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How accounting engages with the process of innovation in new product development

Loredana Giovanna Smaldore

A research dissertation submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

of the

National University of Ireland

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Declaration

I hereby confirm that this material, which I now submit for assessment on the programme of study leading to the award of Doctor of Philosophy is entirely my own work and has not been taken from the work of others except and to the extent that such work has been cited and acknowledged by me within the text of my work. I also declare that I have not obtained a degree in this University, or elsewhere, on the basis of this work.

Signed:
_____________________
Loredana Giovanna Smaldore

Date: __________________
Abstract

This study examines accounting within contexts involving innovation and New Product Development (NPD). Within the NPD process, multiple participants and heterogeneous rationales are involved and must be coordinated. The overarching research objective of this thesis is to examine the way in which accounting engages with the rationale for innovation during the practical unfolding of the NPD process.

A review of the accounting literature for this thesis reveals a gap in understanding of the role and the impacts of accounting within contexts of innovation and NPD. Previous studies have not considered in-depth the possible interplay between accounting and the mechanisms, the relationships, and the dynamics that underpin the rationale for innovation. Examining the way in which accounting engages with the desires, intentions, motivations for innovation has the potential to contribute to the literature, to offer new understandings of how accounting practices can drive and facilitate NPD processes and, within these NPD processes, innovation objectives.

An in-depth longitudinal case study of an NPD process in a manufacturing organisation was conducted to achieve the research objective of this thesis. The material collected in the field study concentrates on the unfolding NPD practices, including accounting practices, for one specific complete NPD project. The findings of this study demonstrate how accounting, interpreted by using the theoretical concept of boundary object, sustained the process for innovation. The findings also show how accounting led the professionals involved in the NPD process to make choices and compromises during the iterative unfolding of work in progress and prototypes of the new product, interpreted by using the theoretical concept of epistemic objects. Accounting challenged the process, questioned the choices and compromises achieved and opened up spaces for reflection and discussions where new possibilities for innovation emerged within the NPD process. This thesis uses the theoretical idea of ductus to explain how accounting drove the innovation process within the NPD setting.

This study contributes to existing literature on accounting within contexts of innovation and NPD. Drawing upon a novel use and application of the theoretical idea of ductus, the primary contributions of the thesis consist in examining how accounting stimulates

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new opportunities for innovation in shaping pragmatic and feasible solutions within the new product innovation process. This study also contributes to the specific strand of literature that portrays accounting as having the potential to bring together and mediating among multiple parties within the NPD process. In doing so, this thesis increases understanding of the enabling role of accounting in the NPD process, given its use from a variety of participants with different backgrounds. Furthermore, the thesis advances the discussion in the literature on firmness and flexibility within product innovation settings. Finally, the contributions to practice, identified and presented in this thesis, demonstrate how embracing accounting practices may contribute to the unfolding of innovation processes within organizations.
Acknowledgements

First and foremost, I wish to express my gratitude to my supervisors Dr. Geraldine Robbins and Prof. Cristiano Busco for their support during this PhD process. Their insightful comments, questions, suggestions stimulated the research for this PhD from various perspectives.

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I am grateful to the staff involved in this case research for having participated in the study.

Finally, I would like to thank my family, for their moral support during this PhD course.
List of Acronyms and Abbreviations

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<th>Description</th>
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<td>ANT</td>
<td>Actor Network Theory</td>
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<td>MCS</td>
<td>Management Control Systems</td>
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<td>NPD</td>
<td>New Product Development</td>
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<tr>
<td>PDD</td>
<td>Product Description Document</td>
</tr>
<tr>
<td>PMO</td>
<td>Project Management Office</td>
</tr>
<tr>
<td>QDAS</td>
<td>Qualitative Data Analysis Software</td>
</tr>
<tr>
<td>RAP</td>
<td>Resource Allocation Process</td>
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<td>R&amp;D</td>
<td>Research and Development</td>
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<tr>
<td>ST</td>
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Chapter One
Introduction and Overview of the Study

1.1 Introduction
This thesis investigates the relationship between accounting and innovation within the practical setting of the NPD process. This chapter begins with the emphasis assigned to innovation by the European Union and the importance of realising innovation by developing viable new products to launch into the market (in Section 1.2). The concept of innovation within organizational contexts is analyzed in Section 1.3. Then, the background and the motivation for this research are discussed in Section 1.4. This is followed by the outline of the research objective and the research questions of the study (in Section 1.5). Then, the research methodology that has been used to develop the thesis and which enabled the gathering, organizing, and filtering of the empirical evidence collected, with the purpose of answering the research questions and achieve the research objective, is examined in Section 1.6. The key contributions emerged from this study are outlined in Section 1.7, which is followed by the presentation of the structure of this study (in Section 1.8). Finally, Section 1.9 summarizes the key points of this chapter.

1.2 Innovation within the European context
Innovation constitutes a recurrent theme within organizations, are they small or large, private or public. The increasing competitiveness among companies, the uncertainties generated by the continuous changes in the markets, the always quicker technological development of products and the existence of many competitors make innovation a key factor that organizations should consider when they formulate their strategies and manage their processes. This study of accounting within contexts of innovation and NPD is motivated by the importance of innovation which constitutes a significant factor for the success, the survival, the development of every organization. The role of accounting and control within processes of innovation and NPD is also widely acknowledged by the literature on these themes.
The European Union has placed much attention on innovation:

Innovation plays an increasing role in our economy. It provides benefits for citizens as both consumers and workers. It accelerates and improves the design, development, production and use of new products, industrial processes and services. It is essential to creating better jobs, building a greener society and improving our quality of life but also maintaining EU competitiveness in the global market (European Parliament, 2016, p.1).

Europe 2020 is the European Union’s ten-year jobs and growth strategy, launched in 2010 for a smart, sustainable and inclusive economy. The five targets for the European Union in 2020 cover the following areas: employment; research and development; climate change and energy sustainability; education; fighting poverty and social exclusion (ec.europa.eu/europe2020).

One of the seven flagship initiatives of the Europe 2020 strategy is ‘Innovation Union’, with the purpose of improving “the conditions and access to finance for research and innovation in Europe so that innovative ideas can be turned into products and services that create growth and jobs” (European Parliament, 2016, p.2). Horizon 2020 is “the financial instrument which provides for the implementation of the Innovation Union” (European Parliament, 2016, p.2). More specifically, Horizon 2020 is an investment program in research and innovation, aimed at guaranteeing the competitiveness of Europe, in addition to creating growth and new jobs in Europe. This program aims to implement many innovations, discoveries, and revolutionary results, which will be transferred from the laboratories to the market. This will reduce the gap between research and the market, by helping, for example, “innovative enterprises to develop their technological breakthroughs into viable products with real commercial potential” (European Parliament, 2016). To achieve the objectives of driving economic growth and creating jobs, Horizon 2020 focuses on excellent science, industrial leadership and tackling societal challenges (European Commission, 2014, p.7). The aim is to develop world-class science, remove barriers to innovation and make work easier between public and private sectors to deliver innovation. Funding for these initiatives is aimed at ensuring that the best ideas are commercialized as quickly as possible and are then used in the towns, the hospitals, the firms, the shops, and in homes as soon as possible, in order to improve the lifestyle of the individuals (European Commission, 2014, p.7).
1.3 **Innovation within the organizational context**

Innovation has traditionally been portrayed as depending on creative ideas that must be “useful and actionable” (Amabile, 1998, p.78), having a valuable effect on business. In any case, organizations implement innovation to create value by developing new knowledge and/or by using existing knowledge in new ways. The concept of innovation is very broad. This thesis focuses on the concept of innovation within organizations. Damanpour (1991) distinguishes different forms of innovation within specific organizational contexts, such as “a new product or service, a new production process technology, a new structure or administrative system, or a new plan or program pertaining to organizational members” (1991, p. 556). This thesis is based within the specific setting of NPD, the process which implements innovation by creating a tangible asset, i.e. a new product (Davila, 2000).

The development of new products represents a significant challenge for the future of organizations. Therefore, many companies have “revitalize[d], restructure[d], and redesign[ed] their new product practices and processes for better results” (Cooper and Kleinschmidt, 1995, p.390). NPD processes need “to be measured and managed” (Davila and Wouters, 2007, p.851), thus management control systems are afforded a complex role (Booker et al., 2007). The participation, coordination and collaboration of the team in charge of developing the NPD project is fundamental for the monitoring of the process under the criteria of cost, time, and quality (Atkinson, 1999). The research interest of this thesis focuses on the study of the role of accounting, specifically on how accounting practices engage with the multi-disciplinary setting of NPD, in which the actors involved strive for developing and delivering innovation for the new product.

1.4 **Background and motivation for the research**

The research conducted for this thesis is embodied within the realm of management accounting and situated within the literature review on the role of accounting within contexts of innovation and NPD. Innovation has been portrayed as “taking advantage of unexpected opportunities, exceptions, new relationships, uncertain outputs, risk and the possibility of failure” (Davila et al., 2009a, p.282; see also van der Meer-Kooistra and Scapens, 2008). NPD is the process which implements innovation by transforming creative ideas into a new product (Davila, 2000). NPD has been mainly described by the accounting literature as a process of product innovation that is structured around phases
Chapter One: Introduction and Overview of the Study

(Davila, 2000), or stages (Jørgensen and Messner, 2009; 2010), in which multiple and heterogeneous rationales and participants are involved and coordinated (Nixon, 1998).

Up to the nineteen nineties, the literature has predominantly portrayed formal management control systems (MCS) as being detrimental to flexible settings (Abernethy and Lillis, 1995) in general, and to innovation and research and development (R&D) settings (Abernethy and Brownell, 1997) in particular. In more recent studies, control has been portrayed as favouring and extending innovation in low-innovating firms (Bisbe and Otley, 2004; Mouritsen et al., 2009). Also, accounting and control can be seen to reduce innovation in high-innovating firms (Bisbe and Otley, 2004; Mouritsen et al., 2009; Bisbe and Malagueño, 2009). Accounting and control, as part of MCS, inspire and encourage the flexibility and the motivation required for creativity and innovation, while at the same time channelling and directing creative ideas, and coordinating the multiple activities they entail towards a valuable innovation (Adler and Chen, 2011; Davila and Ditillo, 2013; Chiang and Hung, 2014).

Within NPD settings, accounting and control/firmness (underpinned by structures, rules and formalizations) and creativity/flexibility (characterized by the need for adaptations and changes for innovation) may be managed and balanced within boundaries of (minimal) structures (Tatikonda and Rosenthal, 2000; Kamoche and Cunha, 2001; van der Meer-Koistra and Scapens, 2008; 2015). By mediating between different actors and domains, accounting calculations engage with, and intervene within, processes of innovation (Miller and O’Leary, 2007; Christner and Strömsten, 2015; Revellino and Mouritsen, 2015). They influence and stimulate the course of action during these processes (Christner and Strömsten, 2015; Revellino and Mouritsen, 2015). Finally, the NPD process has been depicted as a space where multi-disciplinary and heterogeneous participants are involved (Nixon, 1998; Jørgensen and Messner, 2010) and may deal with accounting. Encounters between different experts take place during innovation processes and can lead to hybrid practices or to the creation and emergence of hybrid expertise (Caglio, 2003; Kurunmäki, 2004; Miller et al., 2008).

