (miss)communication challenges caused by cultural differences. In a similar way, another participant talked about the challenge of ***managing communication*** when having end-users with diverse personalities. In particular, in a focus group setting, it may be challenging a less experienced researcher to manage dominant personalities and to facilitate everyone to express their opinion. Finally, ***identification of the right type of end-user*** was another challenge that was reported a few times during the interviews. Some participants fell that when end users are recruited by the research agency, it is not possible to check if they are consumers of Beta's products, or if they have given accurate information about themselves (e.g. financial situation). Nevertheless, as another participant stated, Beta always challenges the research agency to recruit relevant and applicable to the product end-users.

To sum up, the findings show a number of challenges for end-user involvement in NPD. Articulating end-users needs and the complexity of products was the challenges mostly emphasised and discussed. In addition to this but less discussed, were challenges related to appropriately designing and managing end-user involvement.

5.2.5.3 NPD Cost and NPD time

Similar to Case Alpha, participants were asked to share their view on the implications of end-user involvement on NPD costs and on NPD time. All participants stressed that end-user involvement in NPD it certainly is a very time consuming and lengthy process. At the same time, participants also supported that

it is an important and necessary process for developing appropriate and successful products. As participant B2 explained:

> ‘Well, that is only one way, because if you don’t ask what people want you cannot start developing the product, because obviously, 100% it will be wrong, and you will not succeed. It means that you have to do research and involve customers and… so usually involving customers lasts a couple of months, but you put them in advance, so it doesn’t extent the time, because you plan it to involve them. In fact, from idea to the market, it doesn’t matter if it’s a good product or not, research with involving customers takes longer time. But, at the same time, if you don’t involve them and you do it yourself… there is no way for that.’

Similar responses were given to the relationship between end-user involvement in NPD and NPD costs. To be more specific, it was argued that finding the end-users, arranging the process of doing the research (e.g. design questionnaires and focus groups) and adjusting the product based on their feedback, increases the cost and the length of the NPD process. Nevertheless, involving them increases the likelihood of better-performing new products. To better illustrate and in the words of participant B1:

> ‘If you don't involve them, then definitely you save this time. But by involving them, and by investing the money to involve them at that stage, you save money later when you test let's say, because you have to test less collections in order to decide what to launch and you have more profitable products. So, you may sacrifice a bit, theoretically, in money and time, but in order to have better result and better economic performance.’

In short, the findings indicate that while involving end-users in NPD is regarded as a costly and lengthy process, it is viewed to be necessary for developing more appropriate new products and for increasing the new products’ success rate in the market.

5.2.6 Importance of End-user Involvement in NPD

In the vast majority of projects, Beta is involving and engaging end-users throughout the NPD process. The only exemption is in sporadic cases when a very successful collection from another market (another country) is taken and launched in the Russian market. Thus, when discussing with the participants about the importance of involving end-users in the NPD process, they all strongly supported that is very crucial and vital not only for the survival but also for the success of

Beta and its products. Some participants indicated that depending only on managers', designers', and partners' views and experiences may mislead Beta to invest resources in making a product that does not meet end users' requirements and needs. In regard, participant B3 illustrated the situation as:

> "Even for example in the company we did some desk researches and they were not 100% correct, I mean you have to reach the target group, the end-customer who will buy you. No other persons, but the ones that will buy the product. Is vital, without this we would be blind, we would publish products that we like ourselves. For example, let's say my boss likes wines or fishing, how many people are interested in that? I mean, it's very subjective."

In the same way, participant B1 concurred with the view that the products are been developed for the end-users, and therefore their involvement is very important. He also highlighted that irrespectively if the end users' feedback is aligned with the managers' and designers' views, it is always taken into consideration.

Nonetheless, it is interesting to see that whereas end-user involvement in NPD is perceived as vital, their views and suggestions are followed with caution. In particular, all participants highlighted once more that the final decisions of what will be launched and how are for Beta to take. In support, participant B2 argued that:

> 'We have to ask them, because we do it for them. So, we need the consumers to give us tips and insights. What has to be and what shouldn't. Then we already take your experience etc. to see what we can pay for, what we cannot, because the consumer wants everything and for zero money.'

The common idea identified from all the above is that end users' input during the NPD process is very important for developing more appropriate and less risky products. Sometimes end users' views, and feedback might seem harsh but at the same time necessary for objectively assessing a product and its potential. Nevertheless, although end-user involvement is very important, managers and designers are always in control of defining the characteristics of the end product.

5.2.7 End-users Roles and Experts Involvement

Another theme that came up when discussing with the participants is about end-user roles in the development of the fashion project as well as in Beta's NPD process in general. The participants asserted that the primary purpose of inviting and engaging end-users in the NPD process is to verify, re-confirm, or change initial assumptions. In that sense, it was reported that end-users are required to answer a few key specific questions in order Beta to ensure that the product under development is aligned with what end-users anticipated. In addition, when necessary, experts are employed to assist in specific parts of the development of the new product. For example, in the Fashion project, a fashion expert was consulted and worked with the editorial team for developing the content of the magazines.

As already mentioned, it is all participants' view that the outcomes (e.g. suggestions, feedback) from end-user involvement are very important and vital for the success of the product. Nevertheless, it is very interesting to note that the majority of the participants supported that they cannot count entirely on and thoughtlessly trust end users' input. For example, participant B3 commented:

> "You cannot count 100% in the findings [from end-user involvement]. You get a trend, you get a feeling, you get some basic guideline, say directions, to consider and discuss and decide. Discuss with the research team, discuss with the other managers, and decide. These are you know, these are not guidelines to be given, they are hints."

Furthermore, it was indicated that there are two reasons for not relying solely on end users' feedback. First, designers and managers are experienced in their domain and they may know better than the end-users. Second, end-users may not be genuinely interested in participating in the development process and therefore, their answers and feedback may not be accurate.

Given the above points, the findings show that whereas Beta puts emphasis on the importance of end-user involvement in NPD, end-users have a quite indolent role. They are therefore seen as a source of information who can give direction for the development of more appropriate and perhaps successful products.

5.2.8 End-users and Novelty

The interviews revealed that for Beta it is imperative and almost necessary to develop and launch products that are new for the market. Participants supported that although not all products can be very innovative, there are no safe options. To elaborate, every time that Beta launches a similar collection, the sales and the profit decreases. Hence, the less innovative the products are, the less successful they are in the market. As illustrated by participant B1:

> 'This is how the partworks are really successful, whenever you bring a collection in the market, it has to be something new and unique. If it's not, you know it usually doesn't attract the proper number of consumers, so it doesn't work. And if is new and unique, there's always the question of taking a big risk.'

However, all participants asserted that the case usually is that end-users do not suggest novel (product) ideas. In contrast, the most novel ideas come from within the company or from the company's partners.

> 'The most innovative ideas do not come from them. It comes from us or from our partners, not from consumers' (B2)

Hence, although developing innovative products is important for Beta, the company does not trust to end-users the identification of very new and innovative ideas. Nevertheless, it needs to be reminded that Beta's NPD process is very structured and end-user involvement very 'directed'. Thus, the above discussion does not necessarily mean that end-users do not have the ability to come up with new ideas.

5.2.9 Summary of Findings for Case Beta

Overall, Beta follows a very structured NPD process and focuses on the fast development of products. Consequently, the end user's role is mainly restricted in giving feedback and suggestions on specific key questions as set by Beta. More specifically, in the initial phases of NPD, end-users are involved for identification of trends and in the middle and later phases for selection and verification of products' characteristics as they have been set by Beta's NPD team. In this respect, end users are mostly regarded as a source of information and therefore, all final decisions about the appearance and the functionality of the product are

taken by managers. As revealed from the interviews with the participants, developing innovative new products is important for Beta's competitive advantage in the market. However, the highly controlled NPD process and the restricted role of end users may be the reason for end users not suggesting innovative ideas. Nevertheless, end-user involvement is regarded as very important and a necessary condition for avoiding the subjective views of Beta's managers and NPD team. In support, it was suggested that although end-user involvement in NPD is a lengthy and costly process, it is absolutely necessary for developing successful products.

When organising the NPD process, end users are selected according to demographic criteria and are involved throughout the NPD process. Both indirect and direct tools are employed for involving end-users; interestingly, web-based tools are not as preferable. Most important benefits from end-user involvement include identifying their needs and having better insight into product requirements. At the same time, successfully articulating end users' needs is one of the most challenging tasks for Beta. The main reasons for not implementing end users' change requests include (i) economic restraints and (ii) changes regarded as not important. Nevertheless, when discussing the fashion project, it was revealed that Beta managed to meet all key requirements and change requests as proposed by end users which led to the collection been very successful in the market.

5.3 Case Gamma

5.3.1 Phases for End-user Involvement

Since lead-users are the ones to propose and manage the projects, they are involved throughout the NPD process. The participants suggested that whereas it is very helpful and beneficial to work closely with the lead-users, the frequency and level of involvement depends on the lead-users, their experience and the product itself. One participant further addressed that even if the lead-user cannot be present at the workshop, the NPD team will keep him or her updated on the progress of the project and if necessary, will discuss any changes on the initial plan. Nevertheless, in each of the NPD phases, the lead-users will be involved at least once.

Figure 5.3 illustrates the typical NPD process followed for projects where lead-users and end-users are well engaged with the process. More specifically, in the initial NPD phase (idea generation), the lead-users will approach Gamma and propose their product idea. Once the two parties agree to work on the development of the product, the NPD team of Gamma will work closely with the lead-user and together they will agree on and develop the concept design of the product. Next, several different versions of prototypes will be developed including very initial ones which only represent patterns, to more advanced prototypes where final materials have been incorporated. After the final prototype is developed it will be tested as many times as needed to ensure it fulfils all requirements and expectations as set by the lead-user and end-users. Finally, different sizes will be developed and tested by end-users and the product will go through final production and will be ready to be introduced in the market.

Overall, lead-users (and end-users) are actively involved throughout the NPD process. The lead-users are the ones who mainly have the control of the project and they closely collaborate and work together with Gamma's NPD team for developing their products.

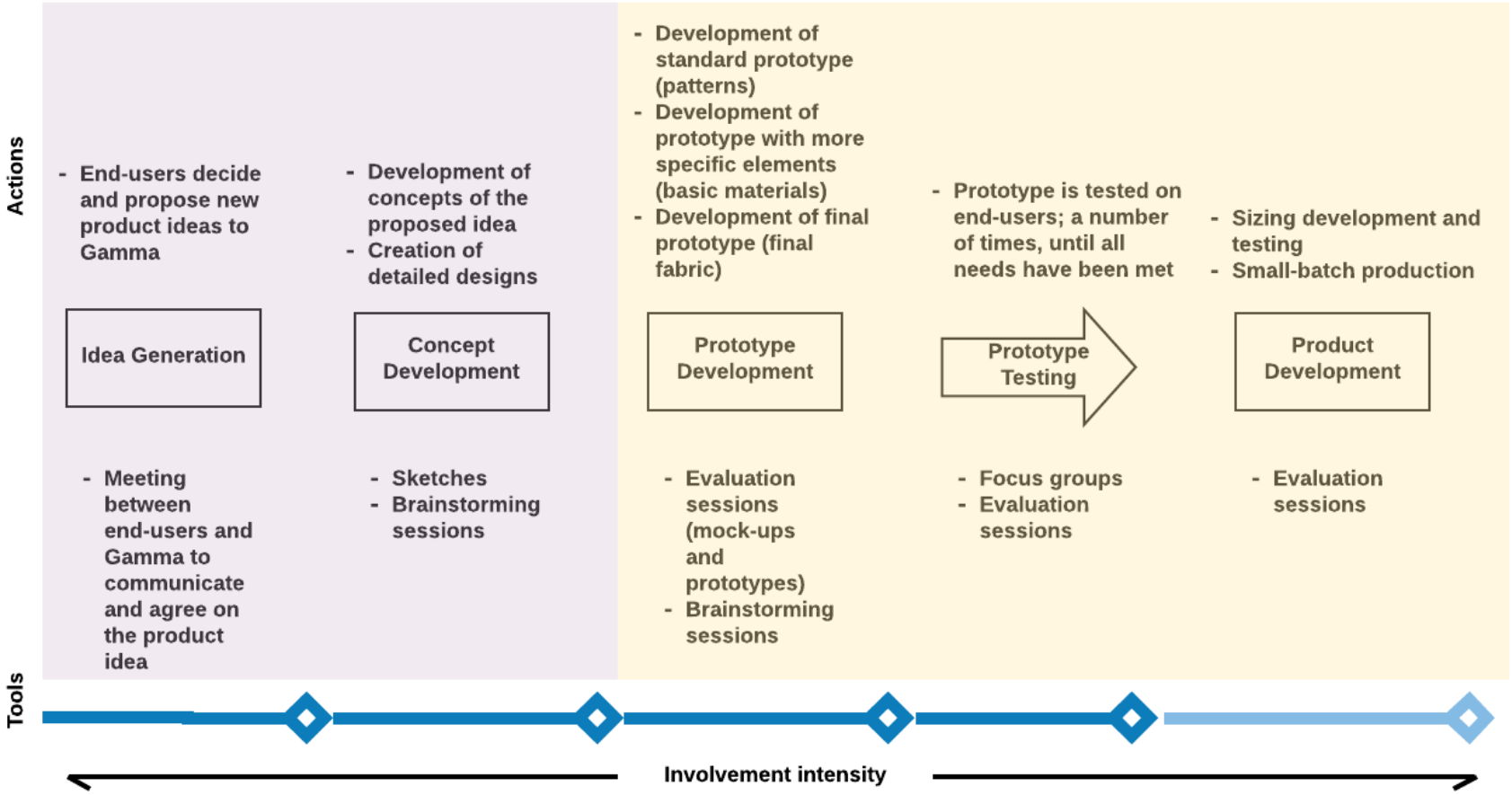

Figure 5.3 Gamma's typical NPD process

5.3.2 Tools for End-user Involvement

Gamma uses a range of tools and methods for involving and closely working with their lead-users and end-users throughout the NPD process (table 5.8). In the very first interaction with the lead-users Gamma arranges for meetings to discuss and agree on the project's main specifications. As the project advances to further NPD phases, a number of other tools are used to generate concept ideas, overcome difficulties, and develop and test prototypes. More specifically, brainstorming sessions, inspirational pictures on Pinterest boards, sketches on paper, and SCAMPER techniques are the tools and methods that Gamma uses to help

> '…getting all that jumbled up, massive, amazing, content inside your head out; in a usable manner that helps you expand, and develop, and improve things.' (G3)

As all participants suggested, these tools are particularly helpful for quickly communicating and discussing ideas or solutions to issues with the lead-users. Participant G1 reported that testing the prototypes is one of the most important phases for being able to develop a successful product. Subsequently, when it comes to developing and testing prototypes, evaluation sessions is the main tool used by Gamma and the lead-users. The evaluation sessions usually happen in an informal manner and may include end-users, the NPD team, and other people who may be around. Less frequently, focus groups may also be used for testing and evaluating prototypes. The focus groups may be organised by Gamma, or more typically, by the lead-user who leads the project and typically involve a wide range of end-users -people who may be interested in purchasing and using the product in the future.

Table 5.8 Overview of Gamma's tools for end-user involvement in each NPD phase

NPD Phase	Tools for end-user involvement	Characteristics
Idea generation	Meetings with end users	Direct
Concept development	– Sketches – Brainstorming sessions – Inspirational pictures	Direct
Prototype development	– Evaluation sessions – Brainstorming sessions	Direct
Prototype testing	– Focus groups – Evaluation sessions	Direct

Hence, the findings show that Gamma uses only direct tools for engaging lead-users and end-users in the NPD process. This is rather expected if one considers the close collaboration Gamma has with its lead-users. To clarify, whereas the lead-users are (as probably expected) involved in all NPD phases, other end-users may also be involved during the prototype testing and product development phases.

5.3.3 End-user Selection Characteristics

Gamma follows a user-centred business model, and consequently, the lead-users are the ones who initially make the first contact in collaborating and developing a product with the company. It is worth noting that the lead-users who propose a project to Gamma do not necessarily have any design training or any previous design experience. Nevertheless, as already discussed, Gamma is stringent and faithful in following ethical business practices. Participant G1 explained:

> 'We make it very clear who we are, what our values are, that's important. We are very clear on what type of clients [end-users] we want to work with. We want it to be as good an experience for them as it is for us. Sometimes we are approached [by end-users] and they're only working and will be working with animal product. That's simple for us, no we can't help you…'

Therefore, Gamma will only work with lead-users who share the same business values. Finally, regarding the end-users that may be involved in the focus groups, Gamma nor the lead-user have specific selection criteria other than sometimes sizing matters.

5.3.4 Clothing Project

When participants were asked to describe an NPD project, the focus turned in to an original style of clothing that Gamma has been recently working on. The lead-user who proposed and initiated the project was actively engaged throughout the NPD process and was working closely with the NPD team in every step of the development process. The next subsection provides a detailed overview of the NPD process of the clothing project.

5.3.4.1 NPD Process for the Clothing Project

The clothing project started when one lead-user proposed the idea of a new sustainable and organic clothing line to Gamma. After discussions with the lead-user, the management team agreed to undertake the project and work together with the lead-user for developing the new clothing line. Subsequently, the concept design phase began. The lead-user already had a rough concept design which brought with him in Gamma's workshop. With this as a basis, the lead-user and the NPD team started working together for improving and finalising the concept design according to the lead user's needs and requirements and in alignment with the designers' suggestions. Once the final concept was agreed, the NPD team started working on developing the prototype. This was a highly iterative phase where the NPD team would develop a prototype, show it to the lead-user, and then modify it according to the lead user's feedback. As soon as the NPD team and the lead-user had agreed on the final version of the prototype, a focus group session was organised to present and test the prototype with other end-users. Finally, after some modifications were made according to the end users' feedback, and before the small-batch production begins, the sizing of the product was tested primarily in-house (with the End-user and the NPD team). Table 5.9 summarises all the activities that took place during the NPD process of the clothing project.

Table 5.9 Summary of activities that took place during the NPD of the clothing project

Phase	Activity	Outcome
Idea generation	– Lead-user proposes new clothing line idea to Gamma	Decision and agreement between Gamma and lead-user for developing the new product
Concept development	– Lead-user presents basic concept design to Gamma – Lead-user and Gamma work together for improving the initial concept and developing a final, more defined concept – Brainstorming sessions, inspirational pictures, and sketches are the main means for creating the final concept design	– Identification of lead user's requirements and needs – Final concept design developed through the collaboration of Gamma and lead-user
Prototype development	– NPD team prepares prototype according to lead user's feedback from the concept development phase – Evaluation sessions where the lead-user gives feedback on the prototype – NPD team and lead-user decide together for changes on the prototype	Prototype developed

Prototype testing	Focus groups with end-users to give feedback on the prototype	Prototype tuned according to end users' feedback
Product Development	Sizing is tested within the NPD team and lead-user as well as in evaluation sessions with other end-users	Product ready to be launched in the market

5.3.4.2 Change Requests from End-users

In the case of Gamma and particularly for the above-presented clothing project, the end-users are closely working with the NPD team for developing the product. Not only that, the lead-user is the one who leads the project and is responsible for all the decisions taken for the development of the product. Participant G2 explained:

> 'If we see where a change could be made that would be of benefit to the lead-user, then we will talk with him through that change and then the decision always rests with him. Because it's their product. It's their designs. It's about their vision and what is it they are trying to execute.'

Additionally, on many occasions during the interviews, the participants stated that the relationship with the lead-users is seen as a partnership where the lead-user and Gamma are equal partners.

> "We build very strong relationships with our customers. We see it more as a partnership rather than a customer relationship." (G2)

In support, it was discussed that the collaboration between the two parties (lead-user and Gamma) is very open and ideas and suggestions for improving the product are coming from both sides. That means, in most of the cases, Gamma is gladly welcoming any suggestions and change requests coming from the lead-users (or end-users). Nevertheless, there are also cases that Gamma will choose not to take forward change requests made by the lead-users (or end-users). In most cases, there is a practical explanation behind that. For instance, the requested change may have an impact on the functionality of the product; or Gamma may not have the appropriate machinery to implement such a change. Also, some changes may not be feasible if they do not align with the quality standards or ethical business values as set by Gamma. Table 5.10 presents an overview of the reasons for not implementing changes based on lead users' requests.

Table 5.10 Types of reasons for not implementing changes in Gamma

Type of reasons for changes not implemented	Illustrative quotes
Impact on functionality	'Sometimes a client might have a vision for something that can't actually physically be done. For example, in terms of the structure of the fabric that they are working on, so it could be that it can be done but they can't use the fabric that they had initially chosen, they have to maybe look at doing it with a different fabric or re-adjust the design to fit that look.' (G2)
Above company's capabilities	'We also have to manage what does a client need. What are they asking for. There are certain elements that we just can't do. We don't have the facilities for it.' (G1)
Different business values	'Sometimes we are approached, and they're only working and will be working with animal product. That's simple for us, no we can't help you' (G2)
Product and material quality	"The client does lead, it's their project; no doubt on that. So, whatever it is we do it their way even if it costs more or takes more time but to our quality standards. Quality is very important for us and we won't compromise on that." (G3)
NPD phase	'There is always the occasional one that might have already started the prototype even beforehand and they want to work towards it so then the flexibility completely changes.' (G1)

Coming back to the clothing project, this is a typical example of projects Gamma usually undertakes and therefore, the collaborative NPD management style where change requests would come from both Gamma and the lead-user was apparent. The interviews revealed that although many changes had to be done during the prototype development, Gamma was very supportive in assisting the lead-user and in continually ensuring that the end-product would meet all the initial expectations. More specifically, participant G3 explained that in times, the clothing project was somewhat challenging because first, the product idea was something very original and there were no examples to follow, and second because different types of fabrics and embroidery had to emerge. Nevertheless, Gamma was able to implement all appropriate changes as requests by the end-users.

5.3.5 Benefits and Challenges of End-user Involvement in NPD

5.3.5.1 Benefits of End-user Involvement

According to the interviews with the participants, one of the most important benefits of end-user involvement in NPD is that it helps to ***reduce the uncertainty of product designs*** and to avoid mistakes. All participants supported that frequent end-user involvement throughout the NPD process is extremely helpful; especially when looking at implementing design changes. Moreover, this could

lead to cost savings for the lead-user and could allow for less stressful work for the NPD team. Subsequently, participant G2 also mentioned how end-user involvement in NPD helps Gamma to understand better and ***identify end users' needs***.

Participants also gave equal importance to benefits related to knowledge gained by the close collaboration between Gamma and end-users. Both sides of this were discussed. First, the participants emphasised the rich experience and ***knowledge they have acquired*** from working with end-users. It became apparent from the interviews and observations that the NPD team in Gamma is very open to learning from others, and it does not carry the 'know-it-all' syndrome that experienced designers may express sometimes. As participant G3 put it:

> "The stuff I can teach you is fantastic, is great, but also I want to know about all the stuff you can teach me."

In support, the second benefit related to the knowledge that the participants discussed, is concerned with ***end users acquiring new skills***. It was highlighted that active and frequent end-user involvement in NPD can equip end-users with additional management skills and may help them to get a better understanding and more realistic view of the manufacturing process.

Finally, participant G1 mentioned that when there is a design challenge, the end-users can propose some very ***innovative ideas***. All the benefits of end-user involvement in NPD that were discussed during the interviews are presented in Appendix X – Case Gamma.

Hence, the findings show that for Gamma, developing a successful new product is perhaps as important as promoting and sustaining a learning relationship between the company and its end-users. The identified benefits reflect the close collaboration Gamma has with its end-users and illustrate the importance Gamma pays on the end users' input during the NPD process.

5.3.5.2 Challenges of End-user Involvement

The interviews revealed several different perspectives regarding the challenges of end-user involvement in NPD; these are presented in table Appendix X – Case

Gamma. One of the most discussed challenges was related to the ***complexity of products***. It was reported that end-users may not always realise the complexity and the work behind making something as simple-looking as a t-shirt. This naivety, in turn, may sometimes lead to the challenge of convincing end-users that there is a better or more appropriate way of solving something, or that the company does not have the capability of providing what is in the end user's mind. Therefore, ***changing end users' opinion*** into something feasible may be challenging for Gamma.

Most of the participants emphasised that end-users would ***constantly want to make changes*** in designs and prototypes. This could cause frustration in the NPD team as it may result in time and cost overruns; something that in a later phase, would affect the lead-user as well. Participant G1 stressed that many times the change requests occur because some lead users tend to ***focus a lot on the details*** of a design. Similarly, participant G2 added that at times, lead-users get too influenced by the feedback provided by end-users in focus groups, and consequently, they would try to incorporate every single change that has been requested; something that is not possible.

Getting emotionally involved in the lead user's journey is another challenge that came up during the interviews and was actively discussed by all participants. Whereas this is good in terms of meeting end users' expectations and developing more appropriate products, it could also prove dangerous and costly. Participant G3 compared the situation with the relationship between siblings; they care, and they are willing to help each other in difficult circumstances but also run the danger of conflicts and personal losses. This discussion led to identifying another challenge of end-user involvement in NPD, which was also reported by participant G2. This is that some end-users may misunderstand their position, and they might feel more senior and more ***overpowered*** towards the NPD team. Although an interesting observation, this was an individual incident for Gamma.

Finally, all participants recognised that ***articulating end users' needs*** is challenging, especially in the prototype phases and when working with end-users that have no design experience. However, the participants stressed that Gamma always ensures to invest enough time in understanding what exactly the end-user expects to see in the product. Subsequently, articulating end users' needs is not

seen as a massive challenge as it would have been for a mainstream business within the industry which would probably have more strict NPD processes.

Overall, the findings show that whereas several challenges of end-user involvement in NPD were discussed, most of them were related to the close collaboration between lead-users and the NPD team (e.g. emotional involvement or constant change requests). Furthermore, other less discussed challenges were related to the complexity of the products and to the effort put for articulating end users' needs.

5.3.5.3 NPD Cost and Time

When asked about the implications of end-user involvement on NPD cost and time, participants of case Gamma seemed very settled in their opinions. First, all of them agreed that end-user involvement in NPD is cost-efficient. As they explained, this happens because the lead-user is frequently present at Gamma's workshop and closely works with the NPD in modifying and improving the product; therefore, any changes and action plans can be made without delay.

Second, whereas all participants recognised that end-user involvement in NPD is time-consuming, at the same time, they all supported that it is necessary. As participant G3 explained:

> 'It takes longer to produce the product than if we said to the client 'ok, thank you very much, we know what we are doing' and we just make it and be done with it. But, what's happened in the past when we allowed the clients to go away, is that they come back, and it has been not right at all (the product). And so, it has actually taken substantially longer. So yes, we can make it faster if left alone, than when the client is with us, but we are more likely to finish the whole project earlier if the client is with us.'

Moreover, participant G1 explained that because most of the projects undertaken by Gamma are unique and innovative, lead-user involvement is essential.

Hence, as supported by participants, the findings show that the customer-centric approach of Gamma may reduce NPD costs. However, whereas the NPD time may be extended, it is of little concern to Gamma as long as the product is developed to flawlessly meet the lead user's needs and expectations.

5.3.6 Importance of End-user Involvement in NPD

As revealed from the interviews with the participants, Gamma's business model is based on following user-centred principles and therefore, end-users are always involved in the NPD process. Not only that, end-users are closely working with the designers and employees of Gamma and they are the ones to have leading roles in the NPD projects. In that sense, it becomes self-evident that end-user involvement in NPD is perceived as essential not only for the day-to-day operations of Gamma but also for the success and survivability of the company.

5.3.7 End-users Roles and Experts

As already mentioned, from the interviews with the participants, it became clear that the end-users are closely working with Gamma throughout the NPD process. As participant G2 explained:

> 'We build very strong relationships with our end-users. We see it more as a partnership rather than a customer relationship. So, we don't just help and service them; we work in partnership with them.'

This close collaboration and partnership do not seem to be affected by the level of (designing) expertise or technical awareness of the end-users. Both end users with designing experience and end users without designing experience are equally involved throughout the NPD process. Subsequently, whereas end-users with designing experience may have a better perception of what is needed for a product to be made, end-users without designing experience may rely more on the knowledge and skills of Gamma's employees.

Overall, the findings show that Gamma perceives end-users more as partners rather than just customers. More specifically, the end-users are not only treated as co-designers and equal members among the NPD team; they are also the ones to have leading responsibilities and to decide on solutions within the NPD projects.

5.3.8 End-users and Novelty

All participants supported that end-users can come up with novel ideas. During the interviews, it was mentioned a number of times that end-users have come up with novel product ideas or that they have the ability to think outside the box and

offer creative solutions to issues faced during the NPD process. However, it was also stressed that creating innovative products should be a guided and structured process. Furthermore, participant G2 added that whereas innovation is encouraged and welcomed, it is not the first priority for Gamma:

> 'There is going to be an economic impact for the end-users. We maybe cannot afford novelty. Priority is economics first, novel later.'