Although the multiple and constructive insights acquired from the literature reviewed in this PhD contribute to an understanding of the role and the impacts of MCS and, specifically, accounting as part of MCS, within innovation settings and NPD processes,
“the literature in this area is still scant” (Moll, 2015, p.9). The literature does not provide significant insights about how accounting can drive and facilitate NPD processes and, within these NPD processes, innovation objectives. It is recognised that these studies do not consider in-depth the possible interplay between accounting and the mechanisms, the relationships, the dynamics that underpin the rationale for innovation. Relying upon these considerations, it is clear that further understanding needs to be developed. Primarily, the concept of innovation should be explored in-depth in order to develop greater knowledge regarding its rationale and the reason(s) and motivation(s) for why processes of innovation move forward. Secondly, there is a need to better understand how accounting engages with the rationale for innovation and, therefore, this should also be investigated. Focussing the study on examining how accounting engages with the desires, the intentions and the motivations of the experts involved in the process of innovation further contributes to the literature, allowing improved understanding of accounting in these innovation contexts, and offering new insights into the way in which accounting practices can help guide NPD processes and in particular innovation-making NPD processes. This investigation offers new insights on how to theoretically study and practically manage accounting within NPD processes as well as on how the possible interplay between accounting and innovation can influence the achievement of the objectives of the NPD process.

Innovation processes in general, and NPD processes in particular, are characterised by heterogeneous, pluralistic perspectives and rationales (Nixon, 1998; Jørgensen and Messner, 2010; Nicolini et al., 2012) that need to be coordinated and managed (Jørgensen and Messner, 2010; Davila and Ditillo, 2013). In this context, the wants and desires for innovation (Busco and Quattrone, 2016), the multiple purposes and ends for innovation, i.e. the intentions (Quattrone, 2015; Busco and Quattrone, 2016), are likely to engage multiple interests and concerns of the professionals/experts involved in the process, where everyone may be motivated to defend and promote their own interest for innovation. Only through the analysis of the multiple individuals’ interactions and collaborations and the analysis of the constraints and objectives such as the cost targets, throughout the unfolding of the empirical NPD process, a deep understanding of both the rationale for innovation and the use of accounting in that process emerges. This background and motivation for the study have led to the formulation of the research objective and the research questions of this thesis.
1.5 Research objective and research questions

Moving from the motivation for this study and the messages that emerged from the literature reviewed, the research objective of this thesis was outlined as follows: to examine and explain how accounting engages with the rationale for innovation in practice within the NPD process. This thesis does not aim to examine the factors which hinder innovation and NPD processes, rather it focuses on how accounting can facilitate these processes. The rationale for innovation is conceived of as being underpinned by the desires, the intentions and the motivations of many who contribute to the unfolding of innovation. The material used to investigate the elements that support the realisation of this research objective is most likely be found in a practical setting of innovation – in an NPD process. The unfolding practices performed to transform creative ideas into a new product, and to study how accounting practices engage with this transformation, is likely to be the most appropriate study setting for achieving the research objective.

From the literature surveyed for this research, accounting has been studied from the perspective of the need to balance firmness and flexibility within processes of product innovation (Tatikonda and Rosenthal, 2000; Kamoche and Cunha, 2001; van der Meer-Koistra and Scapens, 2008; 2015). Also, accounting has been portrayed as a mediating instrument among different actors and domains within innovation processes (Miller and O’Leary, 2007; Christner and Strömsten, 2015; Revellino and Mouritsen, 2015). The hybridization of accounting and non-accounting expertise may also characterize NPD processes (Caglio, 2003; Kurunmäki, 2004; Miller et al., 2008). Firmness and flexibility, mediation and hybridization feature within processes of innovation. They entail different dimensions of and purposes for innovation (firmness and flexibility), the participation of multiple actors from different domains, featured by different interests and concerns (to be mediated), and also by actors with different expertise (who can hybridize their expertise with accounting). The multiple purposes and actors, with different interests and concerns for innovation, are considered here as underpinning the rationale for innovation, namely, the desires, the intentions and the motivations of the multiple actors at work within the NPD process.
Building upon firmness and flexibility, mediation and hybridization characterizing processes of innovation, the research objective of this thesis is intended to be achieved by answering the following three research questions:

1. How does accounting engage with firmness and flexibility in processes of innovation in new product development?
2. How does accounting engage with the rationale for innovation through processes of mediation?
3. How does accounting engage with the rationale for innovation through processes of hybridization?

These three research questions are answered throughout this thesis in light of the broader research objective, which requires an investigation into how accounting engages with the rationale for innovation during the NPD process.

1.6 Theoretical perspectives

To answer the research questions and achieve the research objective of the thesis, the data collected for this study focus on the practices (Schatzki, 2001a; 2001b; 2005; 2006; 2007) that unfold during the empirical NPD process. Attention is placed on the “actions, doings, and sayings” (Schatzki, 2001a) that develop and underpin the development of the new product. How accounting can drive NPD processes, and within these NPD processes innovation objectives, is interpreted by using the theoretical idea of ductus (Carruthers, 1998; 2010). More specifically, the way in which the NPD practices unfold determines the flow, the movement and the direction, i.e. the ductus (Carruthers, 1998; 2010) of the process for innovation. Furthermore, drawing upon the concept of epistemic object (Knorr Cetina, 2001; Nicolini et al., 2012), the desire and the wanting (Busco and Quattrone, 2016) of innovation of the actors involved in the NPD process are interpreted. Using the concept of a boundary object (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012), how people with their heterogeneous interests and interpretations for innovation work together is interpreted. These theoretical perspectives are used to interpret the empirical material collected for this study answering the research questions, with the purpose of eventually achieving the research objective of the thesis and framing the contributions for the study.
1.7 Research methodology

With the purpose of collecting empirical material to be filtered and interpreted to examine the way in which accounting engages with the rationale for innovation in practice, an interpretivist philosophical stance has been used. Through the interpretivist philosophy, focus is placed on the humans, their roles as social actors and how these actors interpret the different situations and events occurring during the NPD process (Ryan et al., 2002; Saunders et al., 2009). This study adopts a qualitative approach, which is considered as being suitable to delineate and interpret qualitative data and facts regarding the multiple concerns and actors at work in the particular social setting of the NPD process. In order to facilitate the emergence of relevant theoretical contributions, the qualitative data were analyzed “through a process of reflection, and going back-and-forth between the data, the literature, and the company” (Wouters and Wilderom, 2008, p.499). The intent was to develop interpretations of the empirical data collected, in light of relevant theoretical perspectives, in the expectation that novel meanings might lead to distinctive theoretically relevant insights (Morse et al., 2002; Bowen, 2008).

The thesis builds on the single case study of Beta, a company operating in the field of electronic devices. The case study of Beta is longitudinal, where the empirical investigation covered the entire unfolding, in practice, of a specific NPD process – the development of a new device (with the pseudonym Kappa). The data collected for this research consisted in a varied range of documents directly related to Kappa. Furthermore, the direct observations allowed the development of insights and understandings concerning the actions and interactions of individuals. The interviews allowed an in-depth examination of the actions, the human interactions and the individuals’ relationships as they evolved during the NPD process. The analysis of this data and their interpretation using the theoretical perspectives facilitated the study of the desires, the intentions, and motivations of the multiple actors involved within the empirical NPD process, their different interests and purposes for innovation which were often “in tension”, and how accounting engaged with these elements underpinning the rationale for innovation during the NPD process.

1.8 Research contributions

The findings from this study contribute to the literature adding a better understanding of the way in which accounting, by engaging with the multiple actors at work during the
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NPD process, drives and facilitates the unfolding of the process for innovation and the achievement of the NPD objectives. Specifically, building on the concept of ductus, the significant role of accounting in sustaining, challenging and facilitating the unfolding process of innovation emerged from the study of the interactions between the actors involved in the NPD process, with different desires, intentions and motivations for innovation, from the early phases of the empirical process. Accounting was revealed to be not only a ratio (Latin word which means account, calculation – see Quattrone, 2015) but also a facilitator of innovation, which triggered and sustained the tensions among the actors involved in the NPD process. In doing so, accounting clearly played a role in enabling and driving the realization and materialization of innovation.

Accounting and the firmness of its cost targets attracted the attention of diverse professionals with interests and purposes that were not reconciled in practice during project Kappa. Furthermore, accounting sustained the mediation within discussions and reflections among these professionals. The use of accounting from a variety of participants with different backgrounds facilitated the unfolding of the process of innovation. The discussions of this study have made visible the central role of accounting throughout the ductus (Carruthers, 1998; 2010) of project Kappa. The failure of accounting, as boundary object (Star and Griesemar, 1989; Star, 2010; Nicoloni et al., 2012), in leading professionals to reconcile all their purposes and interests, “in-tension” (Quattrone, 2015; Busco and Quattrone, 2016), and underpinning their desires, intentions and motivations for innovation, generated temporary compromises among these professionals. The achievement of these compromises enabled the unfolding of work in progress and prototypes – epistemic objects (Knorr Cetina, 2001; Nicolini et al., 2012) whose incompleteness, in turn, motivated further unfolding of innovation.

1.9 Structure of the study

Chapter Two of the thesis focuses on presenting the context in which this study of accounting is set. In this chapter, the literature on the concept of innovation is reviewed, as is the specific setting where product innovation is performed – the NPD process. In this chapter the motivation for the study (also synthesized in section 1.4) is also elaborated in detail.
Chapter One: Introduction and Overview of the Study

In Chapter Three the broad literature on MCS and accounting, as part of these systems, within innovation realms and the NPD process is reviewed. The messages from this literature reinforced the motivation for this study and led to the formulation of the research objective and the research questions in Chapter Four.

Chapter Five presents the theoretical perspectives, identified and drawn upon to frame the case material for the achievement of the research objective. The data for this study are focussed on the practices (Schatzki, 2001a; 2001b; 2005; 2006; 2007) unfolding during the empirical NPD process, including the “actions, doings, and sayings” (Schatzki, 2001a) that develop innovation for the new product. How accounting engages with the rationale for innovation and, in doing so, can drive NPD processes, and within these NPD processes, innovation objectives, is interpreted using the theoretical ideas of ductus (Carruthers, 1998; 2010), epistemic object (Knorr Cetina, 2001; Nicolini et al., 2012) and boundary object (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012).

Chapter Six presents the philosophical stance, i.e. interpretivism, the qualitative approach adopted and the data collection and data analysis for this study. The use of the case study was considered appropriate for this thesis as it facilitated the employment of appropriate theory to explain the observations noted while conducting the study (Busco, 2005, p.27, drawing upon Scapens, 1990). It also allowed for the understanding of a contemporary set of events (Yin, 2014, p.15) such as those that characterized the heterogeneous context of NPD, where multiple people simultaneously carried out collaborative practices for the development of a new product.

In Chapter Seven, the empirical material is illustrated. Following a description of the company Beta, the empirical data gathered is presented, focussing on the evidence considered relevant in light of the research objective. Chapter Seven is descriptive, illustrating the empirical NPD process and its accounting practices, with a focus on how the accounting practices were carried out and by whom during the specific project Kappa.