Hence, the findings suggest that although participants support that end-user can come up with novel ideas, they also stressed the importance of following a properly facilitated and appropriately managed innovation process. Nevertheless, economic value rather than novelty is the primal concern of Gamma when developing new products with end-users.

5.3.9 Summary of Findings for Case Gamma

Gamma is a company structured to assist early stage start-ups and independent designers (lead users) transform design ideas into end products. At the same time, Gamma operates following ethical business principles and practices (e.g. equal pay, no animal abuse). Subsequently Gamma only works with lead users who share the same business values, and which are perceived and treated as partners, co-designers and equal members of Gamma's team. The lead users have the main control over the project and are therefore involved and work together with Gamma's NPD team in every single NPD phase. Apart from lead users, other end-users may also be involved during the prototype testing and product development phases for testing the products and providing feedback. Since the relationship between Gamma and the lead-users is seen as a partnership, end-user involvement in NPD is perceived as essential not only for the day-to-day operations of Gamma but also for the success and survivability of the company. Although interview participants supported that end-users can come up with novel ideas it is the economic value rather than a novelty that is the primal concern when developing new products. Nevertheless, Gamma puts emphasis on properly facilitating and appropriately managing the NPD and innovation process which may extend the NPD process time.

Apart from ensuring that end users hold the same position regarding Gamma's ethical business values, there are no specific criteria for selecting end users to be

involved in the NPD process. Furthermore, suitable for its customer-centric approach, Gamma uses only direct and face-to-face (no web-based) tools for engaging lead users and end users in the NPD process. One of the most important benefits for involving end users is to help to reduce the uncertainty of product designs and to avoid mistakes. At the same time, the participants expressed equal importance for benefits related to knowledge gained by the close collaboration between Gamma and end-users. The most challenging aspect of end user involvement is related to the complexity of products and how end users often fail to see that. Moreover, many challenges are related to the close collaboration between lead-users and the NPD team (e.g. emotional involvement or constant change requests). The main reasons for not implementing end users' change requests to products include (i) impact on the functionality of the product, (ii) no appropriate machinery to implement such a change or (iii) changes may not align with the quality standards or ethical business values as set by Gamma. However, in the discussed fashion project, Gamma was able to implement all appropriate changes as requests by the end-users.

5.4 Case Delta

5.4.1 Treatment-Diet Project

Differently to all the other case studies, Delta is a research group rather than an established company and so far, has developed only one product -ready meals based on the treatment-diet. Consequently, all the information gathered during the interviews it was based on the NPD process followed for the diet project as well as on the personal views and perspectives of the participants. The initial idea of developing the treatment-diet and the ready-meals came from the principal researcher (participant D2) of Delta. For reasons of clarity, it should be noted that the ready-meals were designed and developed by Delta to meet two essential criteria: i) act as a therapy for patients with gastrointestinal disorders and ii) to be attractive enough for people to consume them joyfully.

The NPD process started in 2014, and now it is in a stage where the research team is finalising the NHS approved clinical trials with end-users (patients). Whereas patients are the main end users for Delta, there are also other kinds of end-users involved in the study. These include people who are looking after the patients and

who are responsible for referring the diet to them; such as dietitians, doctors, and clinic consultants (labelled as 'end-users (clinicians)' thereafter). Additionally, other people involved in the NPD process include a random sample of healthy people ('(healthy) end-users') and food experts from the catering company responsible for preparing the ready meals. Therefore, for the treatment-diet project, Delta involved three kinds of end-users: i) patients, ii) clinicians, and iii) healthy people. The end-user selection characteristics will be discussed in more detail in subsection 5.4.1.3. The next subsections will discuss in detail the NPD process for the diet project and the end users' role and impact on it.

5.4.1.1 New Product Development Process and Phases of End-user Involvement

When the discussion turned on what the best time for involving end-users in the NPD process is, all participants agreed with participant D3 who supported that:

> "I think is very important to engage and involve customers or patients in all phases of the product development."

Additionally, participant D1 complemented that end-users should definitely be involved in the early stages of NPD, to assist in appropriately outlining the project requirements and defining product characteristics. After that, and throughout the NPD process, end-users should be involved before every big decision on the product is taken. These views correspond well with the NPD development process followed for the diet-treatment project (Figure 5.4). More specifically, the idea for developing the treatment-diet came from the need for new dietary treatments for gastrointestinal disorders. Although a successful liquid diet plan already existed, evidence on scientific journals and reports suggested that i) the liquid diet was very restrictive resulting in complaints from patients and ii) once a relapse happened the patients would refuse to repeat the liquid diet. Based on this evidence Delta developed a questionnaire which first tested with end-users (clinicians) before sending it to end-users (patients) who in the past had received the liquid diet. The results showed that 80% of the end-users (patients) who completed the questionnaire, had a keen interest in the treatment-diet suggested by Delta. Subsequently, Delta decided to move the project forward and develop the solid treatment-diet. Using as guidance the already existing and successful

liquid diet (e.g. nutrients and vitamins included in the liquid diet plan) Delta developed the formula of the treatment-diet plan.

Next, Delta proceeded with developing the treatment-diet plan and the ready-meals. The prototype development phase included three stages: i) mechanistic study, ii) animal testing and iii) palatability testing. The mechanistic study involved testing both the liquid diet and the solid diet with (healthy) end-users. The aim of the mechanistic study was first to observe the effect the new diet had on the gut bacteria of the (healthy) end-users and second, to compare the two diets in terms of end-user acceptance. During the mechanistic study stage, on day one and day seven of each diet plan (liquid and solid) the (healthy) end-users had to fill in questionnaires aimed at measuring the appetite and at collecting information about the acceptability of the diets. Additionally, the (healthy) end-user had to keep a diary where they would keep a record of the food they had cooked and eaten. Based on the information gathered during the mechanistic study Delta concluded that the solid treatment-diet was more attractive to follow and that there was positive change on the gut bacteria of the (healthy) end-users. However, the solid treatment-diet was tested on healthy people only and therefore, Delta did not have concrete evidence that it would be able to treat patients.

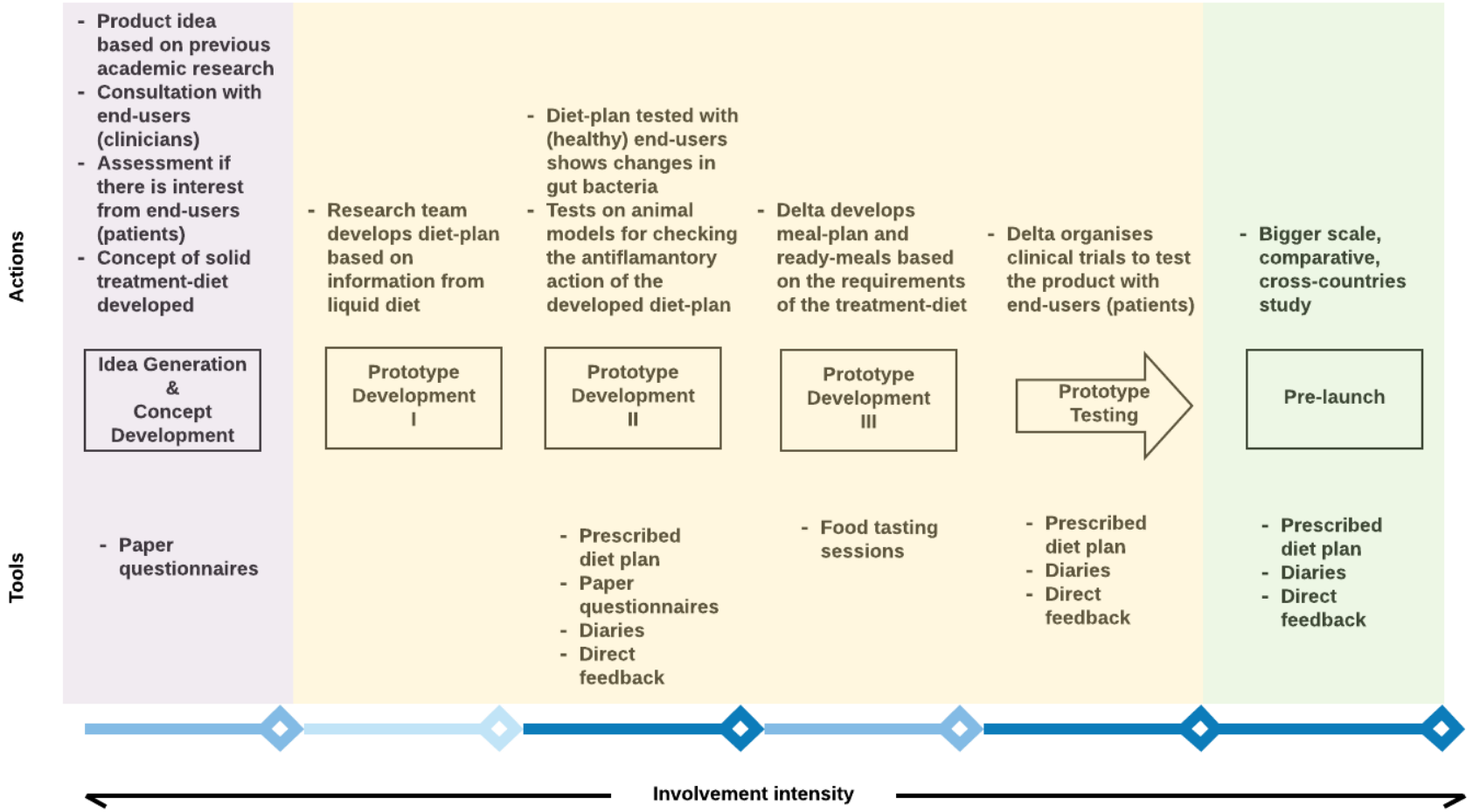

Figure 5.4 Delta's typical NPD process

Hence, the second stage of the prototype development phase started. In this stage Delta used genetically modified animal models to test the healing abilities of the treatment-diet. The results of these tests confirmed that the treatment-diet had anti-inflammatory abilities who could act as a treatment for patients with gastrointestinal disorders. At this time, the third stage of the prototype development phase begun. Based on the feedback gathered from the (healthy) end users' diaries, Delta started experimenting with developing different recipes and different meal plans. Following that, Delta outsourced the food preparation to a catering company and then organised food tasting sessions with end-users (clinicians), the research team, food experts (from the catering company), and (healthy) end-users. Based on the feedback of these tasting sessions, Delta re-designed some of the meals and meal-plans.

Once Delta ensured the anti-inflammatory abilities of the treatment-diet and once the ready-meals were developed according to feedback gathered from the tasting sessions, the prototype testing phase begun. This signalled the start of the first clinical trials where (patient) end-users would try the ready-meals for the very first time. In total, 20 (patient) end-users were provided with the treatment-diet and the ready-meals to follow for eight weeks. During this period, the (patient) end-users would keep diaries and would give unstructured, face-to-face feedback to Delta. The time the interviews with participants were taking place, the clinical trials were in the final stage. Hence, when participants were asked what the next step of the project would be, they indicated that they aim for bigger scale clinical trials which will allow comparisons between the effects of the liquid diet and the solid treatment-diet. Table 5.11 summarises all the activities that took place during the NPD process of the treatment-diet project.

Table 5.11 Summary of activities that took place during the NPD of the treatment-diet project

Phase	Activity	Outcome
Idea generation & Concept Development	– Based on existing academic evidence, identification of need for new diet for treating patients with gastrointestinal disorders – Delta develops a paper questionnaire to assess patients' interest in the treatment-diet – End-users (clinicians) provide feedback on the content of the questionnaire	– 80% of (patients) end-users indicate that are strongly interested in the treatment-diet – Delta decides to develop the treatment-diet and the concept of the ready-meals

	– Questionnaire distributed by post to (patients) end-users	
Prototype development I	– (healthy) End-users invited to test the pre-existing diet as well as the new treatment-diet – (healthy) End-users provide feedback through questionnaires and diaries – Feedback includes suggestions for ready-meals and indicates a negative attitude towards having to cook the food	– (healthy) End-users prefer the treatment-diet from the liquid diet – The use of the treatment-diet is evident to cause changes to gut bacteria in the same way as the liquid diet does – Decision to take further tests for ensuring the healing abilities of the treatment-diet
Prototype development II	– Treatment-diet tested on genetically modified animal models	– Treatment-diet shows ability to treat gastrointestinal disorders – Decision to develop recipes for the ready-meals, and meal-plans
Prototype development III	– Delta collaborates with a catering company and outsources the food preparation to them – Delta develops food recipes according to feedback gathered during prototype development I – Delta organises tasting sessions with (clinicians) end-users, (healthy) end-users, and food experts	– Ready-meals and meal plans are developed
Prototype testing	– (patients) End-users take part in clinical trials – (patients) End-users provide direct feedback and diaries	– Treatment-diet shows positive effects on treating gastrointestinal disorders – Decision for bigger-scale tests

Overall, the findings show that end-users are involved throughout the NPD process. Especially during the first stage of prototype development and during the prototype testing, end-users were actively engaging with Delta. This is in alignment with the views of Delta's participants who have suggested the end-user involvement should happen throughout the NPD process. One may support that due to the nature of the product (ready-meals aimed at treating people) end-user involvement has been a necessity rather than an option for Delta. However, the effort and detail Delta has put into developing ready-meals that not only have healing abilities but also are attractive (in appearance and taste), indicates that involving end-users during the NPD process was a conscious and well-thought

decision. This will become more evident in the subsections to follow and mainly on 5.4.1.4.

5.4.1.2 Tools for End-user Involvement

The tools Delta uses for engaging end-users across the NPD phases include paper questionnaires, prescribed diet plans, diaries, direct feedback and food tasting sessions (for an overview of tools see table 5.12). More specifically, paper questionnaires were used in the first two NPD phases. In idea generation phase, the questionnaires were used with the aim to confirm the claims identified in the existing academic literature about the need for a new treatment-diet for people with gastrointestinal disorders. An interesting point here is that whereas the questionnaire was developed by Delta, before distributing it to (patient) end-users, it was piloted to (clinicians) end-users. As participant D1 explained:

> 'So, the very first thing we did was a survey when we aimed to ask through a questionnaire both paediatric and adult patients who have a gastrointestinal disease which is their opinion about developing such a diet. So, we developed a questionnaire within the team, we checked the questionnaire and we got feedback from nurses from dietitians, and then we posted this questionnaire to every single patient who was treated with a liquid diet over the past year and we asked them to complete the questionnaire and send it back to us.'

Paper questionnaires were also used during the prototype development I phase. This time they were used for assessing the satisfaction of (healthy) end-users when following the liquid diet and the solid treatment-diet.

> "…we asked them how easy was for them to stick to the diet, how hungry they fell, etc., various questions about appetite and satisfaction." (D2)

Table 5.12 Overview of tools for end-user involvement in each NPD phase

NPD Phase	Tools for end-user involvement	Characteristics
Idea generation & concept development	Paper questionnaires	Indirect
Prototype development I	-	-
Prototype development II	– Prescribed diet plan – Paper questionnaires – Diaries - Direct feedback	Indirect & direct
Prototype development III	– Food tasting sessions	Direct

Prototype testing	– Prescribed diet plan – Diaries – Direct feedback	Indirect & Direct

Whereas paper questionnaires were used only on very initial NPD phases, the tools and methods for engaging (healthy and patient) end-users in the prototype development I and prototype testing phases are identical. In both phases (healthy and patient) end-users had to follow a prescribed diet plan, keep diaries, and provide direct feedback to Delta's researchers. The prescribed diet plan it was a necessary requirement for moving forward with the treatment-diet project, so there is not much to analyse rather that both the (healthy and patient) end-users did not stray away from the diet plans. This may be a positive indication regarding the level of engagement of end users and the effort and importance they put on their role in the project. Keeping diaries was another way to involve end-users in the NPD process and collect significant information about the project. In the prototype development I phase the (healthy) end-users had to keep a detailed record of what they were eating. Similarly, during the prototype testing phase, the (patient) end-users were also keeping a diary, but because in this phase Delta was providing the ready-meals, the diaries were less detailed. Moreover, direct feedback was an unbiased and significant method for collecting end users' opinions and perspectives. In occasions when Delta's researchers were meeting end-users (e.g. to provide groceries or collect diaries), the feedback was provided regarding difficulties faced or suggestions for improving the diet. Nevertheless, all participants supported that especially in the case of the (healthy) end-users, people were keenly provided they feedback without being asked to do so. All participant supported that this feedback helped Delta a lot in the prototype development III phase when the ready-meals were designed. However, because during the prototype development I phase the focus was on the clinical efficacy of the diet, this direct feedback was not unexpected; participant D1 stressed that:

> "What was actually a pity is that we did not record this information on a very structured way."

Nevertheless, that brought to the table a question about the reasons for selecting to have questionnaires and unstructured feedback instead of having interviews with the (healthy and patient) end-users. The participants indicated two reasons.

First, in the NPD phases up to prototype development III Delta's focus was on understanding the mechanistic aspect (effect on gut bacteria) and making the diet work. In the words of participant D2:

> 'The reason we didn't do it at this point is because at this stage we want to see if the diet works. Because if you develop a diet which doesn't work, then there is no point for you to be worrying about making it more beautiful.'

Second, in later NPD phases when (patient) end-users were involved, because the process of following the treatment-diet was a new reality for them, Delta did not want to overload them with additional tasks. Participant D2 explained:

> "Because you want to try to minimise the burden, so you want to get information but then you don't want to overload them. Because in our case, our participants are going through a very tough time, so we try to minimise the burden to them as much as possible."

Finally, another tool used for engaging end-users during the treatment-diet project was food tasting sessions. These tasting sessions would take place in the facilities of Delta or the facilities of the catering company. All kinds of end-users, as well as food experts, would participate in the tasting sessions and they would exchange opinions about the taste, appearance, and consistency of the food. Although the tasting sessions were mostly for verification reasons, this was perhaps the most engaging activity where Delta and end-users had direct collaboration.

Overall, the findings show that Delta uses both indirect and direct tools and methods for engaging end users in the NPD process. Whereas paper questionnaires and tasting sessions have been used mainly for verifying assumptions, diaries and direct feedback were methods that end users freely and keenly expressed their opinions, creating a source of inspiration for Delta. It is also interesting to notice that in most cases, the end users felt like part of Delta's team. This is evident on the discipline end users showed during both (liquid and solid) diets and on the genuine enthusiasm on providing feedback.

5.4.1.3 End-user Selection Characteristics

As already discussed, end users of different kinds (patients, clinicians, and healthy) were involved throughout the NPD process of the treatment-diet project. The participants discussed that inviting healthy people (instead of patients) to participate in the project was necessary. This is because before (patient) end-users were involved, Delta had to make sure that the treatment-diet would have at least some positive effect on patients.

Participant D2 stressed that finding the right end-user is very crucial. He explained:

> 'If you develop a product and you know it's working but your customers are very unlikely to stick to that, then you may have a good product, but you don't have the right people to use it.'

However, in the case of (healthy) end-users, the selection was based mostly on convenience. Whereas the project was openly advertised on social media, it was mostly people who were very close to Delta's researchers (friends and friends of friends) that got involved in the NPD process of the treatment-diet project. This happened because Delta wanted to ensure that the (healthy) end-users will follow the entire intervention plan. In the case of (patient) end-users, these were selected with the apparent criterion that they suffer from a gastrointestinal disorder. The only other criterion was that the patients would not be recently diagnosed and should have the disease for a while. The reason behind that was that Delta did not want to put newly diagnosed patients under any additional psychological stress. Finally, in the case of (clinicians) end-users, these would be invited to participate based on their experience and typically would be associated with the (patient) end-users participating in the study. Hence, Delta has been following simple but specific and strict criteria when inviting end-users to participate in the NPD process of the treatment-diet project.

5.4.1.4 Change Requests from End-users

The treatment-diet is a therapeutic diet that aims to reduce or ideally treat gastrointestinal disorders. Subsequently, it has to be a diet that patients will follow and stick to it. The means that Delta puts much effort into understanding

and implementing end users' opinions and requests. In support, participant D2 commented:

> "... we were looking about opinions, personal opinions about what will maximise adherence to the diet"

The other two participants supported that end-users had many recommendations regarding the way the ready-meals were prepared and packaged, the meals selections, and the delivery of the diet. For example, participant D1 discussed how they had to come up with solutions for vegetarian (patients) end-users or how young patients did not like the label of the packaging and Delta had to replace that:

> 'The sandwich has the same packaging as the ready-meals; we've got our own label with information of the diet and the study and my mobile number. However, in sensitive ages, like teenagers, the kids do not really like to take in the school something which says that he's on a xx disease therapy.'

Nevertheless, as participant D2 stressed, there is a limit of what end-users want and what Delta can do. Table 5.13 includes reasons and examples of changes requested by the end-users that Delta could not implement.

Table 5.13 Types of reasons for not implementing changes in Delta

Type of reasons for changes not implemented	Illustrative quotes
Economic constraints	'…we found some difficulty in a sense that it would be very hard to re-design all the meals to cook them with halal meat just for one consumer. We could have the option to make all meals with halal meat, but this would change the price of the product because buying halal meat is more expensive and it's harder to get it, find it.' (D2)
Impact on 'functionality'	'Of course, sometimes everything has to be within certain boundaries because let's say if a patient wants to eat only corn flakes for eight weeks, we won't be able to provide that.' (D2)
Impact on usability	'…So, we were asked from the clinical team if there is a way for a vegan person to go into the diet and the answer is no. The reason has to do with the restrictions of the diet and what is in the diet. So, it has to do with the characteristics of the foods which are in there.' (D1)

Overall, the findings show that Delta always considers end users' change requests. The main reason is that Delta tries to make the healing process as easy as possible for the patients and more importantly tries to maximise adherence to the diet.

However, not every change request can be implemented. Economic constraints, impact on usability, and impact on functionality are the main reasons for not taking forward suggestions and change requests by end-users.

5.4.2 Benefits and Challenges of End-user Involvement in NPD

5.4.2.1 Benefits of End-user Involvement

Regarding the benefits end-user involvement can bring in to the NPD process, all participants emphasised that ***needs identification*** is one of the most important benefits. It was discussed that irrespectively of how knowledgeable and experienced Delta's researchers are, they may not be able to identify all end users' needs without talking to them. Furthermore, it was argued that when involving end-users in the NPD helps in developing more accurate products and this may lead to ***increasing success rate of products***.

Another benefit that emerged during the interview with participant D1 is related to the ***increased confidence*** end-user involvement can bring to a project. More specifically, it was supported that when end-users show support and appreciation to researchers' efforts and ideas, it may create a sense of importance about the project and may increase confidence that the project is on the right path; leading to increased motivation on working on the project. In a similar way, when end-users getting involved in the NPD process, they may start feeling like a member of the NPD team and like they have actively contributed to creating the product. That way, end-users may become ***keener to use (adopt) the end-product*** once is launched into the market.

The participants also strongly supported that by involving end-users in the NPD process, and by listening to their views and suggestions, may help Delta to ***reduce the uncertainty of product designs*** and to avoid mistakes. Participants D2 and D3 also briefly mentioned that if end-users are involved in an early NPD phase, it can ***increase the number of ideas*** for creating or improving the product.

Overall, the findings reveal that the most important benefits of end users' involvement in NPD are related to identifying and meeting end users' needs. This will respectively lead to more successful products and to products that once launched in the market are more likely to be adopted by end-users. An overview

of all the benefits of end-user involvement in NPD is presented in Appendix X – Case Delta

5.4.2.2 Challenges of End-user Involvement

As discussed by all participants, one of the most important challenges when involving end-users in the NPD process is ***identifying the right type of end-user***. In the same lines, participants argued that if 'wrong' people are involved in the NPD process, wrong suggestions will be followed and therefore, this will negatively impact the characteristics and features of the end-product. Additionally, participants also mentioned that sometimes it may not easy to ***find enough end-users*** to participate and engage in the NPD; nevertheless, this did not seem to be a significant concern of Delta.

Having a ***high number of ideas*** may also be challenging during the NPD process. Participant D2 further explained that when having many different opinions and ideas, it may be challenging to select which one is the most appropriate for the smooth and appropriate development of the product. This may also become harder if researchers become too involved with the stories of their patients and by having more suggestions makes it challenging to fulfil all end users' expectations. However, the big pool of ideas may come from the fact that in most cases, end-users do not realise the ***complexity*** and science hidden behind preparing the ready-meals.

Overall, the findings show that identifying the right type of end-users, having a high number of ideas and opinions and the complexity of the product is the main challenges faced by Delta. These are illustrated in Appendix x – Case Delta. Nevertheless, it is important to note what participant D1 suggested: if before even the NPD process begins, a good plan and strategy is in place for end-user involvement then all these challenges should be minimised if not eliminated.

5.4.2.3 NPD Cost and NPD Time

All participants agreed that involving end-users in NPD requires additional time and additional financial resources. However, they confidently supported that if appropriately planned, it can result in a more time-efficient NPD process. Participant D1 suggested:

> "I guess it has to do with the strategy you're following. If you've got good procedures of how to do this and you've thought about this on a good way, then it can be efficient time wise. I mean you need to have a strategy about how you're doing it, and which is the best way to capture people's opinion."

Similarly, when focusing on the costs associated with end-user involvement in NPD, it was concurred that although costly, it is necessary to involve end-users because

> "…say if you don't take their opinions in to account you may develop something that is not suitable for them and then you will have to go back and try to re-invent the wheel." (D2)

Hence, the findings show that Delta recognises the financial resources and time commitments associated with end-user involvement in NPD. However, it was repeatably stressed and suggested that with an appropriate strategy in place end-user involvement in NPD can lead to shorter and more cost-efficient NPD process.

5.4.3 Importance of End-user Involvement in NPD

Several times during the interviews, the participants suggested that end-user involvement in NPD is essential for developing relevant and appropriate products. Participants D1 and D2 discussed how whereas the existing liquid diet can treat patients, it is not palatable and not easy to follow; and because of that, it is not successful. Therefore, when developing the treatment-diet was of paramount importance to closely involve end-users in every step of the NPD process and make changes according to their preferences and suggestions. Participant D2 explained:

> "Developing a product is not all about developing something which is gonna be working, particularly with medicinal food as we call it, you need to develop something that you will make sure that it will be used by your potential customers. So, we could for example make a diet which is working very well but the diet cannot be consumed by patients, then this doesn't help."

In support, participants also discussed how sometimes end-users may come up with unexpected requests and how they may have different perspectives on some of the product's characteristics. An example was given by participant D1 regarding the ingredients used when designing the ready-meals:

> “Okay so I didn't really expect that. I mean I should have expected that. But I thought that when you come up with a dietary therapy and you're going to give this to them instead of a liquid diet it's going to be so much better than that. So, it's fine to taste Greek and to have let's say a lot of olive oil on the top but this is something that people here would never consume. And so, it was very important for me to hear and see that we really have to change this and shift this closer to their culture.”

Finally, it was discussed that regardless of if one wants it or not, eventually end-users will get involved by the decision they make whether to buy a product or not. In that sense, it would be more beneficial for companies to involve their end-users during the NPD than having to completely re-design or discontinue products that are not having good customer acceptance and market performance.

Overall the findings suggest that close end-user involvement throughout the NPD process is very important and supported by Delta.

5.4.4 End-users Roles and Experts

As already shown in the previous sections, Delta uses different kinds of end-users (healthy, patients, and clinicians). From the interviews with the participants, it becomes apparent that end-users are closely working with Delta throughout the NPD process. The treatment-diet is not just a product, it is rather a treatment and perhaps this is the reason all involved end-users have shown great willingness to closely engage and provide thoughtful suggestions. This was most evident during the prototype development I phase where (healthy) end-users would provide additional feedback to Delta regarding meal preparation. Hence, whereas Delta started the NPD process with a more structured and question-answer kind of relationship with its end-users, this involvement and collaboration between end-users and researchers became deeper than anticipated.

Furthermore, Delta invited food experts (employees of the catering company) to take part in the prototype development III phase. The food experts were Scottish cooks who have had many years of experience preparing ready-meals for people or families who do not have time to cook. Because Delta’s team come from different ethnic backgrounds, it was explained that the involvement with the food experts was crucial for the successful development of the ready-meals.

Given the above points, the findings show that end-users were having a quite active role throughout the NPD process and in many instances have worked closely with Delta for improving the treatment-diet.

5.4.5 End-users and Novelty

During the interviews with the participants, it was suggested that end-users may be able to come up with novel ideas. In the specific case of the treatment-diet project, (patient) end-users were able to come up and propose some innovative ideas regarding the preparation of the ready-meals. Nevertheless, participant D1 anticipated that for the end-users to be able to propose novel ideas, they need to be guided. More specifically, in the words of participant D1:

> 'I think you need to guide them in a way, when you involve them. I don't think getting them to brainstorm and find the new product themselves would work. I don't think that they can just get ideas out of their head. I think you (company) need to have some sort of idea before you bring them up in the plan.'