Moving from the material described in Chapter Seven and building on the empirical material considered useful for answering the research questions, in Chapter 8 the answers to the research questions are articulated in detail and the way in which
accounting engages with innovation during the empirical unfolding of the NPD process of project Kappa is analyzed.

In Chapter Nine, the empirical material collected in Chapter Seven and the findings articulated in Chapter Eight are discussed in detail, building on the theoretical constructs (illustrated in Chapter Five), with the final purpose of contributing to the literature through eliciting new understanding of how accounting can drive NPD processes, having analyzed and interpreted in-depth how accounting engages with the desires, intentions and motivations of the experts participating in the innovation process.

Chapter Ten concludes the thesis, presenting the key contributions of this study. Chapter Ten also includes the limitation and ideas for future research.

1.10 Chapter Summary
This chapter introduced the study conducted for this thesis. After having referred to the European perspective concerning innovation, focus is placed on the concept of innovation from the organizational perspective. A summary of the thesis’ background and motivation, research objective and questions, methodology, theoretical perspectives and contributions, and how these contents are organized within this thesis were included in this chapter. In the next chapter a more detailed review of the context of this research, innovation and NPD, is conducted and the motivation for this study is elaborated on in detail.
Chapter Two
Research Context and Motivation for the Study

2.1 Introduction
MCS, with accounting playing a part within these systems, can facilitate and/or reduce innovation (Bisbe and Otley, 2004; Mouritsen et al., 2009), can inspire and/or configure creative processes for innovation among the various players (Adler and Chen, 2011; Davila and Ditillo, 2013). MCS play a role within NPD processes (Nixon, 1998; Davila, 2000; Jørgensen and Messner, 2009; 2010). Davila and Wouters (2007, p.851) claim the following:

Product development started the revolution when it moved from being seen as a black box where money came in and hopefully a product would come out to being interpreted as a process to be measured and managed.

In this “revolution” (Davila and Wouters, 2007), MCS were afforded a complex role (Booker et al., 2007). Relying on this view and the recognition given to the importance of measurement and management, this thesis sets out to further investigate accounting and innovation within NPD contexts, and adopts a different perspective from the previous studies with the objective of better understanding the role of accounting in NPD and innovation contexts.

In this chapter, the need for an in-depth examination of innovation and NPD processes is explained based on the context of this research. This examination aims to aid the further understanding of processes of product innovation in which the objective is to transform novel and creative ideas (Amabile et al., 1996) into a tangible physical asset (Davila, 2000, p.385), i.e. the new product. From a study of previous literature, it is clear that NPD processes rely on the notions of both creativity and innovation. Building upon this viewpoint, this chapter begins with a review of the literature regarding the concept of innovation (Section 2.2). Subsequently, in Section 2.3 the literature on the relationship between innovation and creativity is surveyed. Then, in Section 2.4 the relevant studies dealing with models of NPD processes and the elements that characterize them are synthesized. In Section 2.5 the stage-gate system for managing NPD processes, as outlined by Cooper (1990; 1996), is illustrated. In section 2.6 the
motivation for this study is explained. By building on the studies that recognize the role of accounting within the NPD process, as well as on recent studies by Quattrone (2015) and Busco and Quattrone (2016), which link the concepts of *intentiones*, *inventio*, and *rationes*, it follows that an investigation into the rationale for innovation, as carried out by multiple participants within the NPD process, deserves attention. Finally, Section 2.7 summarizes the key points of this chapter.

2.2 Innovation

The literature acknowledges the role of innovation both in economic and organizational studies. In both these streams of studies, innovation has been depicted as involving many things, such as the introduction of new goods – a product or a service, a new method of production or a new production process technology, the opening of a new market, the conquest of a new supply source for goods and materials, a new plan or program pertaining to the organization and its members (Schumpeter, 1934; Damanpour, 1991). In introducing the concept of innovation in economic studies, the economist Joseph Schumpeter links innovation with economic development. According to Schumpeter (1939), innovation is something that does things in a different way in economic life. Innovation is a factor of change (Schumpeter, 1939). It is a means for the entrepreneur to carry out economic development. The study of innovation that employs an economic perspective considers the role and the impacts of innovation in the development of industries or other sectors, such as business, population and countries.

This thesis covers the study of innovation within the organizational context (Damanpour, 1991). Innovation within organizations has been portrayed as possibly involving three typologies of innovation, each focussing on two types of innovation: administrative and technical, product and process, radical and incremental innovation (Damanpour, 1991). In particular, administrative innovation is related to the organizational structure and administrative processes. Technical innovation is related to work activities, which consists of new products, services, and production processes technology. Product innovation pertains to “new products or services introduced to meet an external user or market need” (Damanpour, 1991, p.561). Process innovation deals with “new elements introduced into an organization’s production or service operations” (Damanpour, 1991, p.561). Furthermore innovation could produce moderately minor effects with, for instance, the review of existing procedures or processes – this is
incremental innovation. Alternatively, innovation can involve major, revolutionary changes, such as the introduction of new technology platforms, radical changes in individual processes or impacts on the whole organization – this is radical innovation. Incremental innovation applies incremental improvements to existing know-how, products, systems and processes, whereas, radical innovation produces changes which transform and revolutionize existing know how, products, systems, processes and ways of thinking.

The process undertaken by an organization to develop and achieve innovation “reveals a multiplicity of heterogeneous and often confused decisions made by a large number of different and often conflicting groups, decisions which one is unable to decide a priori as to whether they will be crucial or not” (Akrich et al., 2002a, p.191). Adopting a socio-technical analysis approach, innovation can be seen as situated in a place where technology and the social environment shape each other (Akrich et al., 2002a, p.205). Innovation is therefore more than a new commodity, or a new form of organization, or the opening up of new markets (Akrich et al., 2002a). The outcome of a project which develops an innovation “depends on the alliances which it allows for and the interests which it mobilises” since “innovation is the art of interesting an increasing number of allies” (Akrich et al., 2002a, p.205), and it is featured by “adaptations, [a] series of trial and error and countless negotiations between numerous social actors” (Akrich et al., 2002b, p.207).

This thesis focuses on the realm of product innovation, considering the organizational perspective within a case company (Damanpour, 1991). “Organizational innovation is the successful implementation of creative ideas within an organization” Amabile (1988, p.126). There is a strand of literature that has examined the role of financial resource constraints within organizations, reflecting on whether these constraints inhibit or enable innovation. Studies within the field of cognitive psychology and creativity have recognized the “positive influence of financial constraints on innovation” (Hoegl et al., 2008, p.1383). For instance, “innovation teams may be more likely to find creative analogies and combinations that would otherwise be hidden under a glut of resources” (Hoegl et al. 2008, p.1384). Despite resource and financial constraints may be considered positive for innovation, previous literature has not linked, neither positively nor negatively, constraints and project performance. Building upon prior literature in
this field and building on a contingency framework, Hoegl et al. (2008) have considered how a “bounded creativity approach, a team process that leverages the team’s domain-relevant skills, an engaging project objective, strong team cohesion, and team potency” can moderate the relationships between financial constraints and the performance of innovation projects (Hoegl et al., 2008, p.1382).

Novelty/creativity may be generated and sustained by constraints (Stoke, 2007). Constraints can direct and promote novelty. Presenting a constraint-based model, Stoke (2003) has referred to the so-called paired constraints, where “one of each pair precludes and limits search for novelty among a specific set of existing responses; the other promotes or directs search among its opposites” (Stoke, 2007, p.107). Considering the contexts of both established and new firms, Katila and Shane (2005) investigated whether the lack of resources is detrimental or beneficial to innovation. With focus on the environmental conditions which can influence innovation in these contexts, such as competition, availability of financial resources, manufacturing intensity and market size (Katila and Shane, 2005), the lack of resources may promote or constrain innovation. In the firms that already possess resources, e.g. established firms, “low-competition, resource-rich, and high-demand environments support innovation [...]”, whereas new firm innovation [...] is greater in markets that [...] are crowded, resource-poor, and small” (Katila and Shane, 2005, p.826) and “in environments that do not demand extensive production assets” (2005, p.814).

This thesis analyzes in detail the process that underpins and makes innovation unfold and materialise, and which is eventually embedded within a new product (Akrich et al., 2002a; 2002b). Attention is also placed on the constraints that characterize the NPD process. The individuals within the organization who act and interact to develop innovation(Akrich et al., 2002a; 2002b), how they deal with the NPD constraints and the impact on creativity and innovation for the new product is also examined.

2.3 Innovation and creativity
Innovation needs to be triggered and stimulated by new ideas and creativity. Innovation “is built on creative ideas as the basic elements” (Amabile, 1988, p.126). Creativity is generated by individuals and/or teams and it is only the starting point for innovation (Busco et al., 2012), constituting the preliminary stage of the process of innovation.
Creativity has been depicted as resulting from the “production of novel and useful ideas in any domain” (Amabile et al., 1996, p.1155) and being the “seed” of all innovations (Amabile et al., 1996). Creative ideas must be “useful and actionable” (Amabile, 1998, p.78) and must have valuable effects on the business – e.g. by improving a product or introducing new ways to carry out processes. Furthermore, to be worthwhile, creativity should result in an innovation that answers and fulfils customer needs (Busco et al., 2012) and creates business value for the organization (Tushman and O'Reilily, 1996; Brown and Eisenhardt, 1997; Davila et al., 2009a; Davila and Ditillo, 2013).

The concept of creativity has been widely dealt with by Amabile (and her co-authors – see Amabile, 1988; 1998; Amabile et al., 1996; Hennessey and Amabile, 2010). Despite creativity has been studied in many fields, it seems that the studies conducted in a field are not aware of those carried out into other fields (Hennessey and Amabile, 2010). For this reason, Hennessey and Amabile (2010) advocate “more interdisciplinary research, based on a systems view of creativity that recognizes a variety of interrelated forces operating at multiple levels” (2010, p.569). The research within organizations has been increasingly focusing “attention [...] on creativity in the workplace” (Hennessey and Amabile, 2010, p.591). Presenting a model of creativity and innovation in organizations, Amabile (1988) has emphasized how the motivation affects the creativity for innovation, “by influencing the likelihood that alternative – and potentially more creative – response possibilities will be explored during task engagement” (Amabile, 1988, p.143). Three components have been considered crucial to individual creativity or organizational innovation: resources (domain-relevant skills for individuals and resources in the task-domain for organizations), techniques (creativity-relevant skills for individuals and skills in innovation management for organizations), and motivation (intrinsic task motivation for individuals and motivation to innovate in organizations) (Amabile, 1988). When the levels of each of these three components are high, there is high contribution to individual creativity and/or organizational innovation (Amabile, 1988). Furthermore, intrinsic motivation, namely “the drive to engage in a task because it is interesting, enjoyable, or positively challenging” (Hennessey and Amabile, 2010, p.574) is crucial for individuals’ creativity and organizational innovation.