Thus, the findings show that if end-user involvement in NPD is well-planned and guided, it may result in some innovative ideas. The treatment-diet is overall a very innovative approach in treating gastrointestinal disorders. Nevertheless, perhaps because the treatment-diet is still under clinical trials for assessing its effectiveness, Delta did not seem very concerned with developing highly innovative solutions. Hence, so far, Delta has not attempted to involve end-users in ways that would aim to boost innovation.

5.4.6 Summary of Findings for Case Delta

Delta is a multidisciplinary research group devoted to designing, developing, and preparing ready meals with the aim to improve the lives of people suffering from chronic gastrointestinal disorders. The treatment diet is the first project of the research group and their first experience in involving end users in the NPD process. Delta invites end users of different kinds (patients, clinicians, and healthy people) to be involved throughout the NPD process. More specifically, during the first stage of prototype development and the prototype testing, end users were actively engaging with Delta by giving feedback and making suggestions for improvements. Delta sees end-user involvement in NPD as essential for developing relevant and

appropriate products. In support, despite end-user involvement being necessary for testing the product, Delta has put tremendous effort in designing the product for not only having healing abilities but also making it attractive for the end users to consume. As a result, end users were reported to have a quite active role throughout the NPD process and to feel part of Delta's team. At the same time, Delta recognises the financial resources and time commitments associated with end-user involvement. However, it is the view of the participants that with an appropriate strategy in place end-user involvement can lead to shorter and more cost-efficient NPD process. In the same lines, it has been stressed that oneway or another, end-users will eventually get involved by the decision they make whether to buy a product or not; thus, would be more beneficial to consciously involve end users during the NPD process.

Delta uses both indirect (for verifying assumptions) and direct (as a source of inspiration) tools and methods for engaging end users in the NPD process. Furthermore, Delta follows simple but specific and strict criteria (e.g. not recently diagnosed patients) when inviting end-users to participate in the NPD process. One of the most important benefits of end-user involvement was reported to be related to needs identification. Involving the 'wrong' end users in the NPD process will lead to inappropriate characteristics and features of the end-product and therefore identifying the right type of end-user is one of the most important challenges when involving faced by Delta. Whereas end users' change requests are always taken under consideration, economic constraints, impact on usability, and impact on functionality are the main reasons for not taking forward these requests and suggestions. Finally, so far, Delta has not attempted to involve end-users in ways that would aim to boost innovation.

5.5 Case Epsilon

5.5.1 Phases for End-user Involvement

The typical NPD process in Epsilon is very structured and identical for all NPD projects. Subsequently, the company involves end-users in specific phases of the product development process and uses a standard set of tools and techniques for end-user involvement (Figure 5.5). In the first phase of NPD, the ideas for new products are generated by the Marketing department. Information about end-

users needs is identified through online questionnaires that Epsilon distributes to installers and the existing consumers of the products. These are analysed together with the current regulations and with other important data (e.g. sales) and form the basis for the development of a product specification document. Next, the Marketing, R&D and Production departments work together for developing the concept of the product. Following that, in the concept-screening phase, the end-users are invited to participate in focus groups for evaluating and discussing the concepts with Epsilon. Participant E2 outlined that this mainly happens for validating reasons:

> 'So we check with the end-users when we translate the project definition into a concept. Because we have questions and I have my point of view and the project manager has another point of view and we have to discuss it. And for me the best person the best person who can decide is the end-user because he's the one who will use it.'

Once all the aspects of the product have been clarified with the end users, the production team then develops the prototype of the product. After that, in the prototype-testing phase, Epsilon invites the end-users to test and evaluate the prototype(s). More specifically, the installers are the ones evaluating the technical and functional characteristics of the product, while the consumers are evaluating mainly the aesthetic aspects. Participant E3 suggested:

> "After we done some prototypes we test the prototypes with them [end-users]. And they say to us, you have to change this part of the product or another part, in order to make a better product."

Next, the NPD team will work on modifying the prototype according to the end users' feedback and within the project's objectives and economic boundaries. However, due to time constraints, end-users are not given another opportunity to test the modified prototype. Hence, once the prototype has been defined, the certification process of the product starts. In this period (approximately six months), while waiting for the product to be certified so it can become authorised for mass production and launch into the market, the end-users may (but not always) get involved one last time. This time it is a less structured and less formal process. More specifically, people from Epsilon may observe how in real situations, the installers install the new product. Participant E1 explained:

> ‘The last time with the end-user is when we are running some products. That could be in order to define it, to be sure that our product work in various conditions. For example, someone would have a big house and use a lot of water or another one would be in a very warm country. But it can also help us to make little modifications. As I see how the product is being installed and I see is used in a way I was not expecting… maybe I can make a little evolution’

However, at this phase of the project, due to the awaiting of the certification, the changes on the product cannot be substantial.

Hence, the findings show that end-users are involved throughout the NPD process but more intensively in the concept testing and prototype testing phases. In the next subsection, the discussion will turn in to the tools used by Epsilon for involving end-users in the different phases of NPD.

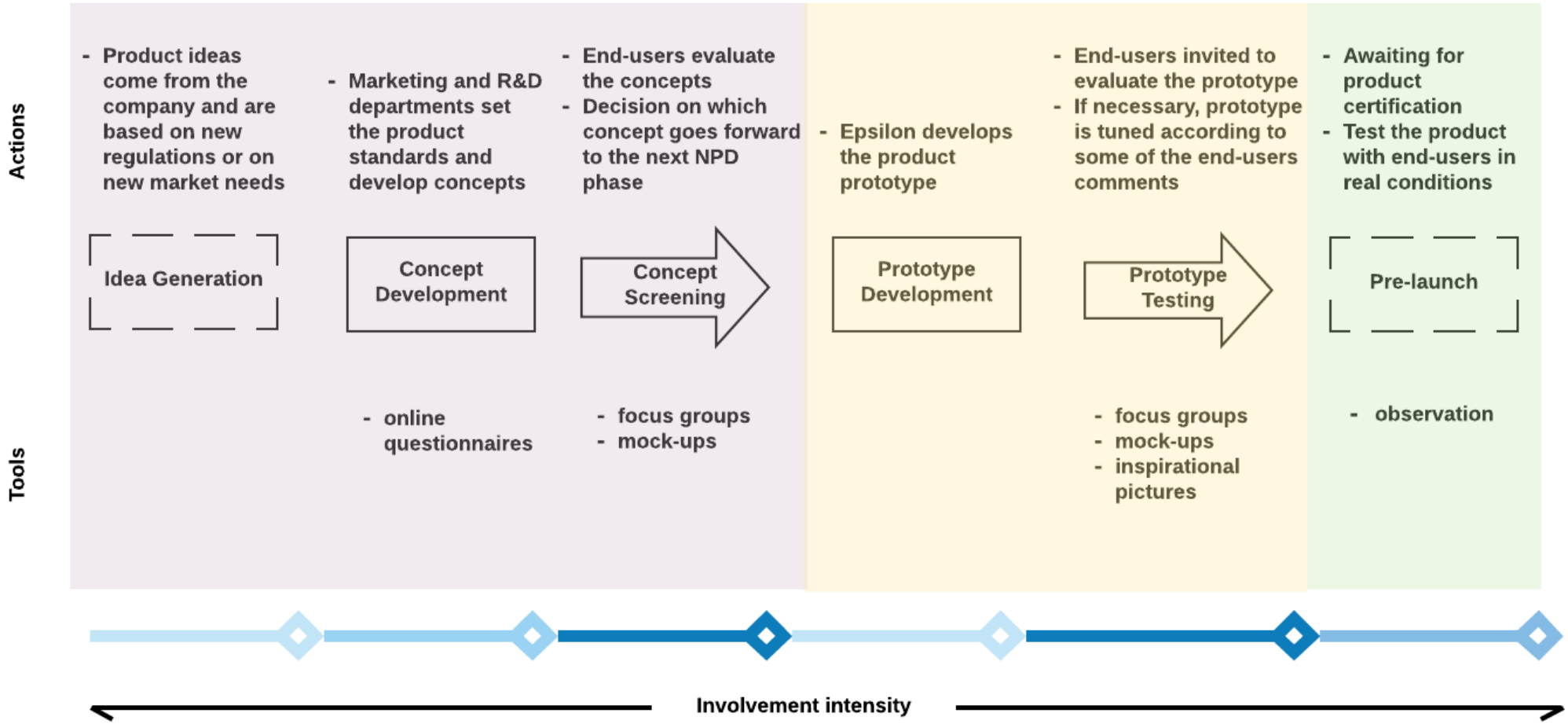

Figure 5.5 Epsilon's typical NPD process

5.5.2 Tools for End-user Involvement

Epsilon uses a range of tools for involving end-users throughout the NPD process, with the most frequently used being focus groups (for an overview of tools see table 5.14). Focus groups are used during the concept screening and the prototype testing phases with the aim to validate decisions, solve disagreements among the development team and when appropriate to listen and record end users' opinions and suggestions on a specific issue. In most of the cases, the focus groups include a presentation of prototypes of the product or parts of the product and mock-ups with the products. Participant E1 gave an example:

> "For example, last time I took a heating system and was movable. So I put it and say: What do you think? Okay. And if it's there what do you think now? Is it better? If it's not better, why? What do you prefer? And maybe they say: Okay, if you put it on this side it is not good for me because when I am installing it there will be a cable and it will be ugly. But if you put it on the other side, in most cases that is the wall side. So, put it there, the cable will be shorter, it won't be ugly because we don't see it for example."

Table 5.14 Overview of Epsilon's tools for end-user involvement in each NPD phase

NPD Phase	Tools for end-user involvement	Characteristics
Idea generation	Online questionnaires	Web-based
Concept development	-	-
Concept screening	– Focus groups – Mock-ups evaluation	Direct
Prototype development	-	-
Prototype testing	– Focus groups – Mock-ups evaluation – Inspirational pictures	Direct
Pre-launch	Observations	Indirect

The participants also suggested that another way to involve end-users, principally just a few months before the launch of the product is to spend a day with installers. This way, they observe the installers on how they install the product and record any issues or challenges that might arise during the installation process. Participant E2 outlined:

> "Sometimes, we went to pass a day with them. To see the life of the installers. So, we follow them and we see how they install the products."

In addition, participant E2 reported that in the square water heater project (which is discussed in detail in subsection 5.5.4) the marketing team used inspirational pictures in order to identify a more aesthetically attractive water heater design. More specifically, through an online questionnaire end users (consumers) were asked to take pictures of the current water heaters in their houses and share them with Epsilon. As participant E2 explained:

> 'We made some questionnaires for the end-users, the home owners, and they had to take photos of their water heaters so we know where they have it installed, where the water heater is in the house; so we could try to improve is aesthetically'

Finally, another way for Epsilon to gather information and end users' opinions is through online questionnaires that are distributed to existing end-users (both consumers and installers). The input from these questionnaires is mainly used to identify contemporary trends in the market and to provide inspiration for new product ideas.

Overall, according to the findings, focus groups is the principal tool used by Epsilon for getting more in-depth understanding of end-users needs and for specifying product requirements. Besides, online questionnaires, observations and inspiration pictures appear to be complementary methods for end-user involvement in Epsilon's NPD process.

5.5.3 End-user Selection Characteristics

Epsilon does not have specific strict criteria for selecting end-users. In that sense, anyone who is either a registered installer of Epsilon's products or a consumer of water heating systems can be invited to participate in the NPD process. The identification and recruitment process can happen in three ways: (i) direct call and an invitation to installers that the production and R&D teams have worked with in the past; (ii) randomly selected from Epsilon's customer and installer database, or (iii) arrangements through specialised research agencies. Hence, Epsilon does not seem to put much effort into the recruitment and selection of end-users.

5.5.4 Square Water Heater Project

For case Epsilon, the participants chose to talk about their experiences while developing the square water heater project. That was a new type of water heater that needed to be developed for replacing an older model. More specifically, in comparison to the older model, the task of Epsilon was to develop a less consuming and aesthetically more attractive water heater product. End-users comprised of both installers and consumers and were involved throughout the NPD process. The next subsection provides a detailed overview of the NPD process of the square water heater project.

5.5.4.1 NPD Process for the Square Heater Project

The decision for developing the square water heater was taken during a meeting in Epsilon for deciding a new product idea. During this meeting, it was discussed that one of their models was not making sales anymore and therefore, there was a need in the market for a new model. It was decided then to undertake the square water heater project.

The Marketing and R&D departments worked together for designing the first concept of the product where the characteristics of the product were defined considering the end users' needs. Following that, questionnaires were sent to end-users in order to help Epsilon validate the defined product characteristics and prioritise end users' needs. Three different concept designs were created and end-users (installers) were invited to evaluate them through participation in a focus group. This helped to decide on the main functions of the product and to create the final concept design that was a combination of two earlier concept designs and involved every modification proposed by end users. For the aesthetic point of view, Epsilon decided that it would be a good idea to position the water heater inside special designed furniture.

Subsequently, following the concept design, the R&D and the Production departments developed the product prototype. The last time end-users were involved in the NPD process was when they were required to test and evaluate the product prototype. Both installers and consumers were invited to participate in focus group sessions where functionality, as well as the aesthetics of the product,

were discussed. One of the main outcomes of these sessions was the decision of developing a square-shaped water heater. In the same line, after adjustments according to the end-user feedback, the final product was created, sent for certification, and finally, launched into the market. Table 5.15 summarises all the activities that took place during the square water heater NPD process.

Table 5.15 Summary of activities that took place during the NPD of the square water heater project

Phase	Activity	Outcome
Idea generation	– Low sales of a product in a specific product range lead to the identification of the need for an improved new product	Decision of developing a new product in the water heaters range
Concept design	– Marketing and R&D Departments work together for developing concepts – A questionnaire sent to end-users (installers) to validate and prioritise identified needs described in the concepts	– Identification of end-user requirements – Concept designs developed and ready to be tested with end-users
Concept screening	– Focus groups with end-users (installers) where different concepts are presented and evaluated – End-user feedback, suggestions and ideas generated	Final concept design created according to end users' feedback
Prototype development	R&D team prepares prototype according to concept screening feedback	Prototype developed
Prototype testing	Focus groups with end-users (installers and consumers) to give feedback on the prototype	Prototype aesthetic as well as technical characteristics tuned according to feedback
Pre-launch	Final prototype sent for certification	– Certification obtained – Product ready to be launched in the market

5.5.4.2 Change Requests from End-users

As seen from the previous subsection, for the square water heater project, end-users were involved three times in the NPD process. In the concept-design phase, Epsilon involved end-users with the purpose to validate and arrange in terms of importance the already suggested product characteristics. Therefore, unless something in the product characteristics seems to be terribly wrong, Epsilon does not encourage the support of new suggestions coming from end-users. Differently, in the concept-screening phase and the prototype-testing phase, the interviews suggested that end-user involvement is very important for evaluating designs and prototypes and for suggesting appropriate changes. In fact, in the square water

heater project, a number of important changes were requested by end-users and were successfully implemented by Epsilon. For example, one suggestion and change request during the concept screening included:

> 'They [end-users] said something like that we have to make some installation for the air from the heated water, to take the air outside and to put the air into the machine and the air go out after and so how we should work to simplify this process' (E2)

Other change requests included improving the interface of the control screen and improving the aesthetics such as colours and materials used. It is also important to mention that even if a change on the product is not possible, Epsilon is keen to work on finding an alternative solution that would satisfy the end-users requests. In the words of participant E1:

> 'But they also asked for some things which we said 'no, really, we can't do that'. So they say 'ok, maybe we can do that?' and we say 'yes, we can!'. And we design it together.'

The participants also discussed and gave examples of changes requested by the end-users that Epsilon could not implement; these are illustrated in table 5.16.

Table 5.16 Types of reasons for not implementing changes in Epsilon

Type of reasons for changes not implemented	Illustrative quotes
Economic (or time) constraints	'We would need to spend more time and more money. Like, to put some more colours on the water heater, not only grey but also red or black. Or to put something like stone coating on the water heater so you can write on it. But… it's too expensive.' (E2)
Impact on functionality	'Some asked to make a water heater according to the consumption needs. So maybe you have a little water heater when there are two persons in the household and two years after when you have kids, you can increase this existing water heater and increase the quantity of the water. But technically, we cannot do that' (E2)
In use by competitors	'Or we have a competitor who uses it. So it will be the same thing and that is not acceptable for us, it cannot be done.' (E1)
Legal agreements	'Sometimes we can't do it because we have a political agreement with this kind of technology so we have to use it for example.' (E1)
Regulations	'There are certain regulations and standards from the EU that we need to meet. To qualify the components and to be sure there are no risks for the end-users. So we need to understand what constraints we have to respect.' (E1)

Overall, the findings show that end users' change requests are encouraged mainly in the concept screening and the prototype testing phases. For the square water heater project, Epsilon was able to implement the suggested changes or to offer alternative solutions that would satisfy the end users' needs. Regulations and legal agreements are undeniably necessary to follow and, in some cases, may prevent implementing changes as requested by end-users. Apart from these, budget constraints and impact on functionality are the most common reasons for not taking forward suggestions and change requests by end-users.

5.5.5 Benefits and Challenges of End-user Involvement in NPD

5.5.5.1 Benefits of End-user Involvement

From the interviews with the participants, it became apparent that ***needs identification*** is one of the most important benefits of end-user involvement in NPD. The participants supported that this involvement may help them to understand better the end-users and their expectations of the product. Additionally, most participants emphasised that quite often there may be ***disagreements among NPD teams*** regarding products' characteristics or on defining end users' requirements. They suggested that the best way to help them come into an agreement that would be accepted and respected by everyone in the teams is to ask and acquire the opinion and suggestions of end-users. Consequently, when opinions and assumptions are validated by the end-users, it helps in ***increasing the motivation and the confidence*** employees have in the project.

The participants also highlighted that by involving end-users in the NPD process, it could help attain ***better insight into product requirements***. More specifically, it was suggested that it could help them identify product's areas or characteristics that are important for the end-user but initially, may have passed unnoticed by the NPD teams. Similarly, it was reported that involving end-users in the concept screening and prototype development phases, it gives Epsilon the benefit of ***reducing the uncertainty of product designs***. In the same tone, when discussing tools and methods for end-user involvement, it was discussed that one of the aims of asking end-users to fill in questionnaires, is for ***prioritising the already identified product requirements***.

Other less-discussed benefits of end-user involvement in NPD included ***increasing success rate of products***, ***increasing number of ideas***, ***assisting in the identification of new markets***, *and* ***offering a better overview of the project***. Particularly for the last one, participant E1 explained that when there are focus group sessions that include end-users and managers from different departments (e.g. marketing and production), everyone gets to listen and see to everyone's issues and suggestions on the project. This way, all the involved NPD managers and their teams may have an overall view of the product and this. Regarding the ***identification of new markets***, participant E2 discussed that direct involvement and contact with end-users could sometimes lead to smaller side-projects. For example, she explained that the installers had difficulties in transferring the products from the truck to the installation place. This acted as an inspiration for developing a new complementary to the water heaters product. More specifically, Epsilon worked closely with the installers and developed a special belt that would help the installers move the water heater easier. All the benefits of end-user involvement in NPD that participants identified and discussed during the interviews are illustrated in Appendix X – Case Epsilon.

In summary, the findings show that the most noticeably recognised benefit of end-user involvement in NPD is related to the identification of end users' needs. More interestingly, the participants also emphasised how needs identification can assist in solving disagreements within NPD teams, increasing their confidence and motivation to the project, and allowing them to take (informed) decisions. Other benefits were also identified but were less enthusiastically discussed by the participants.

5.5.5.2 Challenges of End-user Involvement

During the interviews, the participants mainly focused on three types of challenges of end-user involvement in NPD; these are illustrated in Appendix X – Case Epsilon. First, the ***complexity of products*** was a challenge commonly highlighted by all participants. As participants explained, when end-users and mainly consumers ask for a change on the product, many times they cannot realise the impact this change will have on other components or functions. However, considering the technology and complexity behind the water heaters, this is a quite expected finding. Second, most participants reported *that the*

identification of the right type of end-users may be quite challenging. This is exclusively applicable in the case of the installers. Some installers are highly specialised in a few specific types of water heaters whereas some others may have different expectations from the product (in terms of efficiency, quality, cost, etc.). Therefore, depending on the type of the project, Epsilon needs to identify and invite different kinds of installers for appropriate evaluating and testing the product. Finally, in accordance with the previous discussion, participant E1 reported another challenge, which is related to *the* ***number of end-users***. Whereas in the case of installers, it is challenging to find enough people, in case of the consumers it happens quite the opposite. As already mentioned, Epsilon is a multinational and well-established company. This means that millions of people are currently using its products and millions are prospective consumers. In that sense, participant E1 expressed concerns regarding the low number of consumers that Epsilon may involve during the development of a new product.

To summarise, participants expectedly discussed the complexity of the product as a challenge when involving end-users in the NPD process. Apart from that, Epsilon appeared to face challenges only regarding the selection and the number of end-users.

5.5.5.3 NPD Cost and NPD Time

Participants of case Epsilon did not appear to be very concerned with the time and costs related to end-user involvement in NPD. In particular, participants barely discussed cost-related concerns or worries. However, they reported that although end-user involvement is a pre-defined step in the NPD process, it could still be time-consuming and result in extending the time it takes to develop a product. For that reason, Epsilon invites end-users to participate in focus groups for evaluation and for giving their feedback only once during concept screening and once during prototype testing. For example, in the prototype testing phase end-users are invited to evaluate the product prototype and suggest modifications. Epsilon then makes changes to the prototype according to the end-users feedback; however, the new prototype is not tested again. Instead, if the NPD team is happy with it, the certification process begins and the product is ready to be launched into the market. In support, participant E1 highlighted:

> ‘We don’t invite them [a second time] because it takes a lot of time. They don’t have it and we don’t have it. It takes a lot of time in order to have the guys here and to organise the space, etc. and it takes energy and we don’t have it. And they don’t have it also because when they are here they don’t get money’

Nevertheless, irrespectively of end-user involvement being a time-consuming process, the participants stressed that it is necessary for developing successful and appropriate products.

Hence, the findings suggest that whereas Epsilon recognises the time commitments required for end-user involvement in NPD, it is less concerned with costs associated with this practice. This may happen because end-user involvement is considered necessary, and it is embedded in Epsilon’s typical NPD process. Therefore, Epsilon has already planned for allocating time and financial resources associated with end-user involvement in the NPD process, and this may explain why this is not perceived as a big concern.

5.5.6 Importance of End-user Involvement in NPD

As already discussed, Epsilon may involve end-users throughout the NPD process with more systematic and intensive engagement in the concept and prototype phases. However, end-users are involved only once in each of the NPD phases. This reinforces the suggestions and indications of participants that end-users are invited with the foremost purpose the validation of existing assumptions made by the NPD teams. Furthermore, it was suggested that whereas end users’ feedback and opinions are always taken under consideration, the final decision on product changes and modifications lies with the NPD managers. For example, participant E1 supported:

> ‘…we have the final prototype and we try to cover everything. And the final prototype has already given the response to the main customer needs. So, the modification we would do after that aren’t decided by the customers, but by our economic choice and industrial choice’

However, all participants stressed that end-user involvement is essential for solving disagreements regarding specific product characteristics and functions and for assisting the NPD managers in taking appropriate decisions that better fit the end users’ needs.

Within the same lines, the participants agreed that end-user involvement is very important for developing more successful and more appropriate products. In the words of participant E2:

> "If we don't make that [end-user involvement] we will have a product that nobody wants. And nobody will want to have the product because it doesn't fit their needs"

Another participant highlighted that although employees of Epsilon also test and use the products they develop, their opinion may not be as subjective as the end users' opinion. He suggested:

> "Because our products, we use them also. Every designer, every guy that works in the company also use it at home. So we think we are also customers but in reality we are not because we have a detailed overview of our products and so we need to go to people who actually buy the product and who don't know it at all" (E1)

Finally, the same participant suggested that in some cases, end-user involvement is very important for identifying product characteristics that otherwise would have passed unnoticed by the designers.

Hence, the findings show that Epsilon's NPD managers consider end-user involvement as very important for developing more appropriate, more detailed, as well as more successful products. Still, it should not be overlooked that Epsilon maintains a structured NPD process where end-users are engaged in specific NPD phases for specific reasons and managers are bound by regulations, budgets and predefined product characteristics.

5.5.7 End-users Roles and Experts

Until now, it has become apparent that in the case of Epsilon, end-users are invited to engage in the NPD process mainly for verification and validation of initial assumptions. In that sense, the interviews revealed that end-users are involved in providing answers to specific questions and for evaluating specific elements or functions of the products. In particular, installers are engaging for giving opinions for technical aspects, whereas consumers are invited to give feedback mainly on aesthetics aspects. In some few cases (e.g. the belt project –

see subsection 5.5.4.2), end-users may work more closely and actively with designers, but this is rather an unusual situation.

Overall, the findings show that end-users have a distant role and mainly act as a source of information for giving direction that leads to the development of more appropriate and perhaps successful products. This may be because the water heaters are by nature very standardised products and therefore more active and more direct end-user involvement in NPD may not contribute to a significant change on the end products.

5.5.8 End-users and Novelty

The standardised nature of water heaters also has an impact on the degree of novelty of the developed products. In this regard, the participants suggested that usually their work is associated with making modifications to already existing products. Hence, unless a new extraordinary regulation is introduced or a competitor has successfully introduced a new product in the market, it is not very often that Epsilon has to redesign a product from scratch. Consequently, when end-users get involved in the NPD, they are not expected nor required by Epsilon to provide very new solutions or ideas. Furthermore, one may assume that the structured NPD process followed by Epsilon may not allow novel ideas to flourish. Nevertheless, participant E2 suggested that when the focus is on complementary services (such as the special belt or a mobile application that the company is currently designing) and not on the water heater itself, end-users may come up with novel ideas.

Considering the above, it can be suggested that Epsilon is not concerned with developing highly innovative water heaters. Subsequently, the company does not put much effort into extracting novel ideas from its end-users. However, that does not necessarily mean that end-users are not capable of making novel suggestions.

5.5.9 Summary of Findings for Case Epsilon

End-user involvement in NPD became common practice for Epsilon approximately ten years ago. It initially started by inviting installers and more recently consumers to provide their suggestions and needs on the development of new products. The

NPD process is very structured with defined steps to be followed and end users' role is limited in mainly giving feedback and suggestions on specific (installers on technical and consumers on aesthetic) aspects of the products. Although end users may be involved throughout the NPD process, their involvement is more intense in the concept testing and prototype testing phases. Furthermore, perhaps due to the very standardised nature of the products (water heaters) end users are not expected nor required to provide innovative new solutions and suggestions. Still, the participants emphasised that end-user involvement is very important for developing more appropriate, more detailed, and more successful products.

Epsilon does not have specific strict criteria for selecting end users; although a self-evident requirement is to be either an installer of Epsilon's products or a consumer of water heaters. Mostly direct tools (focus groups, mock-ups, inspirational pictures) are employed for end-user involvement. Indirect (observations) and web-based (questionnaires) tools are not so frequent and appear to be complementary methods for end-user involvement. Whereas the most important benefit for involving end users in the NPD process is for being able to identify end users' needs, the most challenging aspect was reported to be the response of end users on the complexity of the products. In addition, Epsilon recognises the time commitments required for end-user involvement in NPD but is less concerned with costs associated with this practice. In the case of the square water heater project, Epsilon was able to implement the end users' suggested changes or to offer alternative solutions that would satisfy the end users' needs. In cases where Epsilon has not been able to implement end users' change requests, the most common reasons lie with regulations, budget constraints and impact on functionality.

5.6 Case Zeta

5.6.1 Phases for End-user Involvement

In idea generation, the first phase of NPD, the ideas for a new product come directly from distributors. Zeta does not meet any end-users during this phase. Rather, the distributors conduct market research (with or without direct end-user involvement) and then according to the results, they propose ideas for new products to Zeta and to other companies. As illustrated by participant Z1:

> "In fact, the distributor has a marketing service and this marketing service decide to have a new product on a certain line of products. It means that, they say: I want a product that is a copy of something that is sold in Spain; there is product that is working very well in Italy and we want to copy that; or we want a product with less salt."

Hence, in the idea generation phase, the end users' opinions are collected by the distributors and following that, through a product specifications document, communicated to Zeta. Next, during the concept development phase, Zeta works on bringing together and proposing to the distributor the best product offering while respecting the already defined product specifications. This happens in competition with other similar to Zeta companies. The company that provides the best product offering will be selected by the distributor to be the one to develop further and produce the product.

Once Zeta has the green light from the distributor, it will start developing a few different formulas or prototypes, in a term that is more technical. As already mentioned, the drying process can take up to three months. Hence, during the prototype development phase, a number of different prototypes will be developed. That way, Zeta minimises as much as possible the time taken to develop and to test the prototypes. During the prototype testing, it is typically the first time that end-users get involved in the NPD process. Zeta collects end users' opinions and feedback and according to these, develops the final version of the product. This will then may be tested one more time with the end-users before it is launched into the market. Moreover, even after the launch of the product into the market and within a specific time frame, Zeta has the possibility to change the recipe. Hence, sometimes end-users get involved in testing and accessing a product even if it is already in the market. Participant Z1 asserted:

> "We can change the recipe after the first launching. Because we have the obligation to do several panels after the launching. So, sometimes, the launching is not the end of the NPD process."

Testing the product after it is launched into the market is very important for Zeta. One of the main reasons is because they aim for the drying duration to be as less as possible. As participant Z2 explained:

> "Because the duration of the drying of the product has a big impact on the quantity of the product. It means that the less dry the product is,

> the more product you have. So, with the same cost we can sell more products if the product is less dry. So, it could be some kind of temptation to have a product that is a little less dry."

To summarise, in the vast majority of the cases, distributors will be the ones to initiate the process of developing a new product. Zeta will always involve end-users to test and give feedback during the prototype-testing phase of the NPD process. Apart from that, there is the possibility for end users to be invited two more times: (i) in the pre-launch phase for testing the product one more time before it gets launched into the market, and ii) in the post-launch phase when Zeta may want to test small modifications made on the product. Figure 5.6 summarises the typical NPD for Zeta and shows when end-users may get involved in the process.

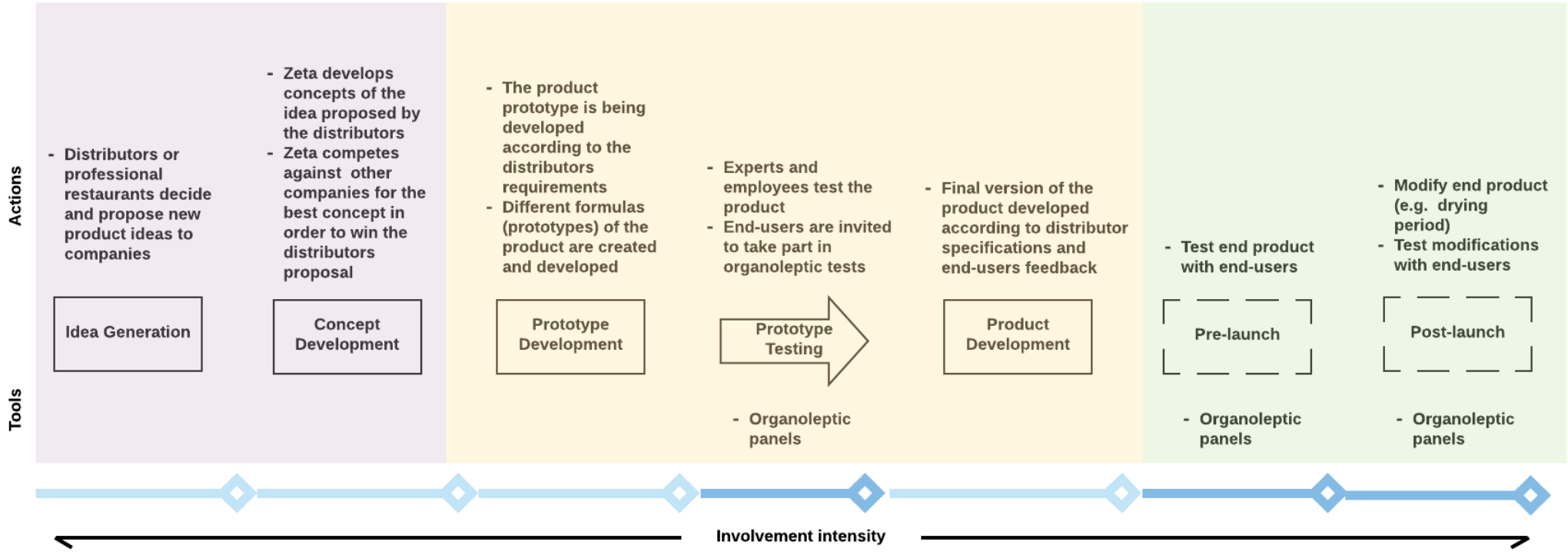

Figure 5.6 Zeta's typical NPD process

5.6.2 Tools for End-user Involvement

The primary tool Zeta is using to involve end-users into the NPD process is evaluation panels. These can be distinguished into two types. First, is an 'informal' type of evaluation panel that people from food-related schools (e.g. food engineering, culinary school) are invited to participate. This is a low-cost but at the same less rigorous type of panel, and it is used when Zeta wants to gather quick opinions about a product. The second and most frequently used type of evaluation panel is evaluation panels organised and managed by the distributor. Whereas Zeta provides the prototypes to be tested, the whole process including an invitation to end users is managed by the distributor. However, there are sometimes projects where Zeta can be more autonomous and therefore responsible for organising and managing the evaluation panels. However, in this case, Zeta outsources the management of the evaluation panels to specialised companies. As the participants explained, managing evaluation panels and in particular organoleptic tests is a complicated process.

Hence, these specialised companies are responsible for inviting end-users and for running and managing the evaluation sessions. The evaluation sessions may include up to approximately 100 end-users and are focused on the organoleptic quality of the product (with taste and colour being the most important elements), and also on health issues (e.g. salt or fat percentage). More importantly, while end-users taste the product, they should remain unbiased. In this sense, any communication with others, including people from Zeta is strictly restricted. Hence, during the evaluation sessions, people from Zeta are not present. More specifically, each end-user is placed individually in a dedicated space for running evaluation sessions and organoleptic tests:

> "The companies that run these panels they have special spaces (rooms) and also spaces divided in very small boxes. The atmosphere is kind, you can have music and so on. But you are not supposed to hear anyone talking and then you receive the product and sometimes even you can't look at the product you are testing. So, there is a very strict protocol." (Z1)

Apart from evaluation panels, there is one more method that end-users may be obliquely involved in the NPD process. This is when Zeta develops and distributes questionnaires to distributors. However, instead of end-users, it is the distributors who fill in the questionnaires according to the feedback they get from consumers and to the performance of the product in the market.

> "We regularly run studies with questionnaires, but these questionnaires are sent to the distributor and it is the distributors answering the questions, taking in to account its own return from the consumers. So, it's always an indirect contact between Zeta and the end-users."

From all the above, it can be seen that Zeta rarely comes into direct contact with end-users. It is rather the distributors of the industry or specialised research companies who organise, manage, and collect end-user involvement and its outputs. Table 5.17 provides an overview of the tools Zeta employs to involve end-users in the NPD process.

Table 5.17 Overview of Zeta's tools for end-user involvement in each NPD phase

NPD Phase	Tools for end-user involvement	Characteristics
Idea generation	-	-
Concept development	-	-
Prototype development	-	-
Prototype testing	– Evaluation panels for organoleptic tests	Indirect
Product Development	-	-
Pre-launch	– Evaluation panels for organoleptic tests	Indirect

5.6.3 End-user Selection Characteristics

Since the evaluation panels are solely organised and managed by distributors or specialised research companies, the end-user selection happens by them. More specifically, the specialised companies have databases of end-users that they invite to participate in the evaluation sessions. These end-users are frequently invited to participate in this kind of research, and therefore they have acquired a lot of experience. For example, they are able to distinguish between kinds of meat or to compare the products' colour. In some cases, they have even developed some expertise in specific products (e.g. specialised in chorizo testing). However,

the participants commented that at times, it may be hard to find end-users that are specialised in specific products.

5.6.4 Chorizo Sticks Project

The previous subsections showed the typical NPD process Zeta follows as well as the typical ways end users' get involved in it. Between these lines, it was discussed how distributors are the ones to define and initiate the process of developing new products. With the in-house chorizo sticks project, however, Zeta took a very different approach to NPD. Chorizo sticks are thin chorizo sausages mainly targeted for the snacking and bars markets. This project was an attempt for Zeta to become less reliant on the volume-focused distributors and to eventually start building its own brand. Because it was an in-house development and therefore was followed by high levels of risk, end-user input was considered very important. The next subsections will discuss the NPD process of the project, end users' input and impact on the end product, as well as the practices followed for end-user selection and integration in the NPD process.

5.6.4.1 NPD Process

The chorizo sticks project was initiated by Zeta when the company identified the opportunity in offering a different and novel (for the French market) snack product. The idea for this product category came from a board of directors' meeting while discussing the strategic direction of Zeta. The next step was a visit of managers in a local university and collaboration with students for creating different concepts of the snack idea. Approximately twelve main concepts were developed, including the chorizo sticks, which was inspired by the popular Mikado snack (see Appendix IX). Following that, and during a meeting in Zeta premises, the managers chose to take under further development of the chorizo sticks concept. Once this decision was taken, the prototype development started. Zeta created a number of prototypes and after consultation by people from a local food engineering school, a small number of final prototypes were created. These prototypes were tested in organoleptic tests. Next, samples of the final prototype were offered to people in local bars. Zeta also had the opportunity to present the chorizo sticks in a famous French food trade show and to win the innovation prize. Before going to a national launch, the product was tested in the market. More

specifically, it was launched in a local supermarket chain and samples were provided to customers. However, the feedback was not favourable with the main issue being the appearance of the product. Consequently, Zeta decided to return to the prototype development phase and to redesign the product. After modification in the recipe, shape, and packaging, another final prototype was created. Surprisingly, this was evaluated by end-users through organoleptic test sessions only. In addition, Zeta decided to launch in supermarkets only and not in bars because it was not feasible to supply small quantities of the product. Hence, the second generation of the chorizo sticks was launched into the market and according to the participants, it is going well in terms of consumers' acceptance. Table 5.18 shows all the NPD phases for the chorizo sticks project.

Table 5.18 Summary of activities that took place during the NPD of the chorizo sticks project

Phase	Activity	Outcome
Idea generation	– Board of directors decides for a new product in the snacking market	A general idea of a snack that could sell through supermarkets as well as bars
Concept design	– Brainstorming session with managers and employees, and university students	12 concepts were proposed (e.g. assembly your own snack, Mikado as an analogy to chorizo sticks)
Concept screening	– Zeta internally assess the different concepts	Chorizo Sticks' selected to move to the next NPD phase
Prototype development	– Prototypes developed in-house and with the consultation of food engineering school – Development of new equipment to meet the needs of new product	Final prototype
Prototype testing	– Evaluation panels for organoleptic test – Prototype tested in bars	– Prototype tuned according to feedback – Final product
Pre-launch	– The product presented in trade show	Innovation prize at international trade
Market test	– The product launched in local supermarket chain	End-user feedback not favourable
(second) Prototype development	– Redesign of the product	Modified prototype
(second) Prototype testing	– Evaluation panels for organoleptic test	Final product
Post-launch	– Product to be tested for improvement	In progress

From the above, it can be seen that for the chorizo sticks project Zeta followed a different from its typical approach to NPD. First, end-users were involved earlier and more frequently in the NPD process. In addition to evaluation sessions at the prototype development phase, end-users were also involved in the concept phase as well as in the market test phase. Second, apart from the traditional (and necessary) evaluation panels with end-users, Zeta employed other tools for end-user involvement and engagement. These included a brainstorming session and testing of the product in bars and supermarkets. Third, different types of end-users were invited to give their opinion and test the product. More specifically, students from the local university acted as end-users and proposed a number of different concepts. In addition, for testing the taste and overall characteristics of the product, Zeta targeted supermarket consumers as well as people in bars. Hence, the differences are mainly identified in the selection methods, tools, and frequency of end-user involvement in the NPD process. However, when the product was redesigned, Zeta followed its typical NPD practises and only employed organoleptic tests for testing the prototype.

5.6.4.2 Change Requests from End-users

As seen from the discussion on the previous subsection, end-user involvement during the chorizo sticks development process was limited. Consequently, there were not many change requests from end users. In the concept design phase, Zeta chose to follow the chorizo sticks idea that was an outcome of brainstorming sessions between Zeta's employees and end-users (university students). In the prototype testing and the organoleptic tests, end-users had a number of prototypes to taste and evaluate, and to eventually select the best one of the given options. When the product was tested in the bars, end-users seemed to be happy with it. However, when the product was tested in a supermarket, the feedback from end-users was very discouraging:

> 'This prototype gets the innovation prize at the Paris food fair trade. And then we start to sell the product in the supermarket, and It was terrible because people said 'okay, it looks like a pet food.'' (Z2)

When participants were asked why they feel the product received such different reviews, they emphasised the difference in the settings of the selling/exhibiting points. Participant Z1 said:

> “But the problem appeared when there was a test in a supermarket. And then you are not in a bar drinking with your friends, you are in front of a range of products and you say ‘hey, what’s that kind of product?’. And then people take the packaging and they saw ‘oh it’s strange’. So, in bars, the most frequent feedback was on taste and the contact because they were talking about the fact that there was no fat on the fingers while eating it.”

Hence, it is interesting to note that one reason contributing to the failure of the first generation of the product may be that the product was tested on the wrong segment. Nevertheless, Zeta decided to listen to its end users’ feedback and totally redesign the chorizo sticks. As participant Z1 explained:

> “The first prototype we tested, people said that, it’s very good, it’s nice when you eat it, but the first contact with the product, the first time you see the product they consider it just like pet food. So, on an aesthetic point of view, the first aspect of the product, it didn’t fit at all. So, we had to go back and change totally the recipe and it is very important because it is not only a question of taste. It is also a question of visual aspect.”

One suggestion that came from end-users for improving the aesthetic as well as the taste of the product was to cover the sticks with a paste. Zeta followed this idea for a while and attempted to create what was proposed by the end-users. However, after some tests, it was decided that it would not be possible to create and launch this kind of chorizo stick. Apart from that, during the second prototype development phase, Zeta did not offer much opportunity to generate potential end users’ suggestions. Zeta instead followed its typical NPD process and only involved end-users for testing and evaluating the already developed prototypes. However, this is an interesting and peculiar point considering that the end-users in the supermarkets had suggested for changes to be made in the visual aspect of the product (not in the taste). In support, in some of the interviews, it was suggested that if end-users were invited to participate more frequently in the NPD process, some of the characteristics of the end-product may have been different. For example, participant Z2 mentioned:

> ‘At the very beginnings the concept and the vision of the product was the Mikado. And so I said let's call it I don't know, xxx or something, a name that sounds like Japan and they looked at me and say: but we don't understand, the communication company said it is XX [name of the product] so it's a good idea, so it's XX [name of the product]. And

> sometimes I would think it could be very interesting to test different names, different packaging...'

Hence, from the above, it can be seen that Zeta does not receive many change requests from end-users. This happens for two reasons. First, in the prototype-testing phase, end-users are given a number of different prototypes to test and choose from. Therefore, there is not much space for them to give a new suggestion that Zeta has not already come up with. Second, even in the chorizo sticks project end-user involvement in the process of developing the product was minimal, at times miss-targeted, and somewhat superficial. Perhaps this is due to the inexperience of Zeta in managing and working with end-users. In the next subsection, when discussing the challenges of end-user involvement in NPD, the inexperience and uncertainty the participants feel when interacting with end-users will become more apparent. Finally, as it was seen, Zeta is open in spending resources for testing end-users change requests. The main reason for not implementing the requested changes was discussed to be the impact it would have on the functionality of the product.

5.6.5 Benefits and Challenges of End-user Involvement in NPD

5.6.5.1 Benefits of End-user Involvement

The respondents outlined a number of benefits related to end-user involvement in NPD; these have been summarised in Appendix X – Case Zeta. As participants discussed, the main reason for inviting end-users to participate in the NPD process is for ***reducing the uncertainty of product design*****s**. In every project, Zeta always invites end-users to test and evaluate a product's prototypes. This happens in order to validate the decisions Zeta has made regarding the product characteristics (taste, aesthetics, etc.) and to avoid potential mistakes. Sometimes, this can also lead to ***reconsidering the company's product offerings***, even if that means modifying traditional recipes. In fact, whereas Zeta is targeting in selling their offerings to young people (mainly millennials), most of the people in management positions are in a senior age and different generation than the targeted consumers. Therefore, opinions and feedback from end-users are very important for evaluating and reconsidering Zeta's current products and practices. In turn, this leads to another benefit outlined by participants and is related to the opportunity of ***identifying new markets***. The participants

discussed that by listening to end-users as well as by observing their reactions during the evaluation sessions may provide ideas for new product offerings. To support that, one participant asserted that Zeta is now considering to develop 'healthier' products and products that can consumers can cook.

The participants also recognised that end-user involvement in NPD could assist them in ***identifying end-users needs***. However, no participants considered that as a crucial reason for working with and asking for end users' opinions. This may be because Zeta is developing and offering very specific products (cold meats) with little opportunity for extreme variation. Consequently, the end-user needs are mostly defined and are not expected to change. Another reason may be that for the time being Zeta is not very experienced in integrating end-users in NPD through other ways than the evaluation sessions. Thus, one may consider that Zeta's current techniques are mainly focusing on validating product characteristics rather than encouraging the identification of new needs. In this regard, one of the participants expressed the opinion that there is hardly any new needs to identify.

Nevertheless, all participants agreed that one of the most important benefits of end-user involvement in NPD is that it ***increases the employees' motivation and confidence in a project***. It is rather logical that this was principally evident in the case of the chorizo sticks project. For it should be considered that it was Zeta's first attempt in developing a solely in-house product, and in particular, a highly innovative product. Therefore, because it was a high-risk project the sensibility to end users' opinions was much higher than with other products. In addition, the interest and motivation of employees working on the chorizo sticks project was increased. As participant Z1 explained:

> 'It's the first time an employee from production, comes early in the morning, knocks at the door and says: 'what about the chorizo sticks? How is it evolving the project?' For the first time people inside the company are interested in knowing, having information about the evolution of a project; that was a very first time!'

Therefore, end-user involvement was discussed as primary driver for increasing employee confidence and motivation on working on the chorizo sticks project.

Finally, the participants outlined how end-user involvement in NPD can increase the ***number as well as the degree of novelty of new ideas***. However, it was mutually stressed among all participants that a high number of proposed ideas coming from end-users it is not helpful nor beneficial for a project. It was suggested that for having the best outcomes, the process of generating new ideas with end-users (e.g. in brainstorming sessions) should be managed closely by Zeta. The drawbacks of having too many ideas from end-users will be discussed in the following section regarding the challenges of end users in NPD.

Overall, the above findings show that in the case of Zeta, end-user involvement in NPD is identified to be very beneficial for reducing the uncertainty of product designs as well as for reconsidering current product offerings. Identification of end users' needs was recognised as a less important and less direct benefit. In addition, participants discussed enthusiastically how end-user involvement in NPD has contributed to increasing employees' motivation and confidence in the project. Besides, whereas participants outlined that end-users may provide novel ideas, there were favourable but at the same time cautious views about the increase of the number of ideas coming from end-users. The next subsection will provide findings regarding participants' views on the challenges of end-user involvement in NPD.

5.6.5.2 Challenges of End-user Involvement

When during the interviews the participants were asked about the challenges of end-user involvement in NPD a number of concerns were uncovered (see Appendix X – Case Zeta). One of the most significant challenges that emerged from the data is related to managers and employees of Zeta having difficulties in ***accepting end users' opinion and feedback***. It was explained that especially for the more senior employees because they have years of experience and they have worked in a high number of projects during the years, they are extremely specialised in what they do. Consequently, it is hard sometimes for them to accept feedback from end-users that contradicts their assumptions of a product. Although Zeta promotes a culture that end users' opinions are genuine and very important, the participants explained that it sometimes takes time and communication effort to help employees listen and accept the end-users' voice.

Another challenge that was strongly discussed during the interviews it is concerned about the ***high number of ideas*** provided by the end-users. Whereas participants felt that having ideas coming from end-users is beneficial during the NPD process, having to deal with a very high number of ideas was perceived as a great challenge. In particular, all participants expressed the opinion that having too many ideas is neither desirable, not efficient. Participant Z2 strongly supported that having to work with a high number of ideas is rather challenging. He further suggested that it could be more useful to have end-users rank existing ideas. In the same line, the other two participants suggested that a better organised and better-managed process is required when collecting end users' ideas during the concept development phase.

The next two challenges outlined during the interviews were opinions suggested individually by the two participants. Participant Z2 expressed the opinion that it is very important to consider when is the ***best period to involve end-users*** *in the NPD process*. In particular, the season of the year and the time of the day should be taken under consideration when organising sessions to test the products with the end-users. This is because some products are popular in certain seasons, and because of the nature of the product (being something that people have to eat). Finally, participant Z1 outlined how it sometimes may be challenging to ***find enough appropriate end-users*** to engage in the NPD process.

In conclusion, the findings show that Zeta is mostly concerned with challenges of end-user involvement in NPD related to accepting end users' opinion and feedback and having high number of ideas. In addition, challenges regarding when to involve end-users in the NPD process and regarding finding enough end-users to participate were also identified. The next subsection will discuss the participants' opinions on the implications of end-user involvement on NPD costs and on NPD time.

5.6.5.3 NPD Cost and NPD Time

Unless directly asked, no participants spent time discussing cost and time concerns related to end-user involvement in NPD. Although they recognised that end-user, involvement in NPD may be time-consuming and costly, they did not seem to have

great concerns regarding this. In particular, when participant Z1 was asked if involving end-users increases NPD costs, he responded:

> "…perhaps yes there is a cost, because you have to pay for the panel, for the outcome of the panel. But on the other side, in time, you will make less mistakes."

Likewise, participant Z2 outlined:

> "I don't know. I really don't know. Because, cost is increasing is… uh but… uh… You have less problems… It could be interesting to study this aspect."

The responses regarding NPD time were in a similar tone:

> "The whole process of arranging for the panel getting the results, etc. it's highly time consuming." (Z2)

The findings illustrate that Zeta recognises the time and financial resources required for end-user involvement in NPD. However, it is not a critical concern for the company. This may happen for two reasons. First, when following a typical NPD process, according to agreement Zeta has with the distributor, it is obligatory to involve end-users for testing and evaluating the product under development. Therefore, it is already part of the NPD to involve end-users. Second, it is worth remembering that the chorizo sticks project is the first attempt of Zeta to involve end-users more frequently in the NPD process. From the interviews, it was revealed that Zeta pays more attention to how (tools and NPD phase) to improve the end-user involvement rather on how to save on resources. In support, when during the interviews the researcher implied that due to time and budget constraints end-users were not invited for more frequent participation in the development process of the chorizo sticks, the participants denied it.

5.6.6 Importance of End-user Involvement in NPD

The food industry in France is highly controlled by distributors. At the same time, recipes and ideas (e.g. cut style of a sausage) cannot be protected by patents, trade secrets, or any other mechanisms. As participant Z2 explained:

> 'For example, this is something very low level of innovation, but Zeta was the first to sell slices of chorizo, very thin slices. We sell it one

> week and about one month after there was a lot of people using the same. Just because the distributors get to call on the other companies and say: you know Zeta's product? Yes. Do the same. And this person [distributor] put every possible supplier in competition immediately.'

That means that if Zeta successfully introduces something new into the market, other companies will immediately copy that and therefore, it would not offer much in terms of competitive advantage. Consequently, Zeta (and similar companies) does not put too much effort into involving end-users for the development of a product. Nevertheless, end users' opinions are still considered very important. Participant Z2 outlined:

> "The integration of the customer is very important; in the process of developing the product, testing, choosing the right recipe."

However, the case of the chorizo sticks project was different because it was the first attempt of Zeta to become more independent. For this project, the end user's opinions were very important because this product did not come from a distributor's order. The chorizo sticks project was a highly innovative in-house project and therefore entailed very high risks for Zeta. Participant Z1 outlined:

> "In this case [chorizo sticks project], if you don't respond to the need, if you don't have the perfect product, you strictly said nothing. It's either nothing or it works. So, in all the cases but in this case particularly, the information you get from end-users is very important."

Surprisingly, there is also another aspect that participants emphasised which amplified the importance of end-user involvement. That is, the change of culture that started happening within Zeta. One participant explained that the people in the production department are not very convinced that end-user involvement can be more helpful and valuable than the opinions of the people inside the company. However, with the chorizo sticks project, this perception has started changing, and people becoming more open into the feedback and opinions acquired by end-users. In turn, this contact with the end-users has helped Zeta to open up in pursuing new product ideas. As participant Z2 outlined:

> 'The contact with the end user has helped a lot. Today at Zeta they say OK we are doing chorizo, but we can do anything that is complementary to chorizo. So that was not the case a few years ago and I think it's thanks to the end user involvement that this change has been added in the strategy and the basic vision of their product.'

Hence, whereas traditionally end-user involvement was very important in testing and evaluating the product-prototypes after the chorizo sticks project the culture inside Zeta has been slowly changing. Zeta and its people are now appreciating more the input of end-users and are becoming more interested in integrating them more frequently and more appropriately throughout the NPD process.

5.6.7 End-users Roles and Experts

In the chorizo sticks project, end-users were invited to suggest concept ideas and to test the product in bars and supermarkets. However, traditionally, end-users mainly get invited to offer their opinion during the prototype testing phase. Their feedback and evaluation of the prototypes are necessary for selecting the final product that will be launched in the market. Nevertheless, the testing and evaluation of prototypes is a rigorous process. When testing a prototype, the end-users must remain in specially designed individual rooms where they will be free of any distractions (such as other people or other smells). This means that end-users interactions with the research company and especially with people from Zeta is kept into a minimum level. As participant Z1 explained, this happens because Zeta does not want end user's opinions on the product to be influenced or affected by their environment. In his words:

> "Because you know, if I ask you to taste this tea for example, you may say 'yes it's nice, it's a little spicy, etc' but someone else in the same room may say 'oh this is the best tea I have ever tasted, and sweet'. Now if you test it a second time, you most likely will say 'oh yeah, it's sweet' but a few minutes before you said it was spicy. So, this demonstrates that the influence between people with each other is very high. So, we have the people testing the products one by one."

In addition, because some end-users are invited frequently, some of them have become experts in testing particular products.

> "So, people that test the products, they have a lot of experience. So, they are able to distinguish some kinds of meat, they have the experience of comparing the colours of products, etc. so they are highly experienced." (Z1)

There are also times that the employees of Zeta are taking the roles of end-users, and they test the products themselves. Participant Z1 outlined:

> ‘We test the product inside the company. So, we produce a little quantity and ask the employees to test the product. And sometimes when there is a safety meeting for example, and at the end, we take benefit of the fact that the people are all together to test new products inside the company.’

In a similar way as with the end-users, through long experience of testing the products, some employees of the company are becoming highly skilled in testing specific kinds of products.

Overall, the findings show that in general, Zeta rarely has direct interaction with its end-users. The only exemption is the chorizo sticks project where end-users had the chance to suggest concept ideas and to test the product in a less than the usual conservative setting. However, Zeta has not provided the chance to end-users to take an active role during the NPD process; instead the involvement activities were designed to extract specific information by the end-users. It is also interesting to see that employees of the company may act as end-users and that long experience in testing products has made both employees and end-users to become experts in specific domains.

5.6.8 End-users and Novelty

Although participants supported that end-users can come up with novel ideas, the nature of the food industry does not favour the development of highly innovative new products. Participant Z2 explained:

> ‘If you want to be the first on the market you have to get the agreement of the distributor; what we call a reference. It means that the central distributor will say okay, you are allowed to try to sell your product to supermarkets. So, you have to get this agreement is very important. But once you get this agreement, immediately the distributor will call other producers and say oh guys please develop this product. And he will give your product specifications to whoever wants it.’

Consequently, apart from the high risk in developing a highly innovative product, the innovation cannot be protected and therefore is of low value to the company. Therefore, innovation in the food sector in France is mainly happening through incremental changes to products (e.g. colour or shape). As one participant suggested, companies are concerned more with process rather than product innovation. Hence, the findings show that because of the particularity of the food

sector in France, Zeta is more open to investing resources in developing innovative process solutions than in developing innovative products. Whereas in the opinion of the participants, end users may suggest novel ideas, the question lies into how useful these ideas would be for the growth of Zeta.

5.6.9 Summary of Findings for Case Zeta

The food sector in France is mainly controlled by distributors and therefore is very particular with implications on decisions for new products, frequency of end-user involvement, and degree of novelty of products. The chorizo sticks project was the first in-house project for Zeta and the first project that the company chose to involve end users throughout the NPD process. Hence, Zeta is not very experienced with organising and managing end-user involvement. Traditionally, end-users get involved only in the prototype-testing phase with the aim to provide feedback to specific questions. However, in the chorizo sticks project, end-users were also involved in the concept development phase by assisting in brainstorming product ideas as well as in the market test phase by trying the product and giving feedback. However, all final decisions on what the product should look and function like are taken by managers and the end users' role is still limited and perceived as important mostly for validating Zeta's decisions.