As mentioned previously, creativity has been linked to, yet distinguished from, innovation. Creativity is “a necessary but not sufficient condition” for innovation.
Innovation builds on creative ideas but also on other elements and factors originating both within and outside the organization (Amabile et al., 1996). Innovation requires implementing creative ideas and meeting customer’s needs differently from how it was done in the past. In this respect, building on the distinction between explorative and exploitative innovation (Benner and Tushman, 2003), Busco et al. (2012) refer to the innovation process as consisting of creative exploration (calling for diversity, variation, failure, serendipity) and efficient exploitation (relying on sameness, precision, consistency, and repetition), with the aim of producing business value during implementation.

This thesis focuses on innovation within the specific context of the NPD process. Within NPD settings, creativity (Amabile et al., 1996) instils “promising ideas for products” (Chandy et al., 2006, p.494). The process for innovation within NPD results in “commercialized products” (Chandy et al., 2006, p.494). This process “is a fate played out in accordance with a mysterious script” (Akrich et al., 2002a, p.188) that does not develop in a predictable and linear way. Akrich et al. (2002b) talk about a “whirlwind model” for this process, which allows for “the multiple socio-technical negotiations that give shape to the innovation to be followed” (2002b, p.212). With focus on the NPD setting, the tangible new product created at the end of the process depends on the actors who participate in this process as well as on the relationships created through their interactions.

2.4 **New product development**

The strategic choices for product development, such as which market to enter, what product to develop, which technology to adopt, as well how resources, human and financial, are allocated and used to develop the new product, are relevant to successful NPD (Cooper et al., 1999). In 1970, Bower identified the relationships between strategy and resource allocation, developing a model for the Resource Allocation Process (hereafter RAP), “a complex, multilevel phenomenon that fundamentally shapes a firm’s strategy” (Bower and Gilbert, 2005). Resources, both financial and human resources, are needed to develop projects of innovation and NPD. The “patterns of resource allocation heavily influence the types of innovations at which leading firms will succeed or fail” (Christensen and Bower, 1996, p.198). The model for the RAP is made of three processes and three levels. The three processes underpinning this model
Chapter Two: Research Context and Motivation for the Study

are the definition of content, impetus for commitment and structural context; the three levels include the corporate, general manager in the middle, and operating (Gilbert and Bower, 2005, p.34, drawing upon Bower, 1970). The insights featuring this model, and the study of their relationships, are useful to understand how the resource allocation drives the strategy.

The RAP model has gained significant success, and developed further, over the years. Gilbert and Bower (2005), for instance, have identified how exceptions and anomalies to the model have opened new spaces and opportunities for its progress (Harrigan, 2007). The concepts underpinning the RAP model and, specifically, how the patterns for the resource allocation process can influence the success, or not, of the innovation and NPD processes were also considered for this study. It was eventually decided that the use of the RAP model was not appropriate to this thesis as the research objective focuses on examining how accounting engages in practice with the unfolding process of innovation, once the resources for the project are in place and the strategies for the new product have been identified.

This study places much attention on the role of accounting and control within NPD and innovation contexts, rather than on the resource allocation and the strategies for innovation. NPD processes have been portrayed as projects organized around phases (Davila, 2000, p.385; Tatikonda and Rosenthal, 2000; Jørgensen and Messner, 2009; 2010), which are generally characterized by the complexity of their parts and the uncertainties of their outcomes (Davila, 2000; Davila et al., 2009b; Jørgensen and Messner, 2010). These uncertainties may relate to what customers want in the future and the features of the new product (Harris and Woolley, 2009), as well as to heterogeneous, pluralistic perspectives and rationales (Nixon, 1998; Jørgensen and Messner, 2010; see also Nicolini et al., 2012). Overall, the objective of the NPD process is to develop projects which transform novel and useful ideas (Amabile et al., 1996) into a tangible physical asset (Davila, 2000, p.385), i.e. the new product.

Shenhar and Dvir (2007) have referred to projects as “engines that drive innovation from idea to commercialization” (2007, p.4). Projects differ from operations. Operations mean “repetitive, ongoing, activities, such as manufacturing, service and production whereas projects involve unique, on-time initiatives, such as launching new products,
new organizations, or new ventures, improving existing products, and investing in the company’s infrastructure” (Shenhar and Dvir, 2007, p.3). Projects have been depicted as processes to be developed in order to achieve a certain goal under constraints of cost, time and quality (the Iron Triangle) (Atkinson, 1999). However, this triple constraint is associated to traditional project management. Constraints of cost, time and quality are not enough for the success of those projects which are complex, uncertain, and changing (Shenhar and Dvir, 2007; Turner et al., 2007), e.g. innovation and NPD projects fall within this typology of projects. For these projects a new approach should be used, such as a framework more success-focused, flexible, and adaptive (Shenhar and Dvir, 2007).

In addition to project efficiency, (e.g. adherence to time and budget constraints), other success criteria should be considered when managing projects, such as the impact on the customers, the impact on the team, the business results, the preparation for the future (e.g. new technologies, new markets, new products) (Shenhar and Dvir, 2007).

To summarize, projects are not only characterized by constraints; attention should be also placed on the flexibility and the changeability of projects, e.g. projects of innovation and NPD. Projects may be distinguished by the dimension of novelty, technology, complexity and pace. According to which dimension features in the project, Shenhar and Dvir (2007) have suggested using the so-called diamond approach, “to provide a disciplined tool for analysing the expected benefits and risks of a project and developing a set of rules and behaviours for each project type” (2007, p.13). This results in acknowledging that projects, including NPD projects, are temporary organizations of which an in-depth understanding is necessary, in order to appropriately manage them (Turner et al., 2007). The role of the project manager is crucial in this sense, as he has to understand the project and find the best way to deal with the project.

2.4.1 Models for new product development

Kamoche and Cunha (2001) have illustrated three models to develop NPD processes: the sequential model, the compression model, and the flexible model. The sequential model relies on the logic that the majority of the activities and the outcomes of the activities that comprise the NPD process are predictable. For this reason, this model conceives of NPD processes as made of a detailed plan and list of tasks to be accomplished. This type of model defines a specific process of development, with definite discrete and sequential phases, such as “new product strategy, exploration,
screening, business analysis, development, testing, [and] commercialization” (Kamoche and Cunha, 2001, p.739). Each of these phases includes precise roles and centralised decision making processes, which follow defined templates and guidelines. In this way, NPD is viewed as a relay race, “in which one stage follows another in [a] predetermined fashion” (Kamoche and Cunha, 2001, p.739). The sequential model for NPD processes is considered helpful in circumstances in which the uncertainty of product innovation needs to be managed and reduced. However, Kamoche and Cunha (2001) recognize that this model may appear to be too formal for all circumstances. It consists of tightly specified norms and procedures that are to be adhered to while moving NPD processes forward. This type of approach could reduce and discourage the flexibility that contexts striving to foster innovation also require (Tatikonda and Rosenthal, 2000; van der Meer-Kooistra and Scapens, 2008; Davila et al., 2009a).

Kamoche and Cunha (2001) also illustrate an alternative model for NPD, the compression model. This model adapts and combines the sequential model, based on the need to reduce the NPD process time. The time for NPD is crucial and fundamental within contexts of innovation (Davila et al., 2009b; Harris and Woolley, 2009). The compression model involves overlapping tasks and activities in order to be efficient in terms of time management (Kamoche and Cunha, 2001). By following this model, NPD moves like an accordion. However, Kamoche and Cunha also recognize how this model needs to be used, by cautioning to be aware of falling into “traps of acceleration” (2001, p.740) in a desire to reduce time to NPD. The structure of both the sequential and compression models, as stated by Kamoche and Cunha (2001), may not help address difficulties that are caused by sudden and unpredictable events, which are likely to occur within product innovation realms. In this respect, the so-called flexible model would be appropriate.

The flexible model is more suitable to NPD processes that are characterized by high levels of turbulence and uncertainty. More specifically, this model ignores the sequential structural features of the previous two models. The rationale of the flexible model builds on the fact that there is no reason to eliminate uncertainties. On the contrary, the need to “absorb” uncertainties is seen as an opportunity (Kamoche and Cunha, 2001) rather than something to be reduced or eliminated. Adoption of the flexible model allows NPD processes to develop flexibly, adapting to and incorporating
changes as well as challenges as they are met. However, in adopting such a model, caution is needed in order to avoid descending into a chaotic situation caused by too much flexibility (Kamoche and Cunha, 2001).

In addition to these existing models for the NPD process, Kamoche and Cunha (2001), inspired by the practice of jazz improvisation, interestingly propose a further model – the improvisational model – where the need for both structure, (a key feature of the first two models: sequential and compression), and flexibility, (a key feature of the flexible model), is managed through and within so-called “minimal structures” (Kamoche and Cunha, 2001; van der Meer-Kooistra and Scapens, 2008; 2015). These minimal structures represent a sort of template of improvisation for innovation, where flexibility is managed and “where appropriate levels of responsibilities, priorities and procedures are clearly defined and combined with wide zones of manoeuvre” (Kamoche and Cunha, 2001, p.750). Within minimal structures, firmness and flexibility within NPD processes are balanced\(^1\).

### 2.5 The stage-gate system for new product development

The stage-gate system for the NPD process consists of the application of a methodology aimed at managing the product innovation process within the NPD setting (Cooper, 1990; 1996; 1998; 1999). Focus is placed on this particular system since it is the approach used to manage NPD processes in the case study that is a part of this research project.

Stage-gate systems recognize that product innovation is a process. And like other processes, innovation can be managed. Stage-gate systems simply apply process-management methodologies to this innovation process (Cooper, 1990, p.45).

Specifically, the stage-gate system for the NPD process consists of a process management tool, such as a roadmap or a template, which introduces a “gating mechanism, featuring a series of rigorous go/kill decision points or "gates" throughout the process” (Cooper, 1996, p. 471). More specifically, the stage-gate organizes the

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\(^1\) The balance between firmness and flexibility within NPD processes is dealt with in detail in Chapter 3.
NPD process into typically four or five discrete and identifiable stages. During each stage, the information needed to progress the project for the next stage are produced and collected. Each stage is characterized by a cross-functional platform, where parallel activities are performed by people coming from different functions and areas. These people work together and compose a cross-functional team led by a project leader. At the end of each stage of the process there is a gate that is the point at which the go/no-go decision is made. In particular, at these points within the NPD process, a review is undertaken, in which what is performed during the stage is evaluated and the deliverables are checked and scrutinized. Generally, the “gates open or close the door for projects to move [not move] to the next stage, and they weed out the mediocre projects” (Cooper, 1998, p.15). Drawing upon Cooper (1990; 1996), the stages and the gates of a typical stage-gate system are synthesized in Table 2.1.