Whereas end users are selected randomly by Zeta or selected by specialised research companies, employees of Zeta may frequently act as end-users and test the products. Additionally, Zeta prefers to invite end-users who through experience in testing specific kinds of food (e.g. chorizo) have become highly specialised. Zeta traditionally uses indirect methods for involving the end-users. In the chorizo project, more direct methods were used but were limited to organising testing sessions in bars and supermarkets. Some of the requests from end-users for changes on the chorizo sticks were pursued; however, implications in the functionality of the product was the main reason for Zeta not implementing any changes. It is important to note that the first generation of the chorizo sticks project was a failure and interestingly, Zeta decided to re-develop the product following the traditional NPD process. Driven by this experience, the participants recognised that the main challenges for end-user involvement in NPD are accepting end users' opinion and feedback and having a high number of ideas to deal with. Nevertheless, benefits of end-user involvement in NPD process were

also emphasised and included reducing the uncertainty of product designs; reconsidering current product offerings; and increasing employees' motivation and confidence in the project. Interestingly, after the chorizo sticks project the culture inside Zeta has been slowly changing towards appreciating more the input of end users and becoming interested in integrating end users more frequently and more appropriately throughout the NPD process.

5.7 Chapter Summary

This chapter provided the within-case analysis and findings for each one of the six case studies. This allowed for in-depth investigation and familiarity with each case company. Following the main constructs of the conceptual research framework (presented in subsection 2.7) and while keeping flexibility and openness for new constructs to arise, the empirical data of each case were analysed, and the main findings emerged. Through a cross-case analysis and discussion, the next chapter will discuss similarities and differences related to the end-user involvement practices and outcomes among the cases.

Chapter 6: Cross-case Synthesis and Discussion

After presenting the findings from the within-case analysis and producing the detailed case reports in the previous chapter (Chapter 5), this chapter presents the findings of the cross-case analysis. As already discussed in subsection 4.4.2, cross-case analysis allows for building a general explanation that fit each case. Hence, the cross-case analysis brings together key issues and insight derived from the six case studies and aims to develop a more comprehensive and holistic understanding on why and how end users get involved in the NPD process as well as the impact this involvement has on the ready-to-launch product. Under each part of the cross-case analysis, theoretical discussions are provided. In doing so, the key themes which emerged from the findings are linked and discussed against the existing theoretical perspectives which were presented in Chapter 3.

This chapter starts with discussing the context of the case studies and how it has affected the findings. Then the six case studies are discussed and classified against the three approaches to end-user involvement in NPD. Following that, sections 6.4 and 6.5 present the findings regarding the benefits and challenges of the three approaches. Section 6.6 offers a discussion on the relationship between end-user involvement and company resources (budget and time). The next section presents the findings on when and how end users get involved in the three approaches. Section 6.8 illustrates how end users may impact specific NPD phases as well as the end product. After that, in section 6.9, all the evidence is gathered together, and the main findings of the study are presented. Finally, section 6.10 summarises the chapter.

6.1 Context of Cases

The companies that served as cases in this study have some differences including industry, size, company culture regarding openness in sharing and receiving information and experience with end-user involvement (see Table 6.1 for a summary). These differences in the context and the characteristics of each case may have an impact on end-user involvement in NPD.

When developing the case study design and selection, the main focus was on conducting cases which covered all different approaches (OI, PD, and IA) to end-

user involvement in NPD (see section 4.3). To achieve that and while assuming that companies associated with the development of consumer products would follow similar NPD processes, the researcher selected companies which operated in different industries. The results show that irrespectively of the industry, all studied companies follow similar NPD processes which are equally capable of initiating and facilitating end-user involvement. However, in the case of Alpha, Delta, Epsilon, and Zeta, end-user involvement in some NPD phases may be restricted due to policies and regulations that need to be followed when working on a specific project. For example, due to regulations (e.g. data protection policies restrict hospitals of using Wi-Fi technology), Alpha was not able to implement some changes requested by the end users. Similarly, when developing new water heaters, Epsilon has to follow guidelines and meet policies following European Union agreements. As a result, although similar NPD processes have been followed across the six cases, the highly regulated nature of some industries and the restrictions these regulations pose on some NPD projects, may have an impact on end-user involvement and their potential contributions to NPD process.

Table 6.1 Companies' characteristics

	Industry	**Size**	**Operation Country**	**Culture of sharing and receiving information**	**Experience with end users**
Alpha	Engineering/NPD consultant	Medium	UK	Open	>5 years
Beta	Publishing	Large	Russia & Greece	Towards open	>10 years
Gamma	Textile	Small	UK	Open	5 years (since Gamma was founded)
Delta	Food (medical)	Small (micro)	UK	Open	First project
Epsilon	Heating systems	Large	France	Towards closed	7 years
Zeta	Food	Medium	France	Closed	First project

Regarding the size of the companies, it was expected that because large companies have more structured NPD processes and more financial and operational resources (Gray and Mabey, 2005; Nicholas et al., 2011), they will be utilising end-user involvement more frequently and in a higher degree than medium or small-sized companies (Ledwith, 2000: 141-142). Differently, Lagrosen (2005: 430) has suggested that there is no relation between the level of end-user

involvement and the size of the company. However, the results of this study revealed that smaller companies (Alpha, Gamma and Delta) promote a more collaborative 'company culture'[6] (in contrast to larger companies -Beta, Epsilon and Zeta) which makes them more open in working closely with end users and keener in listening to and implementing end users' suggestions (see Chapter 5). This conduct may also be related to the country of operation of each company. As can be seen in Table 6.1, the three companies based in the UK (Alpha, Gamma, and Delta) and Beta which is based in Russia, promote a more open company culture. In contrast, the French companies (Epsilon and Zeta) prefer to work within their own boundaries, in a more closed environment. A case in point to illustrate that is the resistance of Zeta's NPD managers and team in accepting end users' suggestions and requests. Nevertheless, this result supports previous work who suggest that most companies and practitioners do not know how or are not concerned with building and implementing an effective and favourable to NPD 'company culture' (Kahn et al., 2012; Nicholas et al., 2011). Therefore, company culture is a 'dangerously weak' aspect of NPD management in most companies (Cooper et al., 2004: 39).

Finally, the experience each company has with involving end users in the NPD process does not seem to affect the level and the outcomes of the involvement. Whereas most of the companies have been involving end users for more than five years, for Delta and Zeta, the project under investigation was their first attempt in closely working with end users. Coincidentally, Delta and Zeta are both operating in the food industry, although for a different purpose and different market segment (Delta is concerned with medical food). However, the two companies have been taken a completely different approach in involving end users in their NPD process and with varying levels of success. Therefore, it would not be accurate to assume that a company's level of experience of involving end users has a significant effect on the NPD process and the outcomes of the involvement.

[6] In this study it is deemed most relevant and appropriate to adhere to the work of Khan et al. (2012: 186) who define 'company culture' as "the company management value system driving those means and ways that underlie and establish product development thinking and product development collaboration with external partners, including customers and suppliers."

6.2 Classification of Cases

In the previous chapter, it was found that the six cases have been following different approaches for involving end users in the NPD process. In order to be able to classify how companies perceive end-user involvement, the discussion during the interviews was often occupied with issues such as the importance of end-user involvement in NPD, the role they may have and the number of times they are invited to participate during the NPD process. Building on the classification developed in subsection 3.2.2 the findings from this discussion allowed the researcher to conclude on the classification illustrated in Figure 6.1.

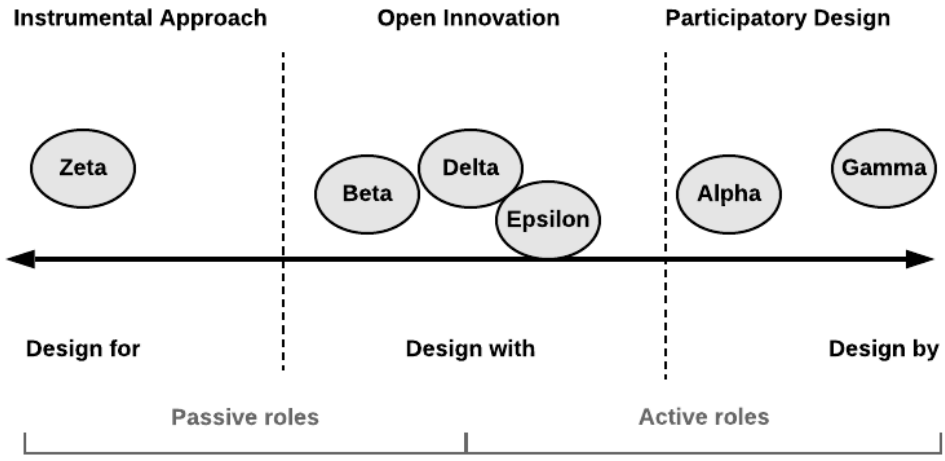

Figure 6.1 Classification of the six case companies against the end-user involvement continuum

Although with the chorizo project Zeta has attempted to involve end users in the NPD process more actively, it seems to be close to the 'design for' category and the instrumental approach. End users were asked about their opinion on the product, but they had a rather passive role throughout the NPD process. Instead, it was the NPD team who made all the decisions and in cases acted as experts, ignoring end users' input (e.g. although end users raised issues related to the shape of the product, during the product re-design end users were only involved in organoleptic tests).

On the other extreme of the continuum, 'design by', Alpha and Gamma have been closely collaborating with and involving their end users in the NPD process. More specifically, Alpha made sure to actively involve end users from the beginning to the end of the NPD process. Although at the boundaries of 'design with' and

'design by', the close collaboration of Alpha with end users especially during the prototype phases positions it closer to a participatory design approach and therefore fall into the 'design by' category. Due to its customer-centred business model and ethical principles, Gamma perfectly fits the participatory design philosophy and the 'design by' category. This is evident in the involvement of lead users who were actively engaged in the design and development of products and equal members of Gamma's NPD team.

The rest of the cases (Beta, Delta, and Epsilon) fall into the 'design with' category and the open innovation approach. In all these cases end users were involved mainly for validating solution as these had been suggested by the NPD teams. Epsilon, however, made some attempts in more actively involving end users in some NPD phases by collecting and implementing end users' ideas. It could, therefore, be noted that comparing to Beta and Delta, Epsilon is closer to the 'design by' category. Also, it is possible that if Delta was not restricted by regulations then end users would be more actively involved in the NPD process.

Overall, the above observations help in categorising the six case studies according to the discussions in the literature and the classification developed in Chapter 2. As it can be seen in Figure 6.1, most companies fall in the middle of the continuum or more towards the extreme end of the continuum. However, it is interesting and important to stress that no case study could absolutely fit the holistic overview of IA, OI, or PD approaches (subsection 2.7) and no case could be classified as a purely 'design for', 'design with', or 'design by' practice. Therefore, the end-user involvement continuum may serve as a more appropriate framework when discussing the different roles and levels of end-user involvement in NPD.

6.3 Benefits of End-user Involvement in NPD

The following subsections present and discuss the six different sets of benefits which are related to the benefits end-user involvement brings during the NPD process. These are summarised in Table 6.2 below.

Table 6.2 Benefits of end-user involvement across the six cases

Benefits		Alpha	Beta	Gamma	Delta	Epsilon	Zeta
End user	Needs identification	x	x	x	x	x	x
	Increase end-user engagement/adoption	x	x		x		
	Help end-users to acquire skills			x			
Planning	Better insight into product requirements		x			x	
	Prioritise product requirements	x				x	
	Better overview of the project					x	
	Reconsider own strategy/product offerings						x
Financial	Increased profitability		x				
	Identification of new markets	x				x	x
	Identification of new segments		x				
Risk	Reduced uncertainty of product designs (and avoid mistakes)		x	x	x	x	x
	Increase success rate		x		x	x	
Ideas generated	Increase the number of ideas	x	x		x	x	x
	Increase the novelty of ideas	x		x			x
Company	Knowledge gained	x		x			
	Increase motivation/confidence in project				x	x	x
	Contributing to solving disagreements within NPD team					x	

6.3.1 End User Related Benefits

The first set of benefits is related to end users. All cases -Alpha, Beta, Gamma, Delta, Epsilon, and Zeta- reported benefits that are directly related to end users. ***Needs identification*** through collaborating and working closely with end users was a benefit that was emphasised across all case companies. More specifically, Alpha, Gamma, and Epsilon supported that end-user involvement helps to understand what exactly end users may expect from the product. Similarly, Beta and Delta stressed that irrespectively of the experience, expertise and knowledge of the NPD team, end-user involvement is necessary for capturing and appropriately meeting all end users' needs and requirements. However, whereas for all the above companies, end-user involvement was seen as very important and perhaps essential for identifying end users' needs, in the case of Zeta it was

not perceived as a main or crucial benefit. These findings provide further support to the work of other scholars who irrespectively of the level and method of end-user involvement in NPD, they have stressed the importance of involving end users in NPD as a mean to better understand needs, requirements and design features (e.g. Ahmed and Amagoh, 2010: 210; Dahlsten, 2004: 147; Dominici and Palumbo, 2013: 90; Han et al., 2016: 21; Hussain et al., 2012: 109; Lin et al., 2006: 242; Nakada, 1997: 130; Olsen and Welo, 2011: 189; Stålberg et al., 2016: 156; Suteu and Buzatu, 2014: 223; Tsimiklis et al., 2015: 67; Wang and Ji, 2010: 173).

Increasing end users' engagement and/or adoption of the product was another benefit who participants of Alpha, Beta and Delta echoed. For Alpha and Delta, it was supported that close involvement throughout the NPD process gives to end users the sense that they have been actively contributing to the development of the product. As a result, they are more likely to become early adopters of the product and perhaps to also pass their excitement to other people (e.g. friends and family), turning them into potential end users. Quite differently, in the case of Beta, it was loosely reported that involving end users in the development of media communication may assist in creating more effective promotion messages that could attract more consumers. End-user involvement in NPD as a mean for increasing adoption of products and product engagement was only reported through the PD literature (Hussain et al., 2012; Wilkinson and De Angeli, 2014) and confirmed through case Alpha in this study. Although case Gamma also follows a PD and 'design by' approach, the benefit of increasing product adoption was not discussed. However, since Gamma collaborates mainly with lead users who are by definition genuinely interested and well-engaged in the NPD process, this should not be surprising. Furthermore, this study found that OI approaches (cases Beta and Delta) may also lead to the same benefit. In particular, the findings from case Delta are consistent with the empirical results offered by Wilkinson and De Angeli (2014) which show that close collaboration with end users from 'sensitive' demographics (in Delta's case patients of chronic gastrointestinal disorders) has the potential to affect end users' self-esteem and to increase the product's adoption.

A final end user related benefit was identified in Gamma and was concerned with ***helping end users to acquire skills***. More specifically, the management and NPD

team of Gamma felt somewhat responsible for providing knowledge and skills to their end users which may help them in improving product development approaches and processes. This is well aligned with the PD philosophy where end users and designers are considered to be equal members of a team. However, current literature (e.g. Ahmed and Amagoh, 2010; Dominici and Palumbo, 2013; Lin et al., 2006; Tsimiklis et al., 2015) has been mostly focusing on knowledge and information generated for the benefit of companies and has not paid adequate attention to the positive impact the collaboration between end users and companies may have on end users.

6.3.2 Planning Benefits

The second set of benefits is 'planning benefits' and includes benefits which support companies to plan and manage the NPD process. This set of benefits is found mainly in large companies who follow an OI ('design with') approach to end-user involvement in NPD (Beta and Epsilon). Companies Alpha and Gamma who follow the PD ('design by') approach and small-size companies (Gamma and Delta) were not found to have any significant planning benefit from end-user involvement.

End-user involvement assisting in having ***better insight into product requirements*** was a benefit emphasised by both Beta and Epsilon. The two companies indicated that end-users may point out important product characteristics that could have been otherwise gone unnoticed by the NPD teams. A similar finding was reported in the study of Roberts and Darler (2017: 23-24) where through close and interactive activities with the end users the companies were able to collect perspectives and ideas different to those of the NPD teams. Furthermore, this benefit of gaining better insight into product requirements have been reported in the current literature through the IA and PD approaches to end-user involvement in NPD (e.g. Hussain et al. 2012; Vatthanakul et al. 2010) but not through the OI approach where Beta and Epsilon belong. Hence, in contrast to the findings in the current literature, the findings of this study cannot confirm that end-user involvement through IA and PD approaches may offer a better insight into product requirements. Furthermore, since both Beta and Epsilon are large companies which follow very similar NPD processes, it is not possible to clarify if

this benefit is triggered and related to the size of the companies or to the OI approach to end-user involvement.

In the case of Epsilon, it was also reported that end-user involvement helps for ***prioritising product requirements***. Quite similarly, Filieri (2013) has suggested that active end-user involvement may help in prioritising different projects. However, when discussing this benefit, Epsilon was referring to the use of questionnaires for collecting end users' views on predefined product characteristics. This is close to practices (e.g. HoQ) followed mainly in IA approach for ranking product requirements. Furthermore, a similar perception was revealed in Alpha, but it was further acknowledged that product requirements and their importance is highly dependent on meeting certain regulations rather on end users' feedback. Hence, prioritising product requirements has been very sporadically discussed by participants in this study or by prior literature and therefore, there is no strong evidence to support this as a benefit of end-user involvement.

The next two benefits have not been discussed in the literature and are unique for each of the companies. First, the benefit that is unique to Epsilon is concerned with having a ***better overview of the overall project***. For example, having in the same room end users and company members from different departments (e.g. marketing and production) offers the opportunity for everyone to listen and discuss issues and suggestions on the product. As a result, all different angles on the issue will be presented, which may help in making more informed and appropriate decisions. Second, ***reconsidering the company's strategy and product offerings*** was the only planning benefit discussed by Zeta and was unique to this case only. This benefit was discussed in relation to Zeta's management team belonging into an older generation than their target market and therefore being disconnected from their preferences and lifestyles. As a result, it was suggested that end users' response to Gamma's products may enable the company to reconsider and perhaps redevelop some of their offerings.

6.3.3 Financial Benefits

The third set of benefits is related to 'financial benefits' and concern the large and medium-sized companies (Alpha, Beta, Epsilon, and Zeta). Half of the cases

(Alpha, Epsilon and Zeta) discussed that in addition to product and project-related benefits, end-involvement involvement may also help the companies to ***identify new markets*** and perhaps lead to smaller side-projects. For example, while interacting and working with installers for the development of a water heater, Epsilon was able to identify and work on the opportunity of developing a special wearable belt for easing the transfer of big and heavy objects (e.g. water heaters). In a similar way, in the case of Beta end-user involvement helped in ***identifying new segments*** of end users (see 5.2.4.1). These findings complement Wilkinson and De Angeli's (2014: 628) argument that closely working with end users can inspire companies to realise new avenues for products. However, Wilkinson and De Angeli (2014) were investigating a PD approach to NPD and according to the systematic literature review there is no study supporting that this benefit stands for OI or IA approaches to NPD. Therefore, this study suggests that irrespectively of the approach followed for end-user involvement in NPD, the interaction and engagement between end users and companies can lead to the identification of new markets which perhaps may act as new sources of revenue.

Differently to the findings in the current literature, this study also identified another financial benefit of end-user involvement which is unique to case Beta and is related to ***increasing profitability***. More specifically, Beta's managers asserted that since end-user involvement helps them to develop more appropriate and more relevant products, this, in turn, increases the margins of profitability for the company. Interestingly, although current literature has discussed how end-user involvement may reduce NPD costs (e.g. Herstatt and von Hippel, 1992), or how it may help to achieve profit goals (Gruner and Homburg, 2000: 9), there is hardly any empirical research providing evidence on end-user involvement having positive impact on product profitability. An exception could be the studies of Langerak and Hultink (2005: 37) and Sandmeier et al. (2010: 103) who briefly indicate improved profitability through end-user involvement in NPD.

6.3.4 Risk Mitigation

The fourth set of benefits is related to 'risk mitigation'. The participants from all six companies echoed that end-user involvement is very important for ***reducing the uncertainty of product designs***, including avoiding mistakes and unnecessary changes. This happens independently of the size of the company, the industry or

the approach to end-user involvement. More specifically, it was revealed that before making crucial changes, and particularly during the concept screening and prototype development phases, end users are invited to evaluate and (ideally) validate the NPD team's assumptions. This empirical finding is in line with many studies which highlight the importance of end users in reducing uncertainty, lack of clarity, and failure rates of products (e.g. Cauchick Miguel, 2005: 76; Daecke et al., 2015: 421; Dahlsten, 2004: 147; Lahti and Seitamaa-Hakkarainen, 2005: 113). Closely related to reducing the uncertainty of product designs and in a similar tone is the benefit of ***increasing a product's success rate***. Beta, Delta, and Epsilon which fall into the OI approach stressed that since end users contribute to developing products that are more accurate and appropriate in meeting end users' needs and requirements, this leads to better chances of launching a successful product into the market. This finding is implicitly supported in the studies of Sandmeier et al. (2010) and Nagamachi (2002) who also report on reduced failure rates of products in the market.

6.3.5 Strengthening the Pool of Ideas

The fifth set of benefits is related to 'strengthening the pool of ideas', and it was the one least discussed by the participants. In five out of the six cases, it was supported that end-user involvement can ***increase the number of ideas*** for a new product or a solution to a problem. This confirms the argument of Vrgović and Jošanov-Vrgović (2017) who explain that end-user involvement can increase the number of ideas, although idea quantity does not necessarily lead to product success. However, this study argues that this benefit is not a strong reason for the companies to actively involve end users in the NPD process. For instance, Beta suggested that although some interesting ideas come from end users, most of them will not be pursued by the NPD team. Differently to other companies, while Gamma did not discuss this benefit, it is self-evident that end users within the role of lead users are the ones to lead the project and therefore suggest ideas and solutions. At the same time, Gamma, Alpha and Zeta indicated that although not often, end users may ***increase the novelty of ideas***. This finding is consistent with the work of previous researchers such as Lettl (2007) and Merter and Hasirci (2016) who support that end users can offer creative ideas and solutions to companies. Furthermore, the current literature on IA does not discuss the number or characteristics of ideas generated by end users and therefore, it is unforeseen

that Zeta highlights the two above mentioned benefits. Nevertheless, whereas the findings of this study indicate that end users have the potential to increase the novelty and number of ideas, the empirical evidence is not enough to assess this.

6.3.6 Improving NPD Teams' Efficiency

The sixth and final set of benefits is concerned with 'improving NPD teams' efficiency'. This set consists of benefits which may help in improving NPD teams' capabilities and potential in developing successful new products. More specifically, Alpha and Gamma reported that the designers and NPD teams can ***acquire valuable knowledge*** from end users. Both companies suggested that they are always open and keen to learn from their interaction and collaboration with end users. Although this benefit has not been discussed in the literature, it fits well with the philosophy of the PD approach in which both Alpha and Gamma are classified.

Another benefit in this set which was reported by Delta, Epsilon and Zeta, is about how end-user involvement can ***increase NPD team's motivation and confidence in a project***. For example, Delta reported that end-user involvement and particularly their support and appreciation on the project could give the confidence to the NPD team that they are on the right path. Similarly, but through a more technical perspective, Epsilon and Zeta suggested similar results when end users test and validate the NPD team's assumptions on the product. It is surprising however that this finding was not discussed in any of the companies who follow a PD approach to end-user involvement.

A third and final benefit was reported by Epsilon alone and had to do with end-user involvement in ***contributing to solving disagreements within the NPD team***. This benefit was not indicated by any other companies and may be specific to the organisational hierarchy and culture of Epsilon. Interestingly, all three above mentioned benefits which were identified across the six cases, they have not been discussed in the current literature.

Overall, the investigation on the benefits of end-user involvement support the following main points. First, while extant literature has focused on the information generated for the benefit of companies, the findings of this study

have also revealed that since end-users play an active role in the development of products, they will also be benefited from exchange of information and close collaboration with the NPD team. Most evidently, end users are found to have the opportunity of acquiring new skills and receiving products that more appropriately meet their needs. Second, end-user involvement does not have a significant effect on supporting companies to plan and manage the NPD process. In particular small companies and those who have very close collaboration with end users (i.e. design by) have not been found to have any planning related benefits that emanate from end-user involvement. Third, large and medium-sized companies can see financial benefits from involving end-users in the NPD process. Irrespectively of the involvement approach, working with end users can lead to identification of new markets or new segments and to increased profitability. This is particularly important for fully exploiting new product's capabilities and increasing profit margins. However, these points have not been given appropriate attention in the extant literature. Fourth, this study confirms and further supports the findings of previous literature on risk mitigation benefits supported by end-user involvement. Fifth, although the findings are in line with the current literature that end-user involvement can strengthen the pool of ideas generated. It is further argued that this is not a strong reason which will drive companies to invite in and work with end users. Finally, it was found that NPD teams gain confidence and motivation when working with end-users in a project. Even more, NPD teams who collaborate closely with end users, anticipate that they will gain valuable knowledge from working with them. That could lead to development of more appropriate and more successful products. But surprisingly, this has been overlooked in previous studies. The next section will look into the findings related to challenges of end-user involvement in NPD.

6.4 Challenges of End-user Involvement in NPD

The following subsections present and discuss the four sets of challenges associated with end-user involvement in NPD. Table 6.3 provides a summary of these challenges. Although many of the challenges correspond with the ones identified in the literature (Chapter 2), this study also reveals a number of challenges that have not been discussed in the literature.

Table 6.3 Challenges of end-user involvement across the six cases

Challenges		Alpha	Beta	Gamma	Delta	Epsilon	Zeta
Organising end-user involvement	Identification of right type of end-user		x		x	x	
	Finding enough end-users	x			x	x	x
	The best period to involve end-users						x
Managing end-user involvement	Changing End-user's opinion	x		x			
	Focusing on details			x			
	Constant changes on designs			x			
	Overpowered End-user			x			
	Cultural differences		x				
	Managing communication	x	x				
	Jumping to solutions	x					
	Emotionally involved			x			
Managing information and knowledge	Articulating end-users needs	x	x	x			
	A high number of ideas				x		x
	Accept end users' opinion and feedback						x
Complexity	Complexity of products	x	x	x	x	x	

6.4.1 Organising End-user Involvement

The first set of challenges is concerned with 'organising end-user involvement'. With the exception of case Gamma, all companies reported issues when organising end-user involvement in NPD. Beta, Delta, and Epsilon reported difficulties in identifying the ***right type of end user*** to involve in the NPD process. Prior studies on end-user involvement in NPD have highlighted the importance of identifying and integrating the appropriate type of end-users for the successful development of products. For example, Enkel et al. (2005b) and Jespersen (2010) have stressed that not all end users can contribute in the same way to the NPD and that different types of end users (such as launching users, requesting users, first buyers) should be involved in different NPD phases. Similarly, Lettl (2007: 53) has argued that

one crucial capability of firms willing to innovate is the competence to involve the 'right' type of end user at the 'right' time and in the 'right' form. However, the participants in this study were not aware nor concerned with looking for and inviting specific types of end users in the NPD process. In contrary, all companies had simple criteria for choosing end users. These included mainly demographic characteristics and, in some cases, checks as to whether the end user was already a consumer of the product. Despite the simple selection criteria, Beta, Delta and Epsilon indicated that they had struggled with identifying the right type of end users. However, it is not to be believed that these simple criteria are not important. For instance, Beta highlighted that a slight inaccuracy when identifying appropriate end users may affect the performance of the product in the market. Hence, independently of the complexity of the end-user selection criteria set by each company, this study confirms that the prospect of NPD success partly depends on the identification of the right type of end user (Enkel, 2005b: 433).

While in this study all companies follow simple criteria for identifying appropriate end users, it is rather interesting that Alpha, Delta, Epsilon, and Zeta, reported that ***finding enough end users*** to involve in the NPD process may also be quite challenging. For Alpha, the trigger of this challenge is in convincing the end users that the project worths their time and in ensuring that the same end users will be willing to participate throughout the NPD process (especially in prototyping when testing gets more intense). This is similar to the findings of Roberts and Darler (2017:24) who suggest that companies find it challenging to identify end users who are willing and able to participate in the NPD process. In a different way, Epsilon's concern lies with the low number of end-users involved in the NPD in comparison to the million consumers the company has worldwide. Nevertheless, the challenge of finding enough end users has not been extensively discussed in prior literature.

One last challenge in this set is regarding the ***period for end-user involvement***. This challenge was pointed out by Zeta alone and it is considered to be closely related to the particular type of the product (chorizo sticks) and the food industry. Hence, it is not surprising that prior literature has not discussed this challenge.

6.4.2 Managing End-user Involvement

The second set of challenges is related to 'managing end-user involvement'. On first glance, it is interesting to notice three points. First, only three (Alpha, Beta and Gamma) out of the six companies reported challenges related to managing end-user involvement in NPD. Nevertheless, Alpha, Beta, and Gamma belong to different company sizes. Thus, the challenges in this set have no dependence on the size of the company. Second, it is also important to note that Alpha and especially Gamma, are the ones to face the most but at the same time, different challenges in this category. An explanation for this is perhaps because these two are the only companies in this study's sample who follow a PD approach to end-user involvement. Hence, because Alpha and Gamma are closely working with end users throughout the NPD process, the challenges to managing this relationship are more noticeable than in other companies. Third, with the exception the challenge of managing communication with end users, none of the challenges in this set has been discussed in the literature, as it has been presented in Chapter 3.

Whereas Alpha and Gamma have reported different challenges regarding managing end-user involvement, one point they agreed on is that at times they find it challenging to ***change end users' opinion***. More specifically, both companies indicated that when they present an unfamiliar design (to end users) or a different way of meeting a need or solving an issue, end users may not be so keen in accepting it. In the case of Gamma, there are other similar kinds of behaviours that the NPD team reported as challenging to deal with. These include end users ***focusing on details***, asking for ***constant changes on product designs***, and even (although a rare case) taking an ***overpowering position*** by commanding their opinion and requests to members of the NPD team.

In Alpha's case the NPD team stressed that one challenge is related to end users ignoring practicalities and technical aspects and wanting to ***jump directly to solutions***. Furthermore, ***managing communication*** between members of the NPD team and end users may also be challenging for identifying needs and requirements and for collecting appropriate feedback. This challenge was also evident in Beta when participants highlighted that especially in group activities (e.g. focus group) it may be challenging to manage dominant personalities. Also,

being an international company and having employees with international experience, participants from Beta mentioned that managing communication with end users from ***different cultural backgrounds*** may also be challenging. This challenge of managing communication is in line with literature from all three different approaches to end-user involvement in NPD. For example, Enkel et al. (2005a: 210) has found that part of end users' information may disappear due to misunderstandings between end users and employees. Similarly, Hess et al. (2013: 586) and Reed et al. (2015: 409) report that poor management of heterogeneity of a group can lead to difficulties in articulating end users' needs when they are working with designers in the PD approach. Whereas Griffin (1992: 183) suggests that good management support is essential for successful implementation of activities for gathering end users' needs (e.g. HoQ), participants from both Alpha and Beta complement that this challenge may also be minimised by learning to listen to end users carefully.

6.4.3 Managing End-user Information and Knowledge

The third set of challenges is concerned with 'managing end-user information and knowledge'. This is relevant to all companies except Epsilon which did not report any information related to this set of challenges. Whereas in the literature it is emphasised that ***articulating end-user needs*** is a major challenge for companies regardless of the approach followed, in this study, only three (Alpha, Beta, and Gamma) out of the six companies reported this challenge. More specifically, the literature suggests that when end users are involved in the NPD process, NPD teams may be unsuccessful in identifying their latent and unarticulated needs (Cui and Wu, 2016; Schaarschmidt and Kilian, 2014), attaining the voice of the customer (Martins and Aspinwall, 2001) and in properly understanding end users' views and ideas (Lahti and Seitamaa-Hakkarainen, 2005). The findings of this study on Alpha, Beta and Gamma support the literature in this matter. Additionally, they complement this by suggesting that having experienced NPD members to facilitate activities with end users and paying attention to end users' body language may help mitigate this challenge.

In addition to the above challenge, Delta and Zeta also reported that having to work with a ***high number of ideas*** may also be a challenging task. Processing and effectively communicating a large amount of information coming from end users

is a challenging task that has also been indicated in the current literature (e.g. Cui and Wu, 2017). Zeta further suggested that it would be more helpful to have end users rank existing ideas rather than asking them to communicate their own. Both companies have no prior experience in involving end users in the NPD process and therefore, this may be a reason why the number of ideas coming from end users may pose an issue. The other four companies did not highlight challenges regarding the number of ideas they receive from end users. This may be due to the experience they have as they are more established companies or perhaps (especially for Beta and Epsilon) due to the fact that they ask more specific questions to end users. In a similar tone, the study of Vrgović and Jošanov-Vrgović (2017) also supports that simple but specific problem statements presented to end users may result in a high number of relevant ideas.

One challenge that was found to be unique to Zeta is related to managers and the other members of the NPD team ***not accepting end users' opinion and feedback***. This finding is similar to Olso and Bakke's (2001) and Cristiano's et al. (2001) who found examples of companies (the first regarding lead user involvement and the second following IA and QFD) who were having difficulties or even stopped using end users' input due to their NPD teams not liking or not accepting the impact. As also noted in section 6.1, this challenge emanates from the company's culture in being reluctant to accept external opinions. In response to this, some prior literature suggests that it is essential for companies to create an environment for open knowledge sharing (Enkel et al., 2005b; Ogawa and Piller, 2006) and to ensure that NPD teams who directly interact with end users have good social and professional skills (Lettl, 2007: 67). Furthermore, considering the particular nature of the food industry in France (see 5.6.1) another reason for facing this challenge could be that Gamma has concerns about end users leaking valuable proprietary information to suppliers; an issue which has also been reported in the study of O'Hern and Rindfleisch (2010).

6.4.4 Complexity of Products

The last and perhaps one of the most discussed by the participants challenge of end-user involvement in NPD is concerned with the 'complexity of products'. All companies, except Zeta, echoed and emphasised that in most occasions end users do not realise the complexity of the product (or the complexity of a component)

and ask for changes that cannot be feasible. The literature has identified the same issue in the studies which are concerned with PD and IA approaches to NPD. When investigating QFD practices in Japanese and US companies, Cristiano et al. (2000) observed that the designs of more complex products are less apt to benefit from this method. Similarly, when investigating a PD project Palls et al. (2008) reported that the more complex the product the more challenging would be to consider how end users experience it or in what ways they may use it in the future. Hence, it was suggested that the PD approach is best suited for specific design questions (ibid: 290) rather than complex designs. However, there are no reports on the impact of product complexity in projects following an OI approach to end-user involvement.

Overall, the findings revealed challenges that have not been addresses in the extant literature. These are centred mainly around managing end-user involvement and range from NPD teams dealing with challenges created by difference in cultural backgrounds, to engaging in power games with end users. Although identifying the right type of end users is not as strongly evidenced as in the extant literature, finding enough end users to engage in the NPD is revealed to be a significant issue for companies. This can be a very important challenge because it may lead to longer NPD processes or not accurate representation of end users which in turn may result in less successful products. The findings confirm the argument in current literature that appropriately managing information gathered from end users is another significant challenge for companies. In particular, the challenge of articulating end-user needs, managing high number of ideas, and accepting end users' opinion and feedback are strongly evident in the findings of this study. Finally, the impact that product complexity has in collaborating with end users is evident in all companies irrespectively of size, industry, or end-user involvement approach. These findings confirm and strengthen the current notion in literature that complexity of products may make NPD with end users more challenging.

6.5 End-user Involvement Impact on NPD Time and NPD Cost

Prior literature on OI and IA studies has reported that end-user involvement leads to faster and less costly NPD processes (González et al., 2003; Herstatt and von

Hippel 1992; Karagozoglou and Brown, 1993; Lettl, 2007; Vonderembse and Raghunathan, 1997). However, the findings of this study show differently. All six companies discussed that involving end users in the NPD process is a lengthy and time-consuming process. In the same way, four out of the six companies recognised that end-user involvement is associated with increased costs. These are mainly related to organising and facilitating end user involvement as well as to pursuing changes and alterations according to end users' feedback and requests. Differently from the other four companies, participants from Epsilon were not concerned with the costs related to involving end users. Similarly, Gamma supported that end-user involvement may reduce NPD costs; which is not surprising if one considers the close collaboration, almost partnership, Gamma has with its end users. Nevertheless, all six companies highlighted that irrespectively of the cost and time-commitment end-user involvement in NPD is a very crucial and perhaps necessary condition for developing more appropriate new products and for increasing the new products' success rate in the market. This view of the companies is in accordance with PD studies. More specifically, Merter and Hasirci (2016) and Reed et al., (2016) suggest that although end-user involvement may bring some difficulties in terms of cost and time, it allows companies to develop more appropriate and successful products.

Hence, while most previous literature ostensibly emphasises end-user involvement to reduce NPD cost and time, it neglects to acknowledge that these benefits do not come as easy and free as presented. Rather, the findings of this study show that in reality end-user involvement extents NPD time and increases NPD cost. Nonetheless, if it is done correctly, the benefits will make up for and will be far more that the costs associated with the process.

6.6 When and How End Users Get Involved in NPD

Regarding the phase of end-user involvement in NPD, the findings show that the six cases position end-user involvement in different NPD phases. At the same time, this reveals that the empirical evidence supports that different approaches to end-user involvement (i.e. OI, PD and IA) may be more suitable for certain NPD phases. More specifically, two companies, Alpha, and Gamma, have been actively involving end users from the beginning and throughout the NPD process.

Additionally, Beta, Delta, and Epsilon involve end users in the early and middle phases of NPD and Zeta typically involves end users in the middle and late phases.

Seeing that the companies who follow a PD approach to end-user involvement (Alpha and Gamma) were engaging with end users throughout the NPD process provides support to the suggestion of Hess et al. (2013) that in PD end-user involvement can be continuous during all phases. Furthermore, Alpha discussed that end-user involvement is mainly required in the early NPD phases and even more in the prototype development and prototype testing phases. This finding is consistent with prior literature who suggest that in PD, end-user involvement is used during the entire development phase (Bruno and Muzzupappa, 2010; Lahti and Seitamaa-Hakkarainen, 2005). Gamma follows a similar but stronger view as the lead-users are involved throughout the NPD process and are the ones who mainly have the control of the project. In this sense, their involvement is equally important in all NPD phases. Whereas Alpha was evidenced to involve end users in the later NPD phases, their input was deemed as less important and less necessary as in previous NPD phases. Although Hussain et al. (2012: 104) has proposed that research in PD should investigate end-user involvement in the late NPD phases, current literature has not offered any insights yet.

In the case of the OI companies (Beta, Delta, and Epsilon), end users were involved in the early as well as middle phases of NPD. Although Beta also involves end users in the late phases for assisting with the communication and promotion strategy of the product. Nevertheless, Beta highlighted that end-user involvement is more intense and important during the concept development and prototype testing. The findings from Delta and Epsilon are also in agreement with this. Hence this study agrees with Lettl (2007) who emphasises that end-user involvement can make valuable contributions to the design of a product. However, it contradicts the findings of Daecke et al., (2015) who supported that involving end users in the design and development phases are not helpful (although this might be specific to the automotive industry). Furthermore, all companies in this study suggested that early end-user involvement may save them from mistakes whereas involvement in late phases may not have a significant impact to the end product as changes cannot be implemented due to temporal, financial and regulatory limitations. This is in accordance with prior literature such as Enkel et al., (2005b) who suggest

that end-user involvement is not encouraged for late NPD phases. However, it partly agrees with Gruner and Homburg (2000) who support that end-user involvement in initial and late phases may increase NPD success but has no effect on the middle phases of NPD.

Zeta traditionally involves end users only in the prototype testing and launch phases. In contrast, the majority of literature on IA supports that end users are better involved in the initial phases of NPD for identifying and capturing their needs (e.g. Ahmed and Amagoh, 2010; Bergquist and Abeysekera, 1996; Cauchick Miguel, 2005, 2013). However, the findings of this study support the indication by a few other studies that end-user involvement can be used after a product has been launched in the market (Dominici and Palumbo, 2013; Nakada, 1997). When developing the chorizo sticks, it was the first-ever project that end-users were also involved in the concept development phase for identifying end users' needs. However, the information gathered did not seem to prevent issues in later phases of the development process (unsuccessful product launch), perhaps due to the unstructured approach in collecting end users' opinions. Assuming that end user requirements are appropriately collected and recorded (e.g. through the HoQ) Hauser (1993) and Elboushi and Sherif (1997) support that these can be used throughout the development process as a framework for making decisions. Nevertheless, this was not the case in Zeta's chorizo sticks project.

Overall, considering the above findings, it can be recognised that certain approaches to end-user involvement are more suitable for certain NPD phases. More specifically, a 'design by' approach may be implemented throughout the NPD process. Differently, 'design with' is more commonly used in the concept development and middle NPD phases, and 'design for' involved end users only in the middle and/or late NPD phases. This finding may assist in recognising better conditions as to when to involve end users in the NPD process, depending on the approach. Extant literature on this topic (e.g. Chang and Taylor, 2016; Enkel et al., 2005) has generally suggested that end users should be involved early on in the NPD process. However, the findings of this study support that end-user involvement may bring more benefits when it happens during the concept development, prototyping, and testing phases.

Regarding the tools employed for involving end users in the NPD process, the empirical evidence of this study suggests that different approaches to end-user involvement use different kind of tools. An overview of the phases end users get involved in the NPD as well as the tools used is presented in Table 6.4. Gamma is the most extreme form of the PD approach and hence not surprisingly is only using direct tools[7] (e.g. creation of mock-ups, brainstorming) to engage with and work together with its end users throughout the development of products. This is not an uncommon practice for PD as identified in prior studies in the literature (e.g. Roberts and Darler, 2017; Kautz, 2011; Merter and Hasirci, 2016). In a similar way, Alpha mainly uses direct tools with exception the idea generation and the pre-launch phases where indirect tools (e.g. interviews and feedback questionnaires) may be employed. Although not common, in a similar way to Alpha's case, Wilkinson and De Angeli (2014) reported that when designing a wheelchair, the designers used a combination of surveys, semi-structured interviews and observation of participants in a controlled domestic environment. Hence, the findings of this study agree with the current literature that following a PD approach, end users get involved mainly through direct tools. Nevertheless, there is a contradiction regarding the use of web-based tools. More specifically, current literature (Hess et al., 2005; Lahti and Seitamaa-Hakkarainen, 2005) suggests that online tools (e.g. virtual design platforms and online forums) can be very beneficial for end-user involvement. As seen in the case of Alpha web-based tools are not preferred because they do not have the ability to capture non-verbal information (e.g. body language) and do not allow for immediate follow-up questions. Also, Gamma does not use web-based tools. Therefore, the findings of this study do not support the discussion in the literature that end-user involvement following the PD approach happens through web-based tools.

[7] For a distinction across the different tool categories please see subsection 2.4.4

Table 6.4 Overview of the NPD phases end users get involved and tools used

	NPD Phase	Alpha	Beta	Gamma	Delta	Epsilon	Zeta
Ideation (early phase)	Idea generation	Indirect & direct	Indirect & Web-based	Direct	Indirect	-	-
	Idea screening	-	Indirect & Web-based				
	Concept development	Direct	-	Direct	Indirect	Web-based	Direct**
	Concept screening		Direct			Direct	
Development (mid-phase)	Prototype development	Direct	Indirect	Direct	Indirect & direct	-	-
	Prototype testing	Direct	Direct	Direct	Indirect & direct	Direct	Indirect & direct**
	Market test		Indirect			Indirect	Direct**
Launch (late phase)	Pre-launch/product development	Indirect	-	Direct		Indirect*	Indirect
	Communication test		Direct				

: The company does not have this phase
\- : End users were not involved in this phase
* : Happens traditionally but not for the square heater project
** : Happened for the chorizo project only

Companies Beta, Delta and Epsilon were found to use both indirect and direct tools. Although prior literature (e.g. Coviello and Joseph, 2012; Rohrbeck et al., 2009) indicates that indirect tools are not a very common practice in an OI approach, evidence in this study shows that especially Delta makes extensive use of indirect tools (e.g. questionnaires and diaries) throughout the NPD process. In support, Beta and Epsilon also employed indirect tools although not as intensively as Delta. However, the three companies were found to use direct tools (such as focus groups and prototype evaluation sessions) more frequently. Use of direct tools has also been discussed in prior studies regarding OI (e.g. Almirall and Wareham, 2008; Dahlsten, 2004) but not very often. Instead, most of the empirical studies in the literature have focused on the use of web-based tools for involving and engaging end users through an OI approach (e.g. Antikainen et al., 2010; Antorini and Muñiz, 2013; Kohler et al., 2011; Prugl and Schreier, 2006: 247; Tsimiklis et al., 2015). For instance, Füller and Matzler (2007) have explored how virtual prototypes and animated 3D models may give the opportunity to end users to test new products before they are fully developed. Although Beta and Epsilon have been employing web-based tools, they do it mostly in initial NPD phases through online questionnaires for quickly and economically collecting end users' preferences and needs. Hence, they have not used more advanced web-based tools as described by Füller and Matzler (2007).

In the case of Zeta, the company traditionally uses indirect tools for involving end users in the NPD process. Although the main tool is evaluation sessions through

organoleptic tests, these were organised and executed in a way similar to filling a questionnaire and therefore are regarded as an indirect form of tool. The use of indirect tools for identifying and gathering information on end-user needs is also the main practice discussed in studies regarding end-user involvement through IA (e.g. Bergquist and Abeysekera, 1996; Dominici and Palumbo, 2013; Matzler and Hinterhuber, 1998: 35; Pullman et al., 2002: 358; Tottie and Lager, 1995: 263). Furthermore, in the chorizo project, Zeta gathered opinions and needs of end users through direct tools and more specifically brainstorming sessions and tasting sessions. This finding complements the few existing studies (e.g. Bouchard et al., 2009; Chen and Chuang, 2008; Duhovnik, 2006) who have also reported the use of direct tools through IA. Finally, Zeta did not use and does not plan to use any web-based tools for involving end users in the NPD, which is consistent with the fact that there is an absence of studies reporting and discussing using of web-based tools in IA.

Hence, whereas the three approaches were found to use different types of tools for involving end users in the NPD process, the most unexpected finding is that the companies in the case studies did not use or used only sporadically web-based tools (e.g. online forums). This decision is perhaps more sensible in the 'design by' cases where NPD teams work closely with end users. However, it is surprising that the companies following a 'design with' or 'design for' approach do not prefer to utilise web-based tools for engaging with end users. Although the companies supported their decisions with rational arguments (e.g. obtaining less accurate end-user information) it is still a very surprising finding that even companies with plentiful resources (e.g. Beta, Epsilon) are not keen in using technology for assisting them with working with end users.

6.7 End-User Involvement Impact on the NPD Process and the End Product

This section aims to present and discuss the impact of end-user involvement on the end product. However, prior to this, it is important to discuss how the six companies approach end-user involvement as their practices and perspectives may have an influence on their receptivity (or not) of end users' change requests.

End Users' Roles in NPD

The six companies had differences in how they approach and perceive end-user involvement in their NPD projects. Alpha and Gamma see their end users more as partners rather than just potential customers. The end-user involvement in these companies is similar to what is discussed in the literature about end-users becoming co-creators of new products, having a very active role in the NPD, and influence decisions (Cui and Wu, 2017; Damodaran, 1996; Neale and Corkindale, 1998: Sanders and Stappers, 2008). Whereas in Gamma this is clearly evidenced due to their collaboration with lead users, in Alpha it became clear through the discussions with the interview and focus group participants. For Beta, Delta, and Epsilon, although end users were often actively involved throughout the NPD process, they were perceived by the companies as a source of information. In these three companies, end users would act as consultants who provided feedback and suggestions in predefined product characteristics. This aligns well with the role of 'user' as discussed in the literature and which is suggested to have little effect on the product (e.g. Damodaran, 1996; Nambisan, 2002; Olsson, (2002). Although it should be recognised that in Delta and Epsilon restrictions from regulations may have affected the level of end-user involvement and their influence on product designs and functions, this would not be enough to alter the whole relationship between end users and NPD teams. A case in point is Alpha which is able to promote and support a very active end-user involvement, while bound by regulations. Finally, the findings showed that traditionally, Zeta rarely has direct interaction with its end users. The chorizo project was a bit different as end users were involved more frequently. Still, the involvement activities were designed to extract specific information by the end-users. Prior studies (Nambisan, 2002; Olsson, 2004) have supported that when end users have this rather passive role, it limits the richness and frequency of their contributions, resulting to little or no influence on the product.

Importance of Involving End Users in NPD

All companies highlighted and agreed that end-user involvement is very important for creating successful products, which is in line with the general consensus in the current literature (e.g. Dahlsten, 2004; Gemser and Perks, 2015; Kujala, 2008). More specifically, Alpha and Delta discussed that end-user involvement is essential in every project as it reduces risks and helps in developing more appropriate

products. For Gamma, which follows a very user-centric business model, end-user involvement is vital not only for the day-to-day operations but also for the success and survivability of the company. Whereas in cases of Beta and Epsilon the same perspectives were echoed, it was also revealed that end users' suggestions are followed with caution and managers and the NPD team are always in control of defining the end-product characteristics. Also, these two companies have clearly specified and structured NPD processes (as to who, how and when to be involved in the NPD process). As a result, end users are involved in specific NPD phases for specific reasons and managers are bound by budgets and in the case of Epsilon by regulations and predefined product characteristics. However, it should be noted that such controlled and structured end-end user involvement may hinder or limit opportunities for more innovative ideas and suggestions coming from end users; this has also been discussed in the studies of Laage-Hellman et al. (2014) and Lettl (2007). Moreover, due to the particular nature of the food industry in France, Zeta has not been very keen in the past in more actively and more frequently involving end users; although the company always valued end user's opinions. Also, the chorizo project was not very successful in terms of capturing end user needs and integrating them into the product. However, the culture inside Zeta seems to be changing to a mentality that can better support end-user involvement. Overall, it is interesting to see that the decision on when and how to involve end users is based mainly on potential benefits end-user involvement in NPD can offer, rather than in conjunction with practical and resource-based criteria.

Effects and Influence of End-user Involvement in Specific NPD Phases and in the End Product

Hence, the discussion with the companies strongly indicated that for every single company, end-user involvement is very important. Nevertheless, when investigating the individual NPD projects of each company and assessing end-user involvement in specific NPD phases, some interesting findings emerged. Table 6.5 provides a summary of all the NPD projects with a focus on the effects and influence of end-user involvement in different NPD phases.

When viewing and comparing all the six case together, it becomes clear that the frequency of end-user involvement in the NPD process is not necessarily associated with the outcomes and the influence they have on the end product. Contrastingly,

what is of highest importance is how (tools) end users get involved and for what purpose. For instance, in Beta end users are involved mainly for validating predefined options and solutions; hence they only have a weak influence on the end product. Also, Zeta although attempted to more actively involve end users in several NPD phases, it either ignored their feedback (market test) or did not properly organise and conduct the involvement activities (bar tasting sessions). As a result, and similar to case Beta, end users only weakly influenced the end product.

Table 6.5 overview of NPD projects illustrating the effects and influence of end-user involvement in different NPD phases

	Alpha **Medical Device** *(PD – design by)*	**Beta** **Fashion Magazine** *(OI – design with)*	**Gamma** **Clothing Line** *(PD – design by)*	**Delta** **Treatment Diet** *(OI – design with)*	**Epsilon** **Square Water Heater** *(OI – design with)*	**Zeta** **Chorizo Sticks** *(IA – design for)*
Idea generation	Identification of end user needs and requirements by gathering information via a mix of indirect and direct tools ☺		Lead user proposes a clothing line. Agreement between Gamma and lead user for working on the project together. ☺	Questionnaire is developed with the help of (clinicians) end users for assessing interest on the product ☺		
Idea screening		End users vote for best ideas included in a predefined list 😐				
Concept development	Product designs created by NPD team and evaluated by end users (iterative process) ☺		Lead user presents basic concept to Gamma. Lead user and Gamma work together in improvements and agree on the final concept ☺	A questionnaire distributed by post to (patients) end-users in order to assess if they are interested in the product 😐	Questionnaire sent to end-users (installers) to validate and prioritise identified needs described in the concepts 😐	A brainstorming session with managers and employees, and university students ☺
Concept screening		End-user feedback, suggestions and ideas generated lead to the identification of main end-user requirements ☺			Focus groups with end-users (installers) where different concepts are presented and evaluated ☺	
Prototype development	Mock-up development and testing in pretend examination rooms and in end users' workplace (iterative process) ☺	End-users are asked through online questionnaires to give their opinion on predefined magazine content and characteristics 😐	NPD team prepares a prototype according to lead-user's instructions. NPD team and lead-user decide together for changes on the prototype ☺	End-users test pre-existing diet as well as the new treatment-diet and provide feedback through questionnaires and diaries. Delta develops diet according to feedback. Tasting sessions with end users conducted and final ready meals developed. End		

	Alpha **Medical Device** *(PD – design by)*	**Beta** **Fashion Magazine** *(OI – design with)*	**Gamma** **Clothing Line** *(PD – design by)*	**Delta** **Treatment Diet** *(OI – design with)*	**Epsilon** **Square Water Heater** *(OI – design with)*	**Zeta** **Chorizo Sticks** *(IA – design for)*
				users take part in clinical trials ☹ ☺		
Prototype testing		Prototype tuned according to feedback from focus groups ☺	Focus groups with end-users to give feedback on the prototype. Prototype tuned according to end users' feedback ☺		Focus groups with end-users (installers and consumers) to give feedback on prototype and agree on final version (square water heater) ☺	Evaluation panels for organoleptic test and prototype tested in bars lead to the final version of the prototype ☹
Market test						The product launched in a local supermarket chain and evaluated by end users ☹
Pre-launch/product development	Usability testing with information gathered for creating promotion strategy ☹		Sizing is tested within the NPD team and lead-user as well as in evaluation sessions with other end-users ☺			
Communication test		Creation of TV spot by evaluating existing scenarios ☹				

☺: end users are actively involved, and their input has the opportunity to influence the end product

☹: end-user involvement is highly directed by the company or is not appropriately organised, and thus the impact of end users is minimal

Following the same logic, end-user involvement in Delta and Epsilon had a medium influence on the end product. These two companies are strictly bounded by regulations which is perhaps a reason for not having more active end-user involvement. For instance, Delta is not allowed to actively include patient end users in the NPD process before clinical trials have been approved. Whereas Epsilon is also affected by regulations and policies, at the same time it follows a very specific NPD process which is very similar to Beta, and it suggests involving end users only for predefined and limited times in the NPD process. However, compared to Beta, Epsilon provided more opportunities for end users to be actively involved and thus more opportunities to influence the end product. For example, during the prototype testing phase, end users suggested for the water heater to have a square shape, something that was followed by Epsilon.

In the cases of Alpha and Gamma end users had a strong influence on the end product. Compared to the other four cases, it is clearly evident that end users had been provided many opportunities throughout the NPD process to express their views and to actively contribute to the end product. Furthermore, the NPD teams did not always provide predefined solutions to the end users and hence created a more open and engaging environment for collaboration.

Nevertheless, giving opportunities to end users to actively participate in the NPD process does not necessarily mean that all their feedback and suggestions will be followed by the NPD teams. More specifically, in cases Alpha, Delta, Epsilon and Zeta in which end users were assessed to have from strong to weak influence on the end product, it was reported that not all of end users' suggestions and feedback were followed by the NPD teams. In contrast, Beta and Gamma supported that in the investigated projects, they incorporated all of end users' suggestion to the end product. However, it was also discussed that this is not always the case and that there are times that not all end users' requests can be implemented. Subsequently, the findings of this study provide insight on the reasons as to why the six companies were not able or chose not to implement changes requested by end users (either on the investigated projects for Alpha, Delta, Epsilon, and Zeta or on other, different projects for Beta and Gamma). These reasons have been categorised and presented in Table 6.6 and may be

applicable to any NPD project, not only to the projects that were investigated as part of this study.

Table 6.6 Overview of reasons for not implementing changes as requested by end users

Type of reasons for changes not implemented	Alpha	Beta	Gamma	Delta	Epsilon	Zeta
Economic constraints	x	x		x	x	
End-user ideas regarded as not important	x	x				
Impact on functionality			x	x	x	x
Above the company's capabilities			x			
Impact on usability	x			x		
In use by competitors					x	
Legal agreements					x	
Regulations	x				x	
Phase of NPD	x					
Were all end users' change requests implemented?	NO	YES	YES	NO	NO	NO
End users' influence on the end product	Strong	Weak	Strong	Medium	Medium	Weak

As already discussed, regulations and legal agreements are for some of the companies undeniably necessary to follow, and they may lead to not implementing changes as requested by end-users. Some reasons for not implementing changes were unique to one company. For instance, Epsilon suggested that the company is not keen on offerings similar to their competitors and therefore, a change request will be automatically rejected if it leads to developing a product similar to competitors. However, the main reasons for not taking forward suggestions and change requests by end-users seem to be related (i) to the impact the change will have on the functionality of the product and (ii) to economic constraints that would not allow for investigating and implementing end users' change requests. Furthermore, it was quite unexpected to find that Alpha and Beta may not pursue

or implement end users' ideas and requests because they were regarded as unimportant to the overall design of the product. Overall, the findings on this matter contribute to our knowledge on the evaluation standards and the reasons as reported by the NPD teams for not implementing changes requested by end users.