Table 2.1: An overview of the stage-gate system as explained by Cooper (1990; 1996)

<table>
<thead>
<tr>
<th>Gate</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate 1</td>
<td>Initial screen of the new product idea.</td>
</tr>
<tr>
<td>Stage 1</td>
<td>Preliminary investigation of the scope of the project. This stage includes preliminary market assessment, preliminary technical assessment and preliminary business assessment.</td>
</tr>
<tr>
<td>Gate 2</td>
<td>Second screen where the project is evaluated on the basis of the information gained in Stage 2.</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Detailed investigation of the attractiveness of the project and definition of the project. This stage includes market research; detailed technical and manufacturing assessment; and a detailed financial and business analysis. This stage is undertaken by a core team of marketing, technical and manufacturing individuals.</td>
</tr>
<tr>
<td>Gate 3</td>
<td>Decision on the business case prior the development stage. This is the last point at which the project can be killed before entering more significant spending.</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Actual design and development of the new product through the implementation of the development plan and prototype or sample. At this stage, the project gains momentum.</td>
</tr>
<tr>
<td>Gate 4</td>
<td>Post-development review where the progress and the continued attractiveness of the product and project are checked.</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Testing and validation of the proposed new product, its marketing and production.</td>
</tr>
<tr>
<td>Gate 5</td>
<td>Decision on pre-commercialization, opening the door to full commercialization of the new product.</td>
</tr>
<tr>
<td>Stage 5</td>
<td>This final stage involves the implementation of the market launch plan and the beginning of full production. After this, the post-implementation review is carried out.</td>
</tr>
</tbody>
</table>
Chapter Two: Research Context and Motivation for the Study

The stage-gate system, as described in Table 2.1, looks most like the sequential model (Kamoche and Cunha, 2001). However, Cooper (1996) also suggests the need to plan a level of flexibility, in which the “stages can be collapsed, gates combined, and long lead-time activities moved ahead” (Cooper, 1996, p. 472), in order to facilitate the acceleration of the project, aiming to reduce the time to market of the new product. This may be managed by overlapping the stages within the stage-gate system, allowing movement of the project to the following stage even though all the deliverables and the activities of the previous stages have not been completed.

2.6 The motivation for the study

The purpose of the NPD process is to develop product innovation that would eventually result in the creation of a new product to be launched into the market. The NPD process constitutes a cross-functional realm, where members of the functions (within the organization) are involved in the development of the new product. These individuals, as a team, carry out activities aimed at developing innovation, e.g. throughout the stages and gates of the NPD process (Cooper 1990; 1996), for the final creation of the tangible new product (Davila, 2000). The NPD team are “neither individuals nor whole organizations, but small groups of individuals sharing an organizational setting” (Harris and Woolley, 2009, p.74), i.e. the NPD setting. The participation, coordination and collaboration among the team for the development of the NPD project are fundamental for the monitoring of the process as regards the criteria of cost, time, and quality (Atkinson, 1999). In this context, the accounting literature interprets accounting as playing a “pivotal role”, bringing together the multiple parties involved in the NPD process (Nixon, 1998; Nixon et al., 2011; Nixon and Burns, 2012). The literature has also interpreted accounting as being an “integrated vernacular” (Nixon, 1998; Nixon et al., 2011), facilitating communication among NPD project participants, as well as their coordination (Jørgenssen and Messner, 2010). Accounting also enables the unfolding of processes for innovation by intervening within the process and facilitating the unfolding of its trajectories (Christner and Strömsten, 2015; Revellino and Mouritsen, 2015).

As discussed in the previous sections, the NPD process is committed to developing innovation in the form of a new product. The preliminary stage of innovation is creativity (Busco et al., 2012), and reflects the wants and the desires of the people involved in the search for innovation (Busco and Quattrone, 2016). Amabile et al.
(1996) state that the “psychological perceptions of innovation (the implementation of people's ideas) within an organization are likely to impact the motivation to generate new ideas” (1996, p.1155). Therefore, the human factors and the technical factors featuring in realms of innovation should not be separate in these contexts, neither should passions and reason. In fact, “passions [such as doubt, trust, or gratitude and admiration, or suspicion, defiance, hate] do not come to interfere with the work of the engineer or researcher; they are the innermost and fundamental constitutive elements of their work” (Akrich et al., 2002b, p.222).

“Without [...] *intentio* (the end), there is no *inventio*\(^2\) (the means) and thus no *rationes*\(^3\) [accounts, calculations]” (Quattrone, 2015, p.19, original emphasis; Busco and Quattrone, 2016, drawing on Carruthers, 1990; 1998). *Intentio* evokes the attitudes, aims, purposes, and inclinations of a person (Quattrone, 2015, drawing on Carruthers, 1990). Quattrone (2015) also refers to *intentiones* (plural of *intentio*) as always being “in-tension” among multiple purposes and having the potential to build new innovation (Busco and Quattrone, 2016). Furthermore, NPD processes build on the multiple interests, concerns and purposes of the different actors at stake (Cooper, 1996; Nixon, 1998; Nicolini et al., 2012), which may challenge the attitudes, aims, purposes and inclinations of the inventor, creating tensions among the multiple actors at work, thus being the source of new innovation (Busco and Quattrone, 2016).

The multi-disciplinary context of the NPD process, the desires and the intentions for innovation (Busco and Quattrone, 2016) of the inventor(s), as well as the different motivations (Amabile et al., 1996; Amabile, 1998) stemming from the multiple concerns and interests of the actors involved (Busco and Quattrone, 2016; see also Akrich et al., 2002a) all have the potential to underpin the unfolding process for innovation within the NPD setting. Specifically, the tensions that result from differing desires, intentions and motivations, moved by the different purposes and goals of the people involved, have the potential to underpin the rationale for innovation throughout

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\(^2\) Building on the literature on rhetorical practices, the word *inventio* has been assigned two meanings: inventory and invention (Quattrone, 2009; 2015; Busco and Quattrone, 2016). Inventory is the space in which new knowledge is classified. Invention refers to the generation of new knowledge, associations and connections, producing a *craft of composition*, the creation of something new (Quattrone, 2009; 2015).

\(^3\) *Ratio* means calculations (Quattrone, 2015, drawing on Goody, 1996). It is concerned with accounts, schematic representations, images (Quattrone, 2009; Quattrone, 2015).
Chapter Two: Research Context and Motivation for the Study

the NPD process and the multiple purposes and ends that build and move the processes of innovation forward (Quattrone, 2009; 2015). In this context accounting can cover a significant role. Accounting has been depicted by the literature as an organizational and social phenomenon (Burchell et al., 1980). Accounting is intertwined with the functions of the context in which it operates, it is implicated in the diverse actions within the organization, and it may be involved in this diversity, such as being used for different ends by the actors of the organization. Accounting sets constraints, and it does not only represent a single interest; rather accounting can become a mechanism engaging negotiations among divergent interests (Burchell et al., 1980).

2.7 Chapter Summary

This thesis considers that what constitutes innovation depends on a multi-disciplinary/cross-functional discovery, in which the search for innovation is driven by desires, intentions, and motivations of multiple actors at work. The study of accounting, with respect to the rationale for innovation, and in particular, the intentions (i.e. the multiple purposes and ends at stake and the tensions generated by them – see Quattrone, 2015; Busco and Quattrone, 2016) that underpin NPD processes, has the potential to contribute to the literature, offering new understanding of how accounting can drive and facilitate NPD processes and the innovation objectives within these NPD processes. The study of how accounting engages with both the desires and the reason for innovation has the potential to offer new contributions to the literature investigating accounting within processes of innovation and NPD. The motivation for this study stems from the literature which deals with the relationships between intentions, innovation, and accounting (Quattrone, 2009; 2015; Busco and Quattrone, 2016) and the potential that these concepts offer for constructing increased understanding of the role of accounting within innovation processes in an NPD setting.

This chapter introduced the context of this study and the motivation for focussing further on the study of accounting within the rationale for innovation during the NPD process. In particular, focus is placed on the multiple interests, concerns and purposes that underpin the desires, the intentions, and the motivations of the multiple actors participating in the NPD process. The explanation regarding the objective of the thesis is based on the motivation for this study and the literature review on accounting within
innovation and NPD realms. A detailed literature review on accounting within innovation and NPD realms is provided in the following chapter, Chapter 3.
Chapter Three

Literature Review - Accounting, Innovation and New Product Development

3.1 Introduction
The purpose of this chapter is to provide a literature review on the role of MCS, including accounting, within innovation contexts in general, and within NPD processes in particular. This chapter begins with a definition of MCS and management accounting within the broader context of management control (Section 3.2). Then follow three sections that explain the relationships between MCS and innovation (Section 3.3), MCS and creativity (Section 3.4) and MCS and NPD (Section 3.5). Attention is also focussed on the enabling role of accounting and control in innovation and NPD contexts (also in Section 3.5). Section 3.6 explores the role of accounting and control within the dimensions of firmness and flexibility (concepts defined in Chapter 2, Section 2.4.1) of processes of innovation. Then Section 3.7 provides a review of studies dealing with the way that accounting mediates within innovation processes. With a specific focus on the NPD setting (as described in Chapter 2, Sections 2.4 and 2.5), and relying on a review of the accounting literature on hybridization processes, a reflection on how accounting may engage processes of hybridization within the operational processes of NPD and vice versa is reported in Section 3.8. Finally, Section 3.9 summarizes the key points of this chapter. The insights gained from this detailed literature review are relied upon to clarify the research objective and the research questions of this PhD thesis, which follow in Chapter 4.

3.2 Definition of management control systems
MCS may be defined as systems “designed to help an organization adapt to the environment in which it is set and to deliver the key results desired by stakeholder groups, most frequently concentrating upon shareholders in commercial enterprises” (Merchant and Otley, 2007, p.785). To keep organizations on track in relation to their strategies and objectives, managers design and implement controls (Merchant and Otley, 2007; Merchant and Van der Stede, 2007). The old view of control is associated with a cybernetic system, with a single loop feedback mechanism, where managers measure performance, compare it to preset targets and take corrective actions, if
needed (Merchant and Otley, 2007; Merchant and Van der Stede, 2007). According to this conventional view, control behaves in a similar way to a thermostat, “where an output measure is compared to the intended goal (temperature) to establish a feedback mechanism that controls the (heating) process” (Davila et al., 2009a, p.282; Merchant and Van der Stede, 2007).

The meaning assigned to MCS has changed over time. Initially, it was simply associated with the practice of providing managers with “more formal, financially quantifiable information” in order to make decisions (Chenhall, 2003, p.129). Subsequently, MCS broadened their scope by also including “non-financial information related to production processes, predictive information and a broad array of decision support mechanisms, and informal personal and social controls” (Chenhall, 2003, p.129). Many forms of control are now adopted for the performance evaluation of the organization, such as action controls, results controls, personnel controls and cultural controls (Merchant and Van der Stede, 2007). Action controls focus on the action of an employee and are directed at making sure that the employee performs actions beneficial to the organization and does not perform actions that are harmful to the organization. Personnel controls are designed to encourage employees to naturally behave and act in the best interest of the organization “on their own” (Merchant and van der Stede, 2007, p.76). Results controls focus on the results produced, whereas cultural controls focus on endeavouring to ensure that employees share appropriate norms and values (Merchant and van der Stede, 2007, p.16; Merchant, 1985).

MCS may also be defined as “formal, information-based routines and procedures [that] managers use to maintain or alter patterns in organizational activities” (Simons, 1990, p.5). Simons elaborates the “levers of control” framework, distinguishing between diagnostic control systems, interactive control systems, and beliefs and boundary systems used to ensure the achievement of organizational objectives (Simons, 1990; 1995a; 1995b). The diagnostic use of control systems allows managers to measure critical performance outcomes. As with conventional MCS, diagnostic controls monitor variances with respect to predefined performance. Their use helps managers monitor goals and track profitability and organizational progress towards achievement of the predefined targets, such as revenues growth and market share (Simons, 1995a; 1995b). Interactive control systems focus on constantly exchanging information that senior
managers consider strategically important. The interactive use of control systems encourages face-to-face meetings between superiors, peers, and subordinates, i.e. horizontal and vertical communication. The adoption of these interactive control systems favours continuous discussion, debate and dialogue on data, assumptions and actions plans and, moreover, demands constant attention by operational managers at all levels of the organization (Simons, 1995a; 1995b). Belief systems are adopted to communicate the general and core values of the organization to employees. Their use allows managers to build the overall culture and credo within the organization as they “inspire and promote commitment to an organization’s core values” (Simons, 1995b, p82). Finally, boundary systems facilitate the communication of acceptable areas of activity as well as those that are considered inappropriate (Simons, 1990).

Management control processes “are focused on ensuring that resources are obtained and used effectively and efficiently to achieve the organization’s objectives” (Merchant and Otley, 2007, p.788). Consequently, they rely “heavily on accounting measures of performance and financial accountability measure” (Merchant and Otley, 2007, p.788). MCS is a broad term that includes management accounting systems, namely, the “systemic use” of management accounting for the achievement of organizational objectives (Chenhall, 2003, p.130). Management accounting consists of practices and techniques using accounting-based measures and variances, which facilitate both decision-making and control. Specifically, management accounting uses “techniques such as cost allocation, responsibility centres, transfer prices, product costing, performance measurement and budgeting. All are expected to contribute to increased firm value” (Hansen and Mouritsen, 2007, p.3). Overall, management accounting is used to provide managers with the required information for their decision-making processes, in order to plan and control the performance of the organisation (Atrill and McLaney, 2009).

Accounting is “an important element of management control, as it offer[...s] the possibility of integrating all aspects of an organization’s work into an over-arching economic calculus” (Berry et al., 2009, p.3). Nevertheless, accounting is also “portrayed as a problem for operations management due to its hierarchical and financial focus and its orientation towards standards and control” (Hansen and Mouritsen, 2007, p.3). Studies that portray these features of accounting “fit poorly with changing operations
practices that emphasise lateral relations, learning, continuous improvement, empowerment and nonfinancial performance” (Hansen and Mouritsen, 2007, p.3), which are practices that also characterize processes of innovation (see Chapter 2, Section 2.2). The accounting literature gives testimony to many relevant studies investigating the role and the impact of MCS, including management accounting and accounting-based controls, in contexts of innovation (see, among others, Bisbe and Otley, 2004; Mouritsen et al., 2009; Bisbe and Malagueño, 2009) and product innovation (or NPD) (Nixon, 1998; Davila, 2000; Jørgensen and Messner, 2009; 2010; Christner and Strömsten, 2015; Revellino and Mouritsen, 2015).

3.3 Management control systems and innovation

The realm of innovation is very broad (Damanpour, 1991). As defined in detail in Chapter 2, Section 2.2, innovation “can be a new product or service, a new production process technology, a new structure or administrative system, or a new plan or program” (Damanpour, 1991, p.556). Contexts of innovation, such as NPD processes or R&D settings (Abernethy and Brownell, 1997; Davila, 2000) have been portrayed as characterized by uncertainties, exceptions and flexibility by the literature on organizations (see, among others, Kamoche and Cunha, 2001), by innovation and product innovation literature (see, among others, Akrich et al., 2002a; 2002b; Cooper, 1999), and by accounting literature (see, among others, Abernethy and Brownell, 1997; Davila, 2000; van der Meer-Kooistra and Scapens, 2008; Davila et al., 2009a; Jørgensen and Messner, 2010). More specifically, product innovation is characterized by: “high levels of uncertainty and continuous change; flexibility and creativity; learning and knowledge creation; and communication and information sharing” (van der Meer-Kooistra and Scapens, 2008, p.374; see also Amabile, 1998; Davila et al., 2009a).

The traditional and long-standing view of MCS within processes of innovation has portrayed MCS “as nothing else but detrimental” to innovation (Davila et al., 2009a, p.281). Formal accounting controls are “poorly suited” to contexts characterized by high levels of uncertainty, exceptions, and low levels of predictability (Abernethy and Brownell, 1997, p.234) – aspects which typically characterise innovation environments (Abernethy and Brownell, 1997; van der Meer-Kooistra and Scapens, 2008; Davila et al., 2009a). In these studies, formal control is portrayed as “counterproductive” to
contexts of innovation, as it “stifles” R&D objectives and product innovation (and NPD), in particular (Moll, 2015, p.2).

Davila et al. (2009a, p.282) synthesize this traditional view of MCS in an interesting way, as follows:

Innovation is associated with taking advantage of unexpected opportunities, exceptions, new relationships, uncertain outputs, risk and the possibility of failure. Tools designed to eliminate variation and control routine activities have little role in these settings. Traditional control tools encourage a command and control approach based on explicit contracts, hierarchical organizations and extrinsic motivation. In fact, they are designed to eliminate innovation (an inefficient process because of the likelihood of failure) and deliver pre-determined objectives as efficiently as possible.

A strand of literature, mainly published up to the end of the nineteen nineties, investigated how innovation realms “are not well suited to the use of accounting-based controls” (Abernethy and Brownell, 1997; p.233; Rockness and Shields, 1984; Abernethy and Lillis, 1995; Abernethy and Stoelwinder, 1995). Previous (management accounting) literature research had focussed on those settings “where tasks are considered to be particularly well suited to the use of accounting-based controls” (Abernethy and Brownell, 1997, p.233). Accounting controls seem to be unsuitable in contexts characterized by high levels of uncertainty (Abernethy and Brownell, 1997, p.234), or at least no significant results to the contrary can be found in previous research (Abernethy and Brownell, 1997). Abernethy and Brownell (1997) explored control systems within R&D contexts and in relation to the level of task uncertainties, (that is high when the task analyzability is low and the number of exceptions are high – see p.245). In particular, they conducted a survey, within such settings in Australia and America, to investigate the suitability of accounting-based controls. In these contexts, “the use of accounting-based controls tend[s] to be de-emphasized whenever task uncertainty is high” (Abernethy and Brownell, p.242). A similar consideration is made for behavioural controls, which are supposed to negatively contribute to performance where task uncertainty is high. Interestingly, it is non-accounting controls, such as personnel controls, that have the potential to “contribute to the overall management control effort of the organization within uncertain contexts” (Abernethy and Brownell, 1997, p.246). This message is in line with Tushman and O’Reilly (1996) who state that
forms of social control systems are well suited to contexts where work requirements are “more complex, uncertain, and changing” (1996, p.108), as an alternative to accounting-based controls and, more generally, traditional, static and formal controls. Furthermore, the meta-analysis conducted by Damanpour (1991), studying the organizational determinants of innovation, portrays “nonsignificant associations” (1991, p.569) between innovation and formalization.

Likewise, previous literature has acknowledged the inability of bureaucratic forms of control to capture the “unpredictability” of certain tasks or work demands (Abernethy and Stoelwinder, 1995). The use of less traditional and less formal controls, such as personnel, social and self-control processes, contributes to avoiding “dysfunctional” behaviours in relation to these bureaucratic controls, which invoke and legitimize organizational rules, norms, values; accommodate organizational efficiency and accountability, and whose compliance is controlled by superiors within the hierarchy of the organization (Abernethy and Stoelwinder, 1995). An appropriate culture within the organization that points to the positive relationship between personnel and organizational goals is needed (Abernethy and Stoelwinder, 1995). Furthermore, realms of innovation have been characterized by high levels of flexibility (van der Meer-Kooistra and Scapens, 2008, p.374; Davila et al., 2009a; Jørgensen and Messner, 2009). Flexibility consists in the capability of an organization to adapt to the changing choices of customers, to promptly switch from one product to another (Abernethy and Lillis, 1995). The role of accounting and measures of efficiency is deemphasized when strategies that privilege (manufacturing) flexibility are developed. In this case, Abernethy and Lillis (1995) argued that a broader set of control measures is needed, since the financial measures, on their own, are not sufficient to measure organizational performance.

The literature that identifies MCS “as nothing else but detrimental” to innovation “has been challenged both through new concepts and recent empirical evidence” (Davila et al., 2009a, p.281; Moll, 2015). Over the last two decades, accounting research has focused on studies in which MCS “work well and are better [...] suit[ed] to” (Moll, 2015, p.2) innovation realms (Simons, 1995a; 1995b; Bisbe and Otley, 2004; Bisbe and Malagueño, 2009; Mouritsen et al., 2009; Revellino and Mouritsen, 2015), and NPD processes (Nixon, 1998; Davila, 2000; Jørgensen and Messner, 2009; 2010; Revellino
and Mouritsen, 2009). Formal controls may enhance innovation contexts as Simons (1990; 1995a; 1995b) found that the interactive use of MCS encourages and leads to successful innovation. As noted earlier in Section 3.2, interactive control systems focus on the constant exchange of information that senior managers consider strategically important. The interactive use of control systems is well suited to contexts of innovation, as it is not aimed at eliminating the uncertainties and the variations required for innovation. On the contrary, it stimulates new opportunities, initiatives and adaptations.

Adler and Borys (1996) attempt to reconcile two effects of formalization, or bureaucracies (written rules, procedures, and instructions) within innovation contexts. They refer to the negative and positive outcomes of bureaucracies. As concerns the negative outcomes, “the bureaucratic form of [an] organization stifles creativity, fosters dissatisfaction, and demotivates employees” (Adler and Borys, 1996, p.61). When formalization is considered as undermining employees’ autonomy, leading to their dissatisfaction, “it follows that it also limits innovation, since employees in formalized settings have little motivation to contribute to the complex nonroutine tasks that constitute innovation” (Adler and Borys, 1996, p.63). As concerns the positive outcomes, the bureaucratic form provides “guidance and clarifies responsibilities, thereby easing role stress and helping individuals be and feel more effective” (Adler and Borys, 1996, p.61). It seems that formalization and innovation may be reconciled when bureaucracies enable “employees [to] do their jobs more effectively and reinforce their commitment” (Adler and Borys, 1996, p.83).

In summary, Simons (1990;1995a; 1996b), Adler and Borys (1996) acknowledge the positive and enabling (Adler and Borys, 1996) effects of formal control systems on innovation. Many studies have drawn on Simon’s framework of levers of control and on his research regarding the interactive MCS for enhancing innovation, in order to further examine its use within settings of innovation. Bisbe and Otley (2004) focus on exploring the effects of the relationships between interactive MCS and product innovation. The use of interactive MCS contributes to attenuating the extremes of the innovation momentum that may produce dysfunctional effects (Bisbe and Otley, 2004;
Mouritsen et al., 2009; Revellino and Mouritsen, 2009). However, the adoption of these controls may lead to higher levels of innovation by extending “the number of entities that innovation can take into account” (Mouritsen et al., 2009, p.752). It emerges that the positive relationship between interactive control systems and innovation depends on the level of innovation (Bisbe and Otley, 2004). Specifically, interactive MCS may be useful for fostering communication, dialogue and stimuli for new initiatives in which there are lower levels of innovation (Bisbe and Otley, 2004). At the same time, these MCS may also facilitate practices of fine-tuning, direction and selection of initiatives in contexts with higher levels and potentially negative excessive innovation (Bisbe and Otley, 2004; see also Mouritsen et al., 2009; Davila and Ditillo, 2013).

The choice of MCS selected for interactive use, such as budget, balanced scorecard or project management systems, may depend on the innovation management mode (Bisbe and Malagueño, 2009). The innovation management mode consists of the managerial process “by which innovation arises” (Bisbe and Malagueño, 2009, p.373). Bisbe and Malagueño have questioned whether the fit between interactive controls systems and the different innovation management modes, i.e. intuitive, systematic and strategic, may result in beneficial outcomes for product innovation (Bisbe and Malagueño, 2009). In this study, it is interesting to discover that a fit between control and innovation management mode does not produce positive effects on product innovation and, more specifically, it does not mitigate the dysfunctional excesses of innovation, e.g., when “innovation becomes excessive, inadequate or produces dramatically diminished returns” (Bisbe and Malagueño, 2009, p.381). Furthermore, the dysfunctional excesses of product innovation can be mitigated by control systems when they are not suitable to the existing management modes, resulting in “new perspectives” (Bisbe and Malagueño, 2009, p.392) for innovation. The relationship between one of the MCS mentioned above, the budget, and product innovation can influence financial performance. The effects of the budget/innovation/financial performance relationship depend on the approach to budgeting (Dunk, 2011). Using the budget as a planning mechanism results in the enhancement of financial performance (Dunk, 2011). When the budget is used primarily as a control mechanism (i.e. “in a diagnostic fashion” (Dunk, 2011, p.103)), “innovation fails to influence performance” (Dunk, 2011, p.104).
The effectiveness of interactive MCS, considered beneficial to innovation in previous literature (Simons, 1990; 1995a; 1995b; Bisbe and Otley, 2004; Dunk, 2011), is dependent on the particular mode of innovation – either exploration or exploitation\(^5\), or both modes (Bedford, 2015). From Bedford’s study, which builds upon Simons’ levers of control framework and adopts the survey approach, it emerges that interactive control systems are well suited to the explorative mode of innovation; while diagnostic and boundary systems produce beneficial effects in firms pursuing exploitative innovation. In firms jointly pursuing exploration and exploitation, the combined use of diagnostic and interactive control systems creates a “dynamic tension that matter[s] for enhanced performance” (Bedford, 2015, p.26) and “encourages decision makers to simultaneously address demands for both innovation and predictable goal achievement” (Bedford, 2015, p.6).

In summary, this section has analysed studies that consider both the detrimental and the beneficial effects of MCS within processes of innovation. There has been a long-standing view interpreting MCS as not being well suited to innovation realms (see, among others, Abernethy and Brownell, 1997; Abernethy and Lillis, 1995; Abernethy and Stoelwinder, 1995). Nevertheless, in many other studies a particular focus is placed on exploring the role that MCS play in enhancing innovation (Simons, 1990; 1995a; 1995b; Bisbe and Otley, 2004; Dunk, 2011; Bedford, 2015). The interactive use of MCS helps manage and moderate possible negative effects of excessive innovation (Bisbe and Otley, 2004; Bisbe and Malagueño, 2009). The interactive MCS also enable innovation in contexts characterized by a lower emphasis on innovation (Bisbe and Otley, 2004).

3.4 Management control systems and creativity

Innovation has been portrayed as a broad concept in Chapter 2, Sections 2.2 and 2.3. It encompasses creativity, which constitutes its primordial stage\(^6\) (Amabile et al., 1996; Amabile, 1998; Busco et al., 2012). Uncertainties, flexibilities, creativity, and exceptions that are typical of realms of innovation can coexist with formal controls (Busco et al., 2012). Specifically, an organization can be both creative and, at the same

\(^5\) The terms exploration and exploitation were explained in Chapter 2, Section 2.3.

\(^6\) See Chapter 2, Section 2.3 regarding the point that creativity is a part of innovation. Creativity is the primordial stage of innovation, constituting its explorative process (Busco et al., 2012).
time, use appropriate control systems. For this purpose, organizations should manage a “twofold purposeful imbalance” between creativity and control (Busco et al., 2012). The first is needed when the creative exploration and exploitation are monitored and managed by control systems without diminishing the “creative fire”. The second is needed within the control systems, including both formal (results) or informal (social) controls, to enable both creative spaces and efficient processes (Busco et al., 2012, p.36). Despite the “long-standing view” (Moll, 2015, p.2) that considers formal and traditional forms of MCS and accounting-based controls a hindrance to innovation, Busco et al. (2012) refer to a possible co-existence of formal and informal controls to achieve both organisational standardization and innovation objectives.

Giving people autonomy and freedom around processes and in their approaches to innovation increases their intrinsic motivation and fosters creativity for innovation (Amabile, 1998). In particular, Adler and Chen (2011) show how studies on individual motivation towards creativity can offer a deeper understanding of the organizational relationships between control and innovation, where controls reconcile with creativity. Specifically, when controls are designed to facilitate ‘intrinsic and identified’ motivational orientations, innovation is enhanced, “without individuals consciously exerting effort” (Adler and Chen, 2011, p.80). Creativity and control are things that are not contradictory; their integration is possible, at least within the context of product innovation (Davila and Ditillo, 2013). Controls both shape and stimulate creativity within the creative teams developing new products (Davila and Ditillo, 2013). The use of controls as a means for coordinating activities allows organizations pursuing innovation to structure creativity and opportunely channel the latter into value (Davila and Ditillo, 2013). This results in the development of controls that prevent the dispersion of creative ideas into activities that do not lead creative effort toward value. Moreover, two effects of control have been identified: they may be adopted to either configure and/or inspire creativity (Davila and Ditillo, 2013; see also Busco et al., 2012). More specifically, directional controls (such as accounting-based mechanisms, behavioural, personnel) are used to set and mould the “creative space” (Davila and Ditillo, 2013; Chiang and Hung, 2014). They allow organizations to channel employee freedom and experimentation with creativity for innovation towards a value. Inspirational controls (ideation methods, visualising tools, social networks) provide individuals with inspiration and motivation for innovation by encouraging their
creativity and enabling a ‘collective mind’ towards a shared and final idea (Davila and Ditillo, 2013; Chiang and Hung, 2014). These controls trigger creativity by encouraging and motivating people to come up with new ideas, to consider new trends and new opportunities as well as new threats for innovation (Davila and Ditillo, 2013; see also Davila et al., 2009a).

3.5 Management control systems and new product development

The NPD process needs “to be measured and managed” (Davila and Wouters, 2007, p.851). In this setting, accounting and control are afforded a complex role (Booker et al., 2007). The literature has suggested “that accounting/financial management plays a key role in resource allocation decisions and in [...] operational management” (Nixon and Burns, 2012, p.238) of the NPD processes. MCS are considered relevant for the management of innovation during the NPD processes (Davila et al., 2009b). A strand of literature has depicted MCS as being flexible and dynamic enough to manage the evolving and changing situations required in innovation contexts. However, MCS are also stable enough to frame models, patterns and action, and to make the innovation viable (Davila et al., 2009b; Adler and Chen, 2011; Davila and Ditillo, 2013). Interestingly, Davila et al. (2009b) have listed seven different control systems that may be used in NPD contexts: project milestones, reports comparing actual progress to plan, budget for development projects, project selection process, product portfolio roadmap, product concept testing process and project team composition guidelines. By relying on these control systems, the reason for their adoption is discovered to be associated with the on-time dimension of the NPD performance (Davila et al., 2009b).

In analyzing the effects of MCS on innovation, Bonner et al. (2002) have carried out a survey on the use of formal control systems within NPD settings. They question how these systems (positively or negatively) influence NPD projects performance. Particular attention is given to the role of upper-management in controlling NPD projects. From this study, it emerges that both interactive and participative control systems are positively related to project performance. This positive relationship also results from the simultaneous involvement of upper-management and project team members in setting operational controls and defining goals and procedures for the project (Bonner et al., 2002). On the contrary, “too much” formal control by upper-management is negatively related to project performance. In this context, team members’ creativity for NPD is
realized when flexibility is allowed “within a broad strategic direction” (Bonner et al., 2002, p.244; see also Kamoche and Cunha, 2001).

A high request for control within the NPD setting is needed because the output (i.e. the new product) is directly launched into the market, having fulfilled cost, time and quality constraints, so as to contribute to the “firm’s market competitiveness” (Chiesa et al., 2009, p.496). Furthermore, organizations measure R&D performance to motivate the researchers and the engineers involved in these settings, and with the purpose of monitoring the progress of activities, evaluating the profitability of R&D projects, favouring coordination and communication and stimulating organisational learning (Chiesa et al., 2009).

Strategy constitutes a key influence on MCS design and use for NPD. MCS need to be structured in a way that links them to the strategy (Hertenstein and Platt, 2000). Hertenstein and Platt refer to three management controls considered important in NPD settings, i.e. the position of NPD in the firm’s organizational structure, the NPD process, and the NPD performance measures. Product strategy and MCS are also related to project uncertainty (Davila, 2000; Hertenstein and Platt, 2000). Three types of uncertainties within NPD processes, i.e. market, technology and project scope uncertainties, are identified (Davila, 2000). Within these processes, project managers use MCS depending on product strategy and type of uncertainty (Davila, 2000). Project managers need to use MCS in order to reduce the uncertainties (market, technology and project scope uncertainties) within the NPD processes. Additionally, they also use MCS to assist with the coordination of the activities (Davila, 2000; Jørgensen and Messner, 2010) during the NPD phases. Indeed, horizontal coordination of the multiple parts involved during the NPD process is needed (Jørgensen and Messner, 2010; see also Nixon, 1998).

3.5.1 Accounting as an element of management control systems in new product development

The NPD process has been portrayed in the accounting literature as being “characterised by pluralistic demands and high uncertainty about outcomes” (Jørgensen and Messner, 2010, p.185; see also van der Meer-Kooistra and Scapens, 2008; Davila et al., 2009a). In this setting, accounting may consist of monitoring the cost of a new product,
updating “a spreadsheet model that require[s...] engineers or managers to fill in estimated unit costs in production, as well as material and labour costs for the development of the product” (Jørgensen and Messner, 2009, p.111; see also Jørgensen and Messner, 2010). During the NPD process, accounting practices have been portrayed as allowing to solve possible disagreements through an established “common criterion for the evaluation of practices (such a profitability) and/or because they provide a space that allows a workable compromise to be developed” (Jørgensen and Messner, 2010, p. 187; see also Nixon, 1998). Furthermore, accounting is also considered relevant for making decisions (Davila, 2000; Jørgensen and Messner, 2009; 2010), depending on the cost impact of the process on the other departments within the organization (Mouritsen et al., 2009). Accounting information makes the impact of the NPD process on its accounting performance transparent (Jørgensen and Messner, 2009; Mouritsen et al., 2009; Revellino and Mouritsen, 2009). Continuing in the context of the NPD process, the use of accounting reminds project managers and engineers of the importance of achieving the expected profitability and financial performance defined or established at the outset of the process.

In Jørgensen and Messner (2009; 2010), the empirical NPD process resembles following a stage-gate system. At each gate the project manager ‘defends’ the development and the performance of the project and explains its key financial indicators to the management board. During the NPD process, control systems may contribute to balancing efficiency and flexibility, two characteristics needed within processes of NPD (Jørgensen and Messner, 2009; van der Meer-Kooistra and Scapens, 2008; Busco et al., 2012). This is specifically shown in Jørgensen and Messner (2009) when the project manager and the engineers within the empirical NPD project carried out activities in order to address new needs for cost calculations when a new product strategy, in that specific case – product modularity, was introduced. These activities had impacts on “a spreadsheet model that required engineers or managers to fill in estimated unit costs in production, as well as material and labour costs for the development of the product” (Jørgensen and Messner, 2009, p.111). This spreadsheet was adapted for the revised NPD strategies (Jørgensen and Messner, 2009). Within this case the finance representatives did not participate in the accounting and control practices during the

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7 For a more in-depth review of the stage-gate system developed by Robert Cooper, see Chapter 2, Section 2.5.
process of product innovation. They did not take part in those initiatives where an adaptation of control was needed in order to cope with the change in the strategy. However, in this specific case, these initiatives were not totally satisfactory and the intervention of the finance director would have been required with “a more top-down management intervention” (Jørgensen and Messner, 2009, p.99).

In studies by Davila (2000) and Jørgensen and Messner (2009; 2010), accounting and control practices are carried out by project managers. In Nixon’s (1998) study, accounting is managed by the financial controller who is part of the NPD project team. In this latter case, during the NPD process, the financial controller plays a “pivotal” role, by balancing and reconciling the various activities, needs and interests within the process in relation to the “contribution and cash flow requirements” (Nixon, 1998, p.340), the strategic considerations and the cost requirements of the NPD. The financial controller executes accounting practices and also assists engineers in their efforts to lower cost. In practicing accounting, the finance controller needs to obtain data from other disciplines and sources involved in the innovative initiatives within the NPD process (Nixon, 1998). The integration of an accountant within the project team improves the use of accounting systems as well as enhances development projects (Rabino, 2001). The accountants as team members would support decision-making processes and introduce a cost discipline in order to “track the financial implications of each phase of the development” (Rabino, 2001, p.75; see also Davila, 2000; Nixon, 1998) during the NPD process. Furthermore, the accountants who participate in the NPD process may appear to possess an “advantage in compiling and using financial numbers, balancing and negotiating financial targets among other disciplines, analysing variances and ensuring consistent application of financial criteria in decisions” (Nixon and Burns, 2012, p.241); but instead, accounting belongs to the team and facilitates their coordination and collaboration (Nixon and Burns, 2012). However, when the engineers are involved in the accounting practices, difficulties may be encountered in managing costs during NPD processes. This happens when costs are not at “the top of engineers’ list” of activities or things to do (Davila and Wouters, 2004, p.15), when they prefer to work more on the technology challenges rather than focussing on the complexity of modelling the cost impact of product design decisions on shared resources within the organization.
The use of accounting within NPD processes allows the actors involved to better develop communication and consensus among them (Nixon, 1998). Accounting is portrayed as “an integrating vernacular that links all project team participants” (Nixon, 1998, p.329; Nixon et al., 2011) facilitating their communication. Practicing accounting links ‘the disparate perspectives’ within the NPD process, such as “the customer, the design engineers, the R&D team, the joint-MDs, the Financial Controller and suppliers” (Nixon, 1998, p.343). Accounting represents a language primarily used in order to coordinate the different practices and activities during the development of new products. Nixon et al. (2011) also recognize the ‘pivotal role’ of accounting among the multidisciplinary team and the “network of participants in the new product design and development” process (2011, p.1; see also Nixon, 1998). Basing their study on the automotive industry, Nixon et al. (2011) highlight how the involvement of the NPD engineers and accountants in accounting, during the NPD process, allows management accounting principles to permeate the entire NPD process. Management accounting is in the strategy, in the process and in the culture of these processes (Nixon et al., 2011). Within the context of NPD, accounting practices also contribute to the process of strategising – i.e. “mobilising different strategic objectives to which […]NPD] practices are supposed to contribute” (Jørgensen and Messner, 2010, p.184). The adoption of management accounting practices is useful to measure and evaluate NPD processes, influencing the actions and practices carried out by the people participating in these processes (Nixon, 1998; Jørgensen and Messner, 2010).

In the studies reviewed, accounting and control are performed by individuals within, or very close to, the team that is developing the new products, through the figure(s) of the financial controller (Nixon, 1998), the project manager (Davila, 2000), the project manager and the design engineers (Jørgensen and Messner, 2009; 2010; Nixon et al., 2011). However, it is also interesting to point out the study by Davila and Wouters (2004), in which the impacts of accounting and control generate “tension between the importance of cost considerations in product development and the difficulty of managing them during this process” (2004, p.15). In some cases, costs need to be managed “outside the development team and around it through support teams” (Davila and Wouters, 2004, p.17), without expecting “cost consciousness within the development team” (Davila and Wouters, 2004, p.17). In addition to “these parallel cost management teams”, Davila and Wouters (2004) have illustrated further alternative
practices, i.e. modular design for cost, clearly defined cost management strategies and cost policies, and product portfolio planning. These practices are meant to manage costs, still within the context of product innovation, but without interfering with the process of innovation and without disturbing the development team from creating the new product (Davila and Wouters, 2004).

3.6 Accounting, control and the balance between firmness and flexibility within product innovation

Innovation has been portrayed as something that takes advantage of “unexpected opportunities, exceptions, new relationships, uncertain outputs, risk and the possibility of failure” (Davila et al., 2009a, p.282). These elements would require innovation processes to unfold flexibly (Tatikonda and Rosenthal, 2000; Kamoche and Cunha, 2001; van der Meer-Kooistra and Scapens, 2008). Creativity for innovation has the potential to nurture the motivation and the flexibility for innovation (Amabile et al., 1996; Davila et al., 2009a; Adler and Chen 2011; Davila and Ditillo, 2013). In addition to creativity, innovation requires further processes to run in parallel that call for different forms of control, including accounting controls, (Davila et al., 2009a; Revellino and Mouritsen, 2009; Busco et al., 2012), which “keep the direction” (Davila et al., 2009a, p.287) for innovation, channelling its creativity into a structured process so as to finally create successful value (Davila and Ditillo, 2013). These studies confirm that processes of innovation are characterized by both firmness and flexibility (Tatikonda and Rosenthal, 2000; Kamoche and Cunha, 2001; van der Meer-Kooistra and Scapens, 2008; 2015), where firmness/control is underpinned by structures, rules and formalizations and flexibility/creativity are characterized by the need for adaptations and changes for innovation.

Flexibility within processes of innovation is stimulated by explorative creativity, serendipity (Busco et al., 2012), room for manoeuvre, autonomy and adaptation (and sometimes also improvisation) (Kamoche and Cunha, 2001), as well as new opportunities and possible failures (Davila et al., 2009a). At the same time, firmness, which builds on controls, such as accounting and other project controls, accounting information (van der Meer-Kooistra and Scapens, 2015), as well as structure, standardisation and detailed planning, results in monitoring day to day activities in order to make product innovation and NPD processes efficient (Tatikonda and Rosenthal,
2000; Kamoche and Cunha, 2001; van der Meer-Kooistra and Scapens, 2008). The control of these processes allows the people involved in the NPD process to better shape and configure the flexibility required for creativity, towards a valuable and successful innovation (Davila and Ditillo, 2013; see also Busco et al., 2012).

Studies such as Tatikonda and Rosenthal (2000), Kamoche and Cunha (2001), van der Meer-Kooistra and Scapens (2008), reviewed in Chapter 2, Section 2.4.1, have analyzed the coexistence of the two apparently contradictory dimensions of firmness and flexibility within the product innovation processes. According to this literature, firmness and flexibility should be managed and allowed to coexist, in order to attain successful outcomes from innovation processes. It is recommended that dichotomous choices should be avoided. Rather more of a synthesis between flexibility and firmness will help move processes of innovation forward (Kamoche and Cunha, 2001). Tatikonda and Rosenthal (2000) have explored ‘firmness and flexibility’ within a product innovation process by looking at the project execution phase. They identify three project execution methods: formality, project management autonomy and resource flexibility. Firmness is associated with formality – namely to set “rules, procedures, and periodical reviews for project control and reviews” (Tatikonda and Rosenthal, 2000, p.405). Flexibility is achieved through autonomy of project management and resource flexibility – these mechanisms allow the process to adapt to changing situations and new opportunities as they arise. Firmness and flexibility may be balanced simultaneously (Tatikonda and Rosenthal, 2001). This balance is achieved through the “firmness (structure) at […] project level, and flexibility at […] working level within the project” (Tatikonda and Rosenthal, 2000, p.418).

Specifically, firmness/control and flexibility/creativity for product innovation may be balanced and managed creating a “synthesis through the concept of ‘minimal structures’” (Kamoche and Cunha, 2001, p.733; see also van der Meer-Kooistra and Scapens, 2015), a sort of template on which creativity can be stimulated and coordinated by the parties participating in the development of the project (see Chapter 2, Section 2.4.1). Within these minimal structures, “the parties could act (and re-act) flexibly” (van der Meer-Kooistra and Scapens, 2008, p.380). Within minimal structures creativity, innovation and continuous learning are permitted. Minimal structures within product innovation would constitute a sort of template of improvisation for innovation,
in which flexibility is managed and “where appropriate levels of responsibilities, priorities and procedures are clearly defined and combined with wide zones of manoeuvre” (Kamoche and Cunha, 2001, p.750).

3.7 **Accounting and mediation during innovation processes**

Accounting and control practices and measures are purposely intended “to evaluate and control product development activities” (Christner and Strömsten, 2015, p.64). Accounting has been portrayed as a “mediating instrument” (Miller and O’Leary, 2007) within processes of product innovation. Miller and O’Leary (2007, pp.702-703) use:

> the term ‘mediating instruments’ to refer to those practices that frame the capital spending decisions of individual firms and agencies, and that help to align them with investments made by other firms and agencies in the same or related industries. The metrics that [Miller and O’Leary ...] are interested in here envision a future, they give substance and timing to that vision, and they demonstrate to all the actors involved what is needed from each of them, so that they may contribute to the making of future markets.

Consequently, by building on this quotation, it is seen that using the concept of a mediating instrument to “demonstrate to all the actors involved what is needed from each of them” (Miller and O’Leary, 2007, p.703) is useful for this study of accounting within NPD processes. Accounting and its calculations are interpreted as instruments that intervene within processes of innovation, mediating “between aspirations, actors and arenas” (Miller and O’Leary, 2007, p.708). In this context, accounting “should be viewed as a *practice*, an attempt to intervene, to act upon