6.8 Putting it all Together

Based on the evidence presented and discussed in the above sections, the original holistic overview (Figure 2.2) has been revised, updated, and presented in Figure 6.2 below. This provides an overview of the three different approaches for end user involvement in NPD and a holistic understanding of their key elements (tools, phases, benefits and challenges) according to empirical evidence of this study. As it can be seen in figure 6.2, the holistic overview highlights differences and similarities among the different approaches to end-user involvement.

More specifically, it was found that the PD (design by) approach supports and encourages end-user involvement throughout the NPD process. End users have a very active role, influence decisions and may be perceived as partners and equal members of the NPD team. Nevertheless, frequency of end-user involvement and attention to their suggestions seems to be descending as the product moves from initial and early development phases to later NPD phases when prototypes are almost finalised and pre-launch or commercialisation activities take place. The empirical findings also support that a PD approach to NPD is happening mainly with the support of direct tools and is more applicable for explorative in nature projects where there are defined objectives but at the same time there is openness and freedom to explore different or new ways of meeting these. The main benefits of this approach include end users' need identification, increasing end user engagement with products, helping end users to acquire new skills, identification of new markets, reducing the uncertainty of product designs, and NPD teams acquiring valuable knowledge. However, challenges are also raised regarding managing end-user involvement (e.g. end users' constant requests for design changes), and complexity of products and articulating end users' needs.

CLASSIFICATION	APPROACH	PHASE	TOOLS	BENEFITS	CHALLENGES
Design By	**Participatory Design**	‣ Ideation ‣ Development ‣ Launch	**Indirect** ‣ ~~Survey~~ ‣ Interview ‣ Observation **Direct** ‣ Mock-up ‣ Brainstorming ‣ Workshops ‣ Inspirational pictures ‣ Presentations ‣ Focus groups ‣ Evaluation sessions ‣ Sketches **Web technology based** ‣ Online forums/communities ‣ Online surveys ‣ ~~Wiki systems~~ ‣ ~~Virtual design platforms~~ ‣ ~~Open source softwre~~	**End user** ‣ Requirements/needs identification ‣ Increase engagement/adoption ‣ Help end users to aquire skills** **Planning** ‣ Prioratise product requirements ‣ ~~Better insight into product requirements~~ **Financial** ‣ Identification of new markets **Risk** ‣ Reduce uncertainty of product designs (and avoid mistakes) ‣ Increase success rate **Ideas generated** ‣ Increase number of ideas ‣ Increase degree of novelty of ideas **Company** ‣ Knowledge gained	**Organising End-user Involvement** ‣ Finding enough end users ‣ ~~Tools and methods used~~ **Managing End-user Involvement** ‣ Chaninging end users' opinions ‣ Focusing on details ‣ Constant changes on designs ‣ Overpowered end users ‣ Managing communication ‣ Jumping to solutions ‣ Emotionally involved** **Managing Information and Knowledge** ‣ Articulating end users' needs **Complexity** ‣ Complexity of products
Design With	**Open Innovation**	‣ Ideation ‣ Development ‣ Launch	**Indirect** ‣ Survey ‣ Diaries ‣ ~~User clinics~~ **Direct** ‣ Workshops ‣ Direct feedback ‣ Inspirational pictures ‣ Mock-up ‣ ~~Living Labs~~ ‣ Focus group **Web technology based** ‣ Online forums/communities ‣ ~~Virtual design platforms~~ ‣ ~~Open source software~~ ‣ ~~Online interviews~~ ‣ Online surveys	**End user** ‣ Requirements/needs identification ‣ Increase end user engagement/adoption **Planning** ‣ Better insight into product requirements ‣ Prioritise product requirements ‣ Better overview of the project** **Financial** ‣ Increased profitability** ‣ Identification of new markets/new segments **Risk** ‣ Reduce uncertainty of product designs (and avoid mistakes) ‣ Increase sucess rate **Ideas Generated** ‣ Increase number of ideas ‣ ~~Increase degree of novelty of ideas~~ **Company** ‣ Increase motivation/confidence on project ‣ Contribute in solving disagreements within NPD team**	**Organising End-user Involvement** ‣ Identification of right type of end user ‣ Finding enough end users ‣ ~~Phase of end-user involvement~~ ‣ ~~Tools and methods used~~ **Managing End-user Involvement** ‣ Cultural differences** ‣ Managing communication **Managing Information and Knowledge** ‣ Articulating end users' needs ‣ High number of ideas **Complexity** ‣ Complexity of products
Design For	**Instrumental Approach**	‣ Ideation ‣ Development ‣ Launch	**Indirect** ‣ Evaluation panels (organoleptic sessions) ‣ ~~Survey~~ ‣ ~~Interview~~ ‣ ~~Observation~~ ‣ ~~Questionnaires~~ **Direct** ‣ Brainstorming ‣ ~~Focus groups~~ ‣ Evaluation sessions	**End user** ‣ Requirements/needs identification ‣ ~~Prioritise product requirements~~ **Planning** ‣ Reconsider own strategy/product offerings ‣ ~~Better insight into product requirements~~ **Financial** ‣ Identification of new markets **Risk** ‣ Reduce uncertainty of product designs (and avoid mistakes) **Ideas Generated** ‣ Increase number of ideas ‣ Increase degree of novelty of ideas **Company** ‣ Increase motivation/confidence on project ‣ ~~Enhance communication between departments~~	**Organising End-user Involvement** ‣ Finding enough end users ‣ Best period to involve end users **Managing End-user Involvement** ‣ ~~Managing communication~~ **Managing Information and Knowledge** ‣ ~~Articulating end-user needs~~ ‣ High number of ideas ‣ Accept end users' opinion and feedback** **Complexity** ‣ ~~Complexity of products~~

Figure 6.2 Updated holistic overview of the three approaches to end-user involvement in NPD

Elements in green colour were derived from the empirical data
Elements in green** colour and asterisks (**) were derived from the empirical data and are unique to the specific approach
Elements in orange colour were discussed in prior literature but for a different approach

OI (design with) approach was found to involve end users mainly in the early and middle phases of NPD and most intensively in the concept development and prototype testing. Although end users have a quite active role during these phases, they are perceived by the companies as a valuable source of information which can provide consultation and suggestions on predefined product characteristics. Through an OI approach to end-user involvement companies mainly aim to reduce risks and to validate existing assumptions rather than aiming at collecting new ideas. Hence, although end users have a strong enough voice to influence decisions (e.g. product characteristics), the companies following OI have very structured NPD processes with managers and NPD teams always in control of decision-making processes. This approach was found to have a wide range of benefits including those related to end users (e.g. need identification), planning benefits, financial benefits, risk mitigation benefits, strengthening the pool of ideas, and benefits related to improving NPD teams' efficiency (e.g. increasing confidence in the project). At the same time, successful implementation of OI may be challenged by identifying the right type of end users and finding enough of them to be involved in the NPD; as well as by articulating end user needs, managing communication between end users and the company, complexity of products and appropriately dealing with high number of ideas. Furthermore, both direct and indirect tools were used for involving end users throughout the NPD process. Simple web-technology based tools (e.g. online surveys) were also employed but not as frequent.

IA (design for) was found to be applicable mostly during the middle and late NPD phases and less at the early phases for assisting with developing product concepts. Zeta rarely came in direct contact with end users who were asked to comment on specific questions and had a rather passive role. The findings also showed that the end users did not have any active involvement in decision-making processes and had no significant influence (if any at all) on the end product. In this sense, the company involved end users mainly for testing and rating predefined solutions. Moreover, benefits of the IA were found to include end users' need identification, reconsidering the company's strategy and product offerings, identification of new markets, reducing the uncertainty of product designs, strengthening the pool of ideas and increasing motivation of employees to work on the project. Successful end-user involvement through IA depends mainly on appropriately organising end-

user involvement (e.g. finding enough end users) and managing collected information and knowledge (e.g. accepting end users' feedback). Although as main practise IA traditionally uses indirect tools to involve end users, directly tools (such as brainstorming sessions) may also be used. Nevertheless, it is important to note that all the above findings are based on company Zeta alone. Although Zeta falls into the classification of 'design for' the end user, it does not explicitly use any of the methods described in the IA (i.e. QFD, Kansei, or Kano). Hence, the empirical evidence on the IA is inconclusive and not generalisable.

On the above basis it can been seen that the three approaches may have a quite different impact on the NPD process. However, the empirical evidence and findings also suggest that the appropriateness of each approach depends on four situation-specific factors. First, the selection of the most appropriate approach to end-user involvement and its successful implementation is found to be contingent on the company's purpose for involving end users in the NPD process. Specifically, PD (design by) is more appropriate for projects where companies have trust on and seek from their end users to come up with new or different ideas and solutions; OI (design with) fits well with ensuring that the project is on the right path by evaluating and validating existing solutions and by offering some opportunities to end users for small changes on product designs; IA (design for) is most appropriate for companies who need the input of end users for simply testing and choosing among predefined product characteristics and predefined solutions. It should be noted that this finding contradicts Cui and Wu's (2017: 73) study who supported that end user as information source is more beneficial for new product outcomes and end user as co-developer is better for projects with less experimentation. Second, the company culture and the NPD team's level of receptivity to external knowledge may be less or more appropriate for each of the three approaches to end-user involvement in NPD. For instance, companies like Zeta and Beta have much confidence in the expertise of their NPD team and only trust their internal mechanisms and decision-making initiatives. Therefore, it is unlikely that they could successfully facilitate and implement a PD approach to end-user involvement. A similar finding was also reported in Enkel's et al. study (2005b) who suggested that a company should pay attention to the NPD team's and managers' motivation for involving end users in the NPD. Also, from the empirical evidence, it seemed that Delta and perhaps Epsilon have the appropriate

culture to support a closer and more active approach to end-user involvement such as PD. Along these lines, Lettl (2007: 67) suggests that companies who invest in the social and professional competencies of their employees that directly interact with end users can more successfully manage end-user involvement in NPD. However, other reasons (such as limited resources or regulations) may prevent these companies from choosing to implement a PD approach. This brings to the discussion the third situation-specific factor which is related to regulations and policies that companies in certain industries have to adhere to. Consequently, the regulated nature of some industries may affect the frequency and level of end-user involvement in NPD and therefore the influence they have on the end product. Hence, for companies in such industries may be more appropriate to follow an IA or OI approach. Nevertheless, Alpha was able to successfully follow a PD approach, which shows that depending on how oppressive or strict regulations are the challenges they entail may be moderated. Fourth and final, the appropriate selection of one of the three approaches to end-user involvement may depend on a company's available resources. More specifically, time, budget, and breadth of tools a company possesses may affect the decision on when and how to involve end users in the NPD process. In this sense, this study suggests that involving end-users through PD requires more time and (preferably) wider range of tools than in OI an IA approaches. Similarly, OI and IA approaches may be more applicable for quickly assessing proposed product solutions. Furthermore, an interesting observation is that two factors, i) a company's experience in an industry and ii) a company's experience with end-user involvement do not seem to affect the selection and successful implementation of any of the three approaches. More specifically, the years of operating experience and experience in an industry in this study did not affect company decisions on selecting and facilitating a specific approach to end-user involvement. Moreover, although Delta and Zeta are two companies with no or minimal prior experience with end-user involvement, they had different levels of success on the collaboration with end users and the product outcomes. Overall, this study identifies four situation-specific factors which may assist companies to appropriately make a selection among the three approaches to end-user involvement in NPD. These include i) a company's defined purpose for end-user involvement, ii) a company's culture and receptiveness to external knowledge, iii) industry associated regulations and

policies and iv) a company's resources. Experience in an industry and prior experience with end users do not seem to affect successful end-user involvement in NPD activities.

Furthermore, another interesting finding of this study is that the prospect of end users successfully influencing the end product depends on the way end-user involvement is being facilitated and controlled, and the openness (or not) of NPD teams in working with end users. This finding supports Roberts and Darler's (2017: 29) view that co-creation activities are contingent upon the level of end-user involvement (passive or active) that a company is adopting, and also upon the purpose of being involved. As already discussed in section 6.7 the main factors for supporting end users' influence on the end product are associated with the level of involvement (approach) and the tools used to support this involvement and collect relevant information. This association can be better illustrated in Figure 6.3 below.

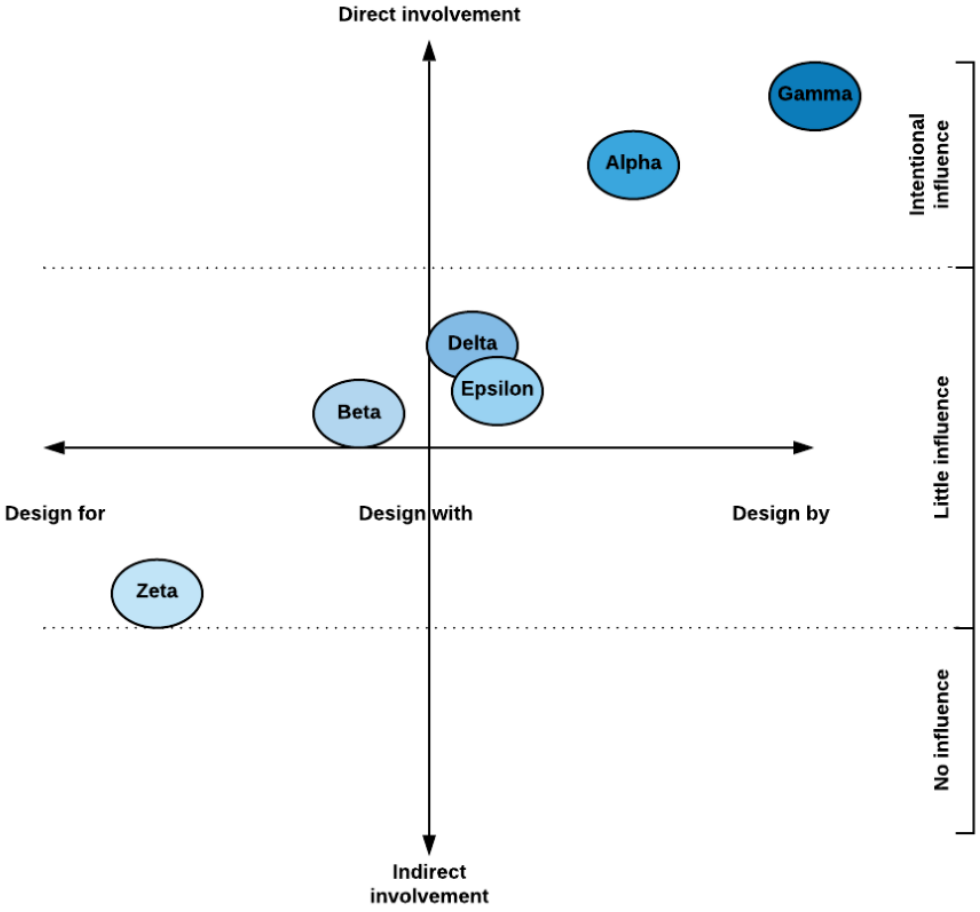

Figure 6.3 End-user involvement matrix

The horizontal axis represents the different approaches to end-user involvement in NPD. Moving along this axis from left to right end users' opportunity to influence decisions about a product's development are increasing. Subsequently, not only the nature of end user relationship with the NPD team is changing but also the role of the end users and the role of the NPD team within the NPD process. Specifically, on the left of the diagram the NPD team has an active role, acts as an interpreter of end users' needs and completely controls all decision-making processes; whereas at the same time end users are passive informants. Moving towards the middle of the horizontal axis, the NPD team is still in charge of all the decision-making, but end users now have a more active role where they can react to and influence the proposed solutions. At the far-right side of the axis, the NPD no longer acts as interpreter or utiliser of needs but instead as a facilitator who assists end users in addressing their needs; hence end users are actively involved and engaged in product development. The vertical axis represents the category of tools through end users get involved in the NPD and captures the level of interaction between end users and NPD teams across the NPD process. Accordingly, the vertical axis is also subdivided into three levels corresponding to the increased influence of end users on the end product. More specifically, it is shown that indirect tools offer the end user little or no possibility to influence the end product.

Gamma represents the most extreme example of the PD (design by) approach in this study, and it has therefore been positioned at the very right side. At the same time, Gamma was reported to make use of direct tools only when involving end users. Close to Gamma, Alpha is also classified as a PD (design by) case and it used mostly direct tools. Beta, Delta and Epsilon are examples of the OI (design with) approach and therefore positioned around the middle of the axis. All three companies employed both indirect and direct tools and are therefore very close regarding the positioning on the vertical axis. However, compared to Beta, Delta and Epsilon were evidenced to provide to end users more opportunities for actively expressing their opinions and influencing the end product and therefore are positioned closer to the right side and the 'design by' territory. In contrast, Zeta used mostly indirect tools for involving end users and aligned with the IA (design for) approach did not capitalise on end users' suggestions who could influence the end product. On this basis, the figure suggests that the higher the degree of overall

involvement, the more direct tools will be employed and the more influence the end user will have on the end product.

Furthermore, while it is apparent that larger companies involve their end users frequently and in a much more structured manner, this does not necessarily mean that they are more deeply involved. Overall, whereas prior literature has intensively discussed the importance of different end user types on different NPD phases (e.g. Enkel et al. 2005b; Herstatt and von Hippel, 1992; Jespersen, 2010), this study argues that according to the empirical evidence, of equal or perhaps higher importance is also the ways end-user involvement is facilitated and controlled and the openness of NPD teams towards encouraging and accepting end users' meaningful feedback.

Putting together the findings presented and discussed on the above sections, the study suggests that for companies to have successful end-user involvement in NPD which provides opportunities for creating (new) superior products, improving new product success and gaining competitive advantage the following questions should be considered: Is there a defined purpose and clear objectives for end-user involvement? Has the company invested on a sufficient and clear plan regarding allocation of resources (time, budget, space)? Is the NPD team open enough in accepting, considering and integrating external knowledge coming from end users? Are there mitigation measures in place to overcome restrictions coming from regulations and policies? If the answer to the above questions is "yes", then the contingency framework presented on table 6.7 may assist companies to make more informed decisions for selecting and following the most appropriate approach to end-user involvement.

Table 6.7 Contingency framework for end-user involvement approach selection

	Design for	Design with	Design by
Culture	Generally, not very open to receiving external knowledge. End users may have limited influence to end product.	Open to receptivity of external knowledge but somewhat suspicious. Blind trust to company's NPD and R&D teams. End users may have some influence to end product.	Open to receptivity of external knowledge. Intentionally allow and support end user influence on the end product.
Commitment	NPD team has very sporadic contact with end users.	NPD team in frequent contact with end users. May require follow-up activities (although not always the case).	NPD team in continuous contact with end users. Intensive collaboration. End users are considered to be part of the NPD team.
Resources	Use of indirect type of tools for involving end users. Not very time-consuming.	Use of combination of direct and indirect type of tools for involving end users. Relatively time consuming.	Use of mostly direct tools for involving end users. Time consuming.
NPD phase	Applied in middle and/or late NPD phases.	More applicable for early NPD phases (after concept development) and middle NPD phases. Emphasis on concept development and on prototype testing phases.	May be applied throughout NPD process.
Distinct benefits*	Identifying end users' needs. Increase on number of ideas generated. Opportunity for reconsidering company's strategy.	Identifying end users' needs. Better planning of NPD process. Increase product success rate. Increase confidence of employees on project.	Identifying end users' needs. Knowledge exchange between end-users and NPD team.
Main challenges*	Managing and organising information from end users. Organising end-user involvement.	Organising end user involvement	Managing end user involvement
Most appropriate for	Simply testing and choosing among predefined product characteristics and predefined solutions. Captures need-related information.	Ensuring that the project is on the right path by frequently evaluating and validating existing solutions with end users and by offering opportunities to end users for small changes on product designs. Captures needs-related and solution-related information.	Companies who invest on and trust that their end users may come up with new or different ideas and solutions. Captures needs-related and solution-related information.

*These should be considered in addition to the general benefits and challenges discussed in earlier sections.

6.9 Chapter Summary

This chapter presented and discussed the findings of the cross-case analysis. Benefits, challenges, and tools and phases for end-user involvement for each of the three approaches were provided in detail, compared and discussed against existent academic literature. PD, OI and IA were found to have a different impact on the NPD process in terms of the benefits and challenges they entail. Subsequently, it was discussed that the appropriateness of each approach depends on four situation-specific factors: i) a company's defined purpose for end-user involvement, ii) a company's culture and receptiveness to external knowledge, iii) industry associated regulations and policies and iv) a company's resources. Furthermore, the findings elicit that the degree of involvement and the way end users get involved in the NPD process have a significant impact on end users' influence in specific NPD phases and on the end product. Chapter 7 will discuss the conclusions of the study directly in relation to each of the research questions. Moreover, the key theoretical, managerial and methodological contributions will be outlined. The chapter will conclude by acknowledging the limitations of this study and with outlining directions for future research.

Chapter 7: Conclusion

The previous chapter presented, discussed and reflected upon the findings of the study. This chapter is the final part of this thesis, and it starts by providing an overview of the overall research. Following this, the research questions are answered according to the findings of this study and the main conclusions are highlighted. Next, section 7.4 outlines the theoretical, managerial, and methodological contributions of the study. The chapter concludes with acknowledging the study's limitations along with discussing and suggesting directions for future research.

7.1 Research Overview

The overall aim of this research study was to investigate and get a deeper understanding of how end users are involved in and influence the NPD process and the end product. To achieve this, the study mapped out the extant literature in order to uncover the contemporary notion around end-user involvement in NPD. This resulted in pinpointing key challenges in NPD, outlining end-user co-creation within the NPD context, and identifying and discussing different levels of end-user involvement and different roles end users can take in the NPD (sections 3.1 and 3.2). Subsequently, three different approaches to end-user involvement in NPD arose to act as representatives of the different levels of end-user involvement in NPD (section 2.3). Specifically, participatory design (PD) to represent 'design by', open innovation (OI) to represent 'design with', and the instrumental approach (IA) to represent 'design for'.

These three approaches formed the basis for conducting a systematic literature review with the purpose to offer a multi-level and multi-perspective review for identifying and synthesising the diverse empirical literature on this topic. After setting search criteria and using three databases (Google Scholar, Scopus, and Ebsco), 99 empirical studies were identified as relevant. The extensive examination of the identified relevant studies revealed that: (i) a limited number of studies had looked directly at the impact of end-user involvement, resulting in a shortfall in the understanding of end-user involvement in NPD; (ii) literature tend to emphasise the benefits and neglect the challenges of end-user

involvement which have led to a poor understanding of the conditions, outcomes, and effects of end-user involvement in NPD; (iii) the literature rarely distinguished between distinct approaches or methods of end-user involvement in NPD; (iv) the majority of the studies focused on discussing end-user involvement on specific NPD phases (e.g. initial phases). The last two findings indicated that there is no solid evidence in the literature to substantiate how best involving end users is related to successful NPD. Subsequently, the outcomes of the systematic literature review led the study to focus on exploring key issues including how and why companies decide to involve end users in the NPD process and investigating how this involvement affect specific NPD phases and what is the influence of end users in the end product. Accordingly, these key issues were reflected in the research questions of the study (section 2.6).

Considering the research aim and research questions, the study employed an interpretive, qualitative multiple case study methodology. In total six case studies were conducted consisting of companies varying in sizes and industries. Semi-structured interviews were the main instrument for collecting data and exploring managers' and NPD teams' perspectives on end-user involvement in NPD. Additionally, these were triangulated and complimented with documentations as well as non-participant observations (section 4.4). In line with the nature of this research's aim and research design, a thematic approach to analysis was followed. After that, the findings from the analysis of the six cases were presented and the emergent themes from each case were highlighted. In particular, a detailed case description of each company and its experience with end-user involvement in NPD enabled to obtain familiarity with each case before conducting the cross-case analysis (Chapter 5).

The cross-case analysis (Chapter 6) assisted in identifying similarities and differences among the six cases and resulted in findings which were then linked, compared, and discussed against the existing perspectives found in prior literature. This enabled for drawing a more holistic picture of the three different approaches for end-user involvement in NPD and a comprehensive understanding of their key elements (tools, phases, benefits and challenges). On this basis, it was found that the three approaches are best used for different situations and have a different impact on the NPD process. Conditions for increasing the

likelihood of successful end-user involvement in NPD were also identified. However, these and other key findings will be discussed in the following sections in relation to the research questions and through the research's contributions.

7.2 Return to the Research Questions – Main Conclusions

7.2.1 Conclusions for Research Question 1

The first research question of this study was twofold and was concerned with: *'How and why are end-users involved in the NPD process?'*. First, this research question aimed at investigating how NPD teams choose the different tools and NPD phases for involving end-users into the NPD process. Second, the research question aimed at identifying what benefits companies are hoping for as well as what the drawbacks and challenges are that companies are concerned about and have experienced when involving end-users in their NPD processes.

The study concluded that in relation to when in the NPD process end users get involved, the different approaches to end-user involvement (i.e. OI, PD and IA) are suitable for certain NPD phases. When following a PD approach, end-users play an active role throughout the NPD process, and they are involved in decision-making about the characteristics and functions of the product. On the contrary, in OI and IA, end users usually are not trusted to play an active role in the initial generation of new product ideas. Typically, end users are contacted after the company has developed a new concept for a product in order to evaluate it. Nevertheless, perhaps the most interesting finding here is that across the three approaches, end-user involvement is more intense and is seen as most important during the concept development phase and the prototype development and testing phases. This contradicts with the discussions in the current literature that the value of end-user involvement diminishes during the development (middle) NPD phases and that end users should be involved much earlier than in prototype development phase (Chang and Taylor, 2016: 58; Daecke et al., 2015: 420; Enkel et al., 2005: 43, Gruner and Homburg, 2000: 12; Roberts and Darler, 2017: 29). At the same time, it would be false to imply that end-user involvement is not beneficial in early NPD phases. The findings of this study showed that most companies value early end-user involvement as it may reduce risks and save them

from mistakes; which is consistent with prior literature (e.g. Gruner and Homburg, 2000; Jahanmir and Lages, 2015; Wu and Fang, 2010). Furthermore, the study supports that whereas end users may be involved in late NPD phases, this happens primarily for communication or promotion reasons and therefore has no impact on the product itself. Overall, whereas the three approaches were found to be better applicable in different NPD phases, the findings also support that end-user involvement is most beneficial during the concept development and prototype development and testing phases.

Regarding the tools employed for involving end users in the NPD process, the study concludes that the three approaches favour different types of tools. Specifically, PD employees mainly direct type of tools (e.g. brainstorming, mock-ups), OI both direct and indirect (e.g. surveys, diaries), and the IA traditionally uses indirect tools. However, this is not surprising if one considers the differences in the degree of end-user involvement among the three approaches. A very interesting finding arising is that in any of the three approaches, web-based tools are hardly used for involving end users. This finding does not reflect the notion in the literature which investigates and discusses many practical applications of how online technology is used for better integrating end users in the NPD process (e.g. Antorini and Muñiz, 2013; Füller and Matzler, 2007; Tsimiklis et al., 2015; Wu and Fang, 2010). The companies in this study only made occasional use of basic online tools (such as online surveys or online forums). In this respect, the main reasons for not using web-based tools were (i) that the gathered information may not be accurate and ii) information and ideas may be stolen by competitors. Furthermore, the companies were not aware of more advanced web-based tools such as virtual design platforms or animated 3D models. Hence, perhaps the issue lies with companies not being exposed to new, more contemporary, and more advanced web-based tools and technologies.

Concerning the benefits of end-user involvement in NPD, six sets of benefits were identified as contributing to more successful NPD processes (Table 6.2). All three approaches were found to be beneficial for identifying end users' needs, reducing the uncertainty of product designs, and increasing number of ideas. These benefits have been widely discussed in prior literature (e.g. Ahmed and Amagoh, 2010; Dahlsten, 2004; Hussain et al., 2012; Suteu and Buzatu, 2014; Wilkinson and De

Angeli, 2014; Xiong et al., 2016). However, and among other benefits, each of the approaches was found to have some more distinct benefits. For instance, in PD, the mutual benefits of NPD teams working closely with end users were emphasised in the form of knowledge exchange. Specifically, it was found that end users were able to acquire new skills and accordingly, NPD teams benefited from gaining new knowledge from end users which they could use in other projects. This is something that to best of the researcher's knowledge has not been investigated in literature in the NPD and innovation domain. Furthermore, it was found that in comparison to the other two approaches, OI may enable benefits related to better planning for NPD (e.g. better insights to product requirements), and to increasing success rate of products; which in large have also been discussed in past studies (e.g. Daecke et al., 2015; Dahlsten, 2004; Filieri, 2013). Additionally, the study adds to the current literature by finding that OI is also beneficial for increasing NPD team's efficiency by increasing confidence to work on a project and contributing into solving disagreements with the NPD team. Finally, in the IA among other benefits, a new perception was captured that when involving end users to the NPD process, the company is enabled to reconsider its strategy and product offerings. Hence, the study concludes that whereas involving end users in NPD may bring typical benefits such as better identifying end users' needs, some other benefits are more likely to be achieved by following one of the three approaches to end-user involvement.

Regarding the challenges of end-user involvement in NPD, some challenges were found to confirm previous empirical studies and also a number of new challenges were identified which have not been explicitly discussed in prior literature (Table 6.3 and Figure 6.2). Difficulties in articulating end users' needs and suggestions are one of the most cited challenges in the literature independently of the approach followed by companies (e.g. Cui and Wu, 2016; Enkel et al., 2005a; Schaarschmidt and Kilian, 2014; Lahti and Seitamaa-Hakkarainen, 2005; Martins and Aspinwall, 2001). However, only three out of the six companies in this study were found to face difficulties in articulating end users' needs. This is an issue especially for the companies who are following a PD approach. In this matter, the findings of this study lend support to Lahti and Seitamaa-Hakkarainen's (2005) view that the lack of common language between end users and NPD teams may limit dialogue and exchange of ideas. However, as it was supported by the

participants of this study, this challenge may be minimised if experienced NPD members are the ones involved and dealing with end users. Furthermore, this study advanced previous research by finding that end-user involvement following a PD approach faces challenges which are related mainly to appropriately managing end-user involvement (e.g. end users' constant requests for design changes). This type of challenges is more evident in PD (than any of the other approaches) perhaps due to very close collaboration between NPD teams and end users and due to end users often being actively involved in decision-making processes. Differently to PD, and in line with previous research studies (e.g. Cui and Wu, 2017; Enkel et al., 2005a; Jespersen, 2010) end-user involvement through OI was found to be challenged mainly by appropriately organising end-user involvement (e.g. finding the right type of end users) and managing communication in heterogeneous groups (e.g. different personalities). Additionally, the findings highlighted that appropriately organising end-user involvement (e.g. finding enough end users) and managing information and knowledge (e.g. accepting end users' feedback) are the main challenges for companies following the IA. However, managing information provided by end users may be directly affected by a company's culture (openness to accept new or external knowledge) and therefore it cannot be assumed that this challenge affects every company following IA. Finally, the complexity of products poses a challenge for companies following an OI or a PD approach to end-user involvement. The PD literature has highlighted that the more complex the product the more challenging will be to identify and associate end users' needs (Palls et al., 2008). Whereas similar suggestions have been made for the IA (e.g. Cristiano et al., 2000) the findings of the study could not confirm that. Also, in previous literature, the complexity of products has not been identified as a challenge for end-user involvement in an OI approach. Overall this study posits that success of involving end users in the NPD process may be affected by different challenges that companies have to face depending on the approach they follow.

In view of all the above findings, this study concludes that the three different approaches to new product development emphasise different tools and articulation of end-user requirements across different NPD phases. While all three approaches involve end users throughout the NPD process, there is common agreement that the most important times to involve end users is in the concept

development and in the prototype development and testing phases. Moreover, the three approaches are positioned differently on the benefits and challenges of end-user involvement. All the above findings regarding tools, phases, benefits, and challenges, resulted in a revised holistic overview (Figure 6.2) which was presented in Chapter 6.

7.2.2 Conclusions for Research Question 2

The second research question of this study was concerned with: *'What are the effects of end-user involvement in each successive phase of the NPD process?* This research question looks into the different effects that end-user involvement may have throughout the NPD process and specifically in each one of the NPD phases.

The study found that end-user involvement through the PD (design by) approach has a strong impact throughout the NPD process. More specifically, in the initial NPD phases, end users are able to propose new ideas for products, product characteristics and concept designs. At the same time, end users work closely with NPD teams to revise, improve, and select the final concept design. During the middle NPD phases, initial prototypes are developed by the NPD team according to the concept design. After that, an iterative process follows where end users are invited to test and give feedback on prototypes. This process ends with the NPD and end users agreeing mutually on the final product prototype. In the late NPD phases, depending on the product and its characteristics, end users may have an impact in tuning the last details (e.g. cloth sizing) before the product enters production. Hence, the study concludes that end-user involvement through a PD approach may strongly impact designs and decisions throughout the NPD process. This finding confirms previous literature (Cui and Wu, 2017; Damodaran, 1996; Neale and Corkindale, 1998: Sanders and Stappers, 2008) which found that end users can have a very active role in the NPD, influence decisions, and become co-creators of new products

Regarding end-user involvement following the OI (design with) approach, the findings of this study support that end users have a moderate impact during the overall NPD process. This happens because managers and NPD teams are always in control of defining the end-product characteristics. Even when end users are asked

for their opinion and suggestions, their empowerment happens with control. More specifically, although end users are involved in early NPD phases (e.g. idea generation and concept development), they are found to hardly have any strong impact on the product under development. This is because end users are involved in validating or selecting among pre-defined solutions and ideas. However, in the concept screening phase, for most companies, it is the first time that end users are actively involved with the purpose to evaluate concept designs and propose their own ideas and suggestions. Coming to the middle NPD phases, it is only during the prototype testing phase when end users are able to strongly influence designs and decisions. However, it is somewhat questionable how valuable their feedback and suggestions could be in such a late phase where there is no space for fundamental or very meaningful changes on already defined prototypes. Finally, end users are rarely involved in the late NPD phases in which their input is similar to the very initial NPD phases (to select among predefined solutions). Considering all the above, this study concludes that end-user involvement through an OI approach may only have a moderate impact on designs and decisions throughout the NPD process. This finding confirms the notion in the literature (Damodaran, 1996; Nambisan, 2002; Olsson, (2002) that in a 'design with' (OI) approach end users act as consultants and generally have little influence on decisions concerning the end product.

When investigating end-user involvement following the IA (design for) the study found that end users have little to no impact during the NPD process. During the initial NPD phases, end users may be involved only in the concept development phase. By doing so, end users may affect decisions on the concept that will be selected to progress to the next NPD phases. End users may also be involved in testing prototypes and whereas they are actively involved and thus have great potential in influencing decisions, in reality, this study found that their impact is minimal. Also, in the market-test phase end users are involved in a similar way as in the prototype testing phase; nevertheless, they still have little to no impact on the product. An explanation for that is that the company does not appropriately or adequately organise and facilitate the involvement activities in order to gather valuable information and suggestions from end users. Also, the findings have shown that in cases although end users' opinions and suggestions are recorded, the company chooses not to follow them. As a result, this study concludes that

end-user involvement through an IA (design for) approach has no to little impact on designs and decisions in the NPD process. This confirms prior studies (Nambisan, 2002; Olsson, 2004) who have suggested that in such passive roles, end users have little contributions on the NPD.

Overall, in response to the second research question the findings of this study provide support to the existing literature by suggesting that the impact of end-user involvement in specific NPD phases depends on the approach followed. More specifically, regarding end users' effects on the NPD process, it is posited that end-user involvement through PD may have strong impact, end-user involvement through OI may have moderate to little impact, and end-user involvement through IA may have little to no impact.

In addition, building on the findings of research questions one and two, the study concludes that the appropriateness of each approach, as well as the impact it may have on the NPD process, depends on four situation-specific factors. These include i) a company's defined purpose for end-user involvement, ii) a company's culture and receptiveness to external knowledge, iii) industry associated regulations and policies and iv) a company's allocation of resources. Moreover, experience in an industry and prior experience with end users do not seem to affect successful end-user involvement in NPD activities. Hence, when a company decides to involve end users in the NPD clear NPD strategy and clear objectives need to be set and decisions need to be made in advance regarding what and how the company is willing to invest in this involvement.

7.2.3 Conclusions for Research Question 3

The third research question of this study was concerned with: '*What is the contribution of end-user involvement to the (design and functionality of the) end product?*'. This research question aims at investigating the influence that end-user involvement may have on the overall design and functionality of the end product. It is also seeking to understand the importance of involving end-users in the NPD process.

The study found that in all approaches, end-user involvement is seen as crucial for reducing risks and helping in developing more appropriate products. In addition to this, in PD end users' input is also recognised as very important for the survivability of the company. Furthermore, as it was uncovered when answering the first two research questions, end users are given a number of opportunities to actively participate in the NPD process, express their suggestions and influence the end product. However, depending on the approach a company follows, end-user involvement varies in terms of frequency and level of involvement. For example, in all approaches end users may be involved throughout the NPD process but in PD, they have a very active role in comparison to IA, where end users have a rather indolent role. Nevertheless, giving opportunities to end users to actively participate in the NPD process, does not necessarily mean that all their suggestions will be followed and appear in the end product. At the same time, even when not all of end users' suggestions are followed, there is still an opportunity for having an important contribution to not only the appearance but also the functionality of the end product. Hence, building on the arguments for answering all three research questions, the study concludes that the prospect of end users successfully influencing the end product depends on the way end-user involvement is being facilitated and controlled, and the openness (or not) of NPD teams in working with end users. This means that the impact of end user in the NPD process and the end product and the potential successful outcomes are largely dependent on the counterpart. A similar view has been discussed recently by Roberts and Darler (2017) who support that co-creation activities are contingent upon the level of end-user involvement that a company is adopting, and also upon the purpose of being involved. Overall, this study suggests that the higher the degree of overall involvement, the more direct tools will be employed and the more influence the end user will have on the end product (irrespectively if all end users' suggestions are followed or not).

7.2.4 Conclusions Related to Additional Findings

The findings discussed in regard to the research questions also provide insight on three more points which are related to the end-user involvement in NPD. These will be discussed in the following paragraphs.

First, the dominant view in existing literature (e.g. Herstatt and von Hippel 1992; Karagozoglou and Brown, 1993; Lettl, 2007) is that end-user involvement leads to faster and less costly NPD processes. However, this study argues that irrespectively of the approach, involving end users in the NPD process is a time-consuming and costly process. Nevertheless, the study is in line with the findings of Merter and Hasirci (2016) and Reed et al., (2016) and concludes that although some difficulties related to cost and time are recognisable, end-user involvement allows companies to develop more appropriate and successful products. At the same time, the study posits that the decision on when and how to involve end users is based mainly on potential benefits end-user involvement in NPD can offer, rather than in conjunction with practical and resource-based criteria.

Second, this study found that when deciding to involve end users in the NPD process companies are selecting them in a relatively random fashion. Specifically, the selection is based mainly on demographic or segmentation criteria (e.g. existing consumers of the product). Less frequently, the companies may invite end users with some kind of expertise; however, that highly depends on the nature of the project and even then, the selection criteria are flexible. At the same time, prior literature (e.g. Enkel et al. 2005b; Herstatt and von Hippel, 1992; Jespersen, 2010) has intensively discussed the importance of different end user types on different NPD phases. However, for the investigated companies in this study the end user type, as discussed in the literature, is not a concern. Furthermore, considering all the findings discussed in the previous sections, it is unlikely that the end user type will have a significant effect on the approach a company follows for end-user involvement. To elaborate, lead users or requesting customers may not be able to provide meaningful contributions if they are involved in NPD processes within a company following the IA. In contrast, the same type of end users will have a greater impact if the company follows a PD approach and is therefore by nature more open to external inputs. Hence, the study concludes that whereas the importance of end user' type is not in question, of equal or perhaps higher importance are the way end-user involvement is facilitated and controlled and the openness of a company towards encouraging and accepting end users' feedback.

Third, the findings of this study provide an interesting insight on reasons that may keep companies from implementing changes according to end users' requests. Whereas a number of reasons were identified (see Table 6.6) the most common ones include economic constraints and impact that the change may have on the functionality of the product. Perhaps the most surprising finding was that some companies may occasionally perceive end users' requests as not important and therefore automatically decline them without giving any consideration.

Overall the purpose of this section was to provide answers to the research questions that lead this research and to discuss all the main findings of the study. In the next sections, the discussion will turn in to the contributions and implications these findings have on theory and practice.

7.3 Research Contributions and Implications

This research study provides important contributions and novel insight into the growing body of research that has sought to investigate and enhances our understanding on how end users are involved in and influence the NPD process and the end product. While most existing literature concerning the effects of end-user involvement in NPD provides some general statements, this study yields more specific insights. Overall, this study provides an answer to the continuing call in the literature for more insight on how end users get involved in NPD in terms of their roles and contributions, what the capabilities are for managing and leveraging end users as a resource of NPD (Coviello and Joseph, 2012; Laage-Hellman et al., 2014; Roberts and Darler, 2017), and a closer examination on the conditions under which end-users act as effective co-creators in NPD (Gemser and Perks, 2015; Gruner and Homburg, 2000). Table 7.1 provides an overview of the research findings and what these means in terms of contributions and implications.

Table 7.1 Overview of findings and contributions

Findings	Related research in extant literature	Contribution
The 'design by', 'design with' and 'design for' approaches are three different ways to end-user involvement in NPD that have not been distinguished very well in current literature. They were found to: • come with different challenges and benefits • use different set of tools • are targeting different NPD phases	Previous literature has looked mostly into benefits (Gemser and Perks, 2015 and Mahr et al.,2014 are also supporting this point) and has not conducted in-depth qualitative investigations and comparisons between the three selected approaches of end-user involvement. Previous studies (e.g. Filieri, 2013) usually focus on investigating a specific NPD phase.	Empirical identification of *challenges* (rather than only benefits) associated to end-user involvement. A holistic overview (figure 6.2) of the three approaches has been determined *clarifying and extending knowledge on benefits and challenges, tools and phases of end-user involvement.* *Contributes to the development of contingency framework that provides original contribution to knowledge (table 6.7) which form the first contribution of this study.*
End-user involvement is more beneficial in concept development, prototype development, and testing phases	Generally, it is suggested that the end users should be involved early on in the NPD process (e.g. Chang and Taylor, 2016; Enkel et al., 2005) Daecke et al., (2015) support that involving end users in the design and development phases is not helpful Gruner and Homburg (2000) suggested that end-user involvement has no effect in the middle phases of the NPD	*Empirical findings on this matter contradict the suggestions on current literature. This is an indication that further investigation is needed and forms the second contribution of this study.*
Companies choose to not make use of (web) technology-based tools	Previous literature (e.g. Antikainen et al., 2010; Antorini and Muñiz, 2013; Kohler et al., 2011; Prugl and Schreier, 2006: 247; Tsimiklis et al., 2015) has investigated and has highlighted many practical applications and benefits of using (online) technology to involve end users in the NPD process. Füller and Matzler (2007) for example have explored how companies utilise virtual prototypes to engage end users and they are supporters of using web-based technology for involving end users	*Empirical findings on this matter contradict the suggestions on current literature. This is an indication that further investigation is needed and forms the third contribution of this study.*
Identification of four situational specific factors as key to more effective end-user involvement. These include i) a company's defined purpose for end-user involvement, ii) a company's culture and receptiveness to external knowledge, iii) industry associated regulations and policies and iv) a company's allocation of resources. Experience in an industry and prior experience with end users does not affect successful end-user involvement in NPD activities.	Enkel's et al. (2005b) and Lettl (2007) suggest that a company should pay attention to the NPD team's and managers' social and professional competencies and motivation for involving end users in the NPD. It is generally suggested that large companies may be utilising end-users more frequently as they have more financial and operational resources (e.g. Gray and Mabey, 2005; Nicholas et al., 2011) Roberts and Darler (2017) propose that co-creation activities are contingent upon the purpose of being involved.	Empirical findings open a discussion in literature about considering and managing conditions for when a company decides to involve end users in the NPD. This study posits that clear NPD strategy and clear objectives need to be set and decisions need to be made in advance regarding what and how the company is willing to invest in end-user involvement. *This new scholarly knowledge provides new understanding and guidance for managers for better involving end-users in the NPD process and forms the fourth contribution of this study.* *Contributes to the development of contingency framework that provides original contribution to knowledge (table 6.7).*

Decision criteria for involving end users is based mainly on potential benefits end-user involvement in NPD can offer, rather than in conjunction with practical and resource-based criteria. Companies do not consider different end-user types. Selection is based mainly on demographic or segmentation criteria.	Prior literature (e.g. Enkel et al. 2005b; Herstatt and von Hippel, 1992; Jespersen, 2010) has intensively discussed the importance of different end user types on different NPD phases.	The empirical findings of the study suggest that while the importance of end user' type is not in question, of equal or perhaps higher importance are the way end-user involvement is facilitated and controlled and the openness of a company towards encouraging and accepting end users' meaningful feedback. *Empirical identification and unique insights on how a company decides on whether to involve end users in the NPD process. This forms the fifth contribution of this study*
The prospect of end users successfully influencing the end product depends on the way end-user involvement is being facilitated and controlled, and the openness (or not) of NPD teams in working with end users. While the level of end-user involvement has strong impact on NPD outcomes, frequency of end-user involvement does not necessarily impact new product outcomes.	In the limited extant literature, Roberts and Darler (2017) support that co-creation activities are contingent upon the level of end user involvement that the company is adopting and upon the purpose of being involved.	The empirical findings of this study suggest that the higher the degree of overall involvement, the more direct tools will be employed and the more influence the end user will have on the end product (irrespectively if all end users' suggestions are followed or not). More specifically, regarding end users' effects on the NPD process, it is proposed that end-user involvement through PD may have strong impact, end-user involvement through OI may have moderate to little impact, and end-user involvement through IA may have little to no impact. *This* in-depth study *confirms and further supports extant literature, and this forms the sixth contribution of this study.* *Contributes to the development of a contingency framework that provides original contribution to knowledge (table 6.7).*
Identification of reasons that may keep companies from implementing changes according to end-user feedback and suggestions.	Not identified discussion in extant literature.	*The seventh contribution of this study is the development of comprehensive list of factors leading NPD teams to decline end users' requests (table 6.6)*. The empirical findings point that among other reasons, end users' requests may be perceived as not important by some companies and they will be automatically declined without any consideration. *This could further confirm and support arguments that (organisational) culture is very important for successful end-user involvement*.

7.3.1 Theoretical Contribution and Implications

Specifically, the first theoretical contribution of this study is the development of a novel, holistic overview (figure 6.2) and a contingency framework (table 6.7) on three different approaches for end-user involvement in NPD. Previous research (e.g. Filieri, 2013) tends to mainly focus and investigate end-user involvement in a specific NPD phase. This thesis provides the first qualitative study to investigate and compare the effects of three different levels of end-user involvement in each NPD phase in a business-to-consumer context. The consideration and investigation of three different approaches together allow for a more coherent conceptualisation of the role of end-users in developing new products. As a result, the developed integrative and coherent holistic overview and the original contingency framework (table 6.7) allow for simultaneous comparisons between three approaches to end-user involvement in NPD and identifies a number of different benefits and challenges which may influence the successful implementation of each approach. This is different from previous literature which has focused mostly on the benefits of end-user involvement and has neglected the challenges (Gemser and Perks, 2015).

Furthermore, the holistic overview and contingency framework give valuable insights on when and how end-user involvement is best embedded in NPD for each of the approaches which form the second contribution of the study. The literature suggests that in order to achieve better results, end users should be ideally involved in the early NPD phases (Chang and Taylor, 2016: 58; Daecke et al., 2015: 420; Enkel et al., 2005: 43, Gruner and Homburg, 2000: 12; Roberts and Darler, 2017: 29). However, this study has found that whereas the three approaches are better applicable in different NPD phases, end-user involvement is most beneficial during the concept development and prototype development and testing phases.

The third contribution of this study emanates from the contradicting suggestions in the literature that online tools can be very beneficial for end-user involvement (Hess et al., 2005; Lahti and Seitamaa-Hakkarainen, 2005). Differently, this study posits that companies hardly use web-based tools when interacting with end users.

The above findings help to extend our theoretical knowledge and add significant value to research within the end-user co-creation and NPD domain.

The fourth contribution of this study is the identification of four situation-specific factors that may affect the appropriateness of each approach for end-user involvement in NPD. These include: i) a company's defined purpose for end-user involvement, ii) a company's culture and receptiveness to external knowledge, iii) industry associated regulations and policies and iv) a company's resources. Although previous literature (e.g. Roberts and Darler, 2017; Laage-Hellman et al., 2014) has implicitly touched on these factors, they have never been brought together in a study with a focus on end-user involvement in NPD. Moreover, this study found that experience in an industry and prior experience with end users does not affect successful end-user involvement in NPD activities. These factors advance our understanding of the conditions under which customer participation can be a viable strategy for companies.

The fifth contribution to knowledge comes from the evidence that when companies decide to involve end users in the NPD process, they are not very concerned about the difficulties in cost and time that this involvement may entail. More specifically, the decision on when and how to involve end users is based mainly on potential benefits end-user involvement can offer, rather than in conjunction with practical and resource-based criteria. Although this is not necessarily a good practice, this finding expands our knowledge on how a company evaluates decisions regarding inviting end users to participate in NPD.

The sixth contribution of this research is the identified relationship between the level of end-user involvement, the use of direct tools, and the influence on the end product. In this sense, it was found that through the PD approach end users may have a strong impact throughout the NPD process and a strong influence on the end products. End users' strong impact and influence is found to diminish through the OI approach and becomes even less to almost non-existent through the IA. Hence, this study has suggested that the prospect of end users successfully influencing the end product depends on the way end-user involvement is being facilitated and controlled, and the openness (or not) of NPD teams in working with

end users. This finding contributes significant value to the current literature as it has not been established in any previous studies.

Finally, the seventh contribution of this study is the identification of specific reasons as to why companies choose not to implement changes based on end users' feedback and suggestions. Apart from the apparent reasons such as economic constraints and impact on products' functionality, a number of other reasons were identified. The findings on this matter contribute to our knowledge on the evaluation standards and the reasons for not implementing changes requested by end users.

7.3.2 Managerial Implications

The findings reported in this study offer a number of valuable managerial implications. To begin with, the findings of this study are expected to provide direction to managers on selecting and adopting the most appropriate approach of end-user involvement in order and to create more effective and more efficient new product development processes. The three approaches to end-user involvement have proved to be quite different on a number of aspects, and the empirical findings in this study have assisted in building a contingency framework that provides insights for managers as to the main strengths and drawbacks and tools of each approach, and for which phase of NPD each approach is better suited. This study has not only focused on benefits but has also investigated the challenges of each of the approaches and end-user involvement in general. Therefore, it can assist managers to be better prepared as to what to expect, to embrace benefits better and accurately overcome challenges, and to build capabilities for better implementing these approaches. For example, because in PD most challenges are associated with managing end-user involvement, it is recommended that managers should clearly define tasks, responsibilities and decision-making processes between the NPD team and end users and should plan ahead in case of disagreements occur.

Additionally, the findings of the study provide information to show which one of the approaches is best suited and when, depending on a company's goals, resources, and culture. For example, effective involvement of end users in PD is

a resourceful option which is associated with NPD teams workings closely and actively with end users. It is suggested that managers should be well prepared and plan ahead in order to meet these requirements and prevent unnecessary disappointment. In line with this, this study advocates that in order to reap full benefits of end-user involvement in NPD managers should invest in creating an open environment where their employees will be motivated to work along with end users. This perhaps may become achievable if everyone in the company is briefed and aware in advance of the NPD strategy and the benefits and challenges end-user involvement may entail. Hence, it is emphasised that regardless of the approach they choose to use, companies should be equipped with top management support and be ready to invest sufficient resources in understanding customers' needs. This study has developed a contingency framework (table 6.7) which may assist in addressing the above-mentioned concerns and is therefore expected to provide direction to managers for making more informed decisions when collaborating and working with end users.

7.3.3 Methodological Implications

This study is one of the few that have followed a rigorous qualitative multiple case study approach to address the phenomenon of end-user involvement in NPD. A number of previous studies have employed a (multiple) case study methodology to investigate end-user involvement in NPD. However, they have been mostly descriptive in nature and most have adopted a narrow view by focusing for example, in a specific NPD phase or a specific industry. Differently, this study is perhaps the first attempt to qualitatively assess and compare simultaneously three different approaches to end-user involvement in NPD using as sample consumer goods companies from different industries, sizes, and countries. This enabled to acquire a more holistic view of the issue while at the same time allowed for a detailed investigation and understanding of end users' role and contribution in NPD. Moreover, the semi-structured interviews allowed for in-depth discussions which helped to grasp and experience through the eyes of participants who are exposed and involved in NPD processes with end users, what is happening in the field. This assisted in getting below the surface of practices and decisions and to identify new and quite unexpected issues that were not thought of before. Also, having conducted a systematic literature review prior to empirical data collection,

it resulted in developing an initial holistic overview for the three approaches which was based on prior empirical studies on the issue. This, in combination with following an inductive approach to data collection and analysis, allowed to have certain expectations as well as to give space for unexpected issues and explanations to emerge from the data. Finally, the employment of NVivo 12 qualitative data analysis software enabled for effectively and efficiently managing the complexity of the data collected by multiple sources of evidence. This way, the results are considered to be more accurate, transparent and rigorous (Eriksson and Kovalainen, 2008).

7.4 Limitations and Directions for Future Research

The findings and the contributions of this research are somewhat constrained by certain limitations, which are worth noting as they may form opportunities for future research.

First, decisions made during the early design of this research study have some implications on the outcomes and results. More specifically, this study has approached the topic under investigation by adopting a stage gate view of the NPD process, without considering or incorporating other wider perspectives (such as agile or design thinking, or lean start-up). At the same time, the study looked into the end-user involvement phenomenon from a general innovation domain and focused on three specific approaches to end-user involvement in NPD (i.e. PD, OI, and IA) which acted as cases of conceptualisation for representing three different levels on end-user involvement (i.e. design by, design with, design for). These decisions have an impact on the returns of relevant extant research studies from the systematic literature review and might contribute to limiting the inclusion of some other interesting and helpful literature or perspectives on the topic. Nevertheless, this study can be extended to include more conceptualisations of different ways for end-user involvement in NPD such as agile product development or design thinking. Also, the findings of this study may be used as foundation for designing and conducting research on some more focused areas. For example, it is suggested that theoretical perspectives related to knowledge management or organisation culture may be used in future research for testing and consolidating some of the findings of this study.

Second, although the number of cases employed in this research is sufficient from a theoretical perspective (e.g. Eisenhardt, 1989), the sample is restricted to one to three case studies for each one of the three approaches. Additionally, there were limitations of access provided by case companies to conduct interviews with more participants. This happened only for two case studies (Epsilon and Zeta), and it was mitigated by conducting in-depth interviews with people in top managerial positions who were key in controlling NPD processes and working with end users. In addition, and for all cases irrespectively of the number of participants, documentation (e.g. reports, specification documents, minutes of meetings) were accessed and assessed to validate and complement the data from interviews. Despite these limitations, the data were collected, analysed, (Chapter 4) and presented (Chapter 5) as rigorously and transparently as possible. Therefore, if more case studies were conducted, it would improve the findings, but it is unlikely that it would alter the main conclusions. Along these lines, it is suggested that future research could use more case studies in order to strengthen the basis and perhaps extend the developed holistic overview.

Third, it should be noted that in this research, an explorative qualitative research approach was applied, and the findings were mainly inducted from empirical evidence. Therefore, future research could make use of quantitative research methods for testing the validity of some of the findings across a larger sample.

Fourth, while this study found that end-user involvement is more beneficial in the concept development and prototype development phases, previous research has stated that end users should be better involved in the initial NPD phases. As such additional research is needed to investigate and consolidate in which NPD phases end-user involvement is more beneficial in terms of contributions to product characteristics. Similarly, and with the technological advancements which characterise this era, more research is needed in identifying web or technology-based methods and tools for end-user involvement in different NPD phases.

Fifth, earlier research shows that end-user increases the likelihood of developing more appropriate and more successful products. However, this should be also weighed against the costs in time and money that end-user involvement may bring. Hence, while this study has highlighted benefits of end-user involvement, it has

also identified that there is no conclusive evidence to support that at the same time this practice has a beneficial effect on reducing NPD cost or NPD time. Previous research has also been inconclusive in this matter with studies supporting different views. Hence, it is suggested that further research is needed for getting a better insight into the relationship between end-user involvement and effects on time and cost.

Finally, a sixth opportunity for future research arises from the finding that company culture plays a significant role in successfully involving end users in the NPD process. Although previous research has also supported this observation, it is mainly confronted as a symptom of poor organisational learning in an attempt of companies to avoid ambiguity and inertia (Olson and Bakke, 2001: 392). This only strengthens the argument that there is a lack of studies on explicitly exploring the effects of company culture on end-user involvement in NPD. Therefore, it is suggested that future research could investigate the receptivity of knowledge and information between end users and different NPD departments.

7.5 Chapter Summary

This chapter provided a conclusion to the results and discussions of the research presented in this thesis. First, an overall summary of the study was presented. Following that, the three main research questions were addressed and the main conclusion of each was presented and discussed. Next, the theoretical contribution of this study along with the managerial implications and methodological implications were outlined. Finally, the limitations of the research were acknowledged, and future research recommendations were presented. It is anticipated that the results of this study will be of value to contribute to the theoretical understanding of end-user involvement in NPD and provide practical value to managers. It is also hoped that this study will encourage future fruitful work to expand the evidence base and to investigate more deeply this flourishing and exciting research area.

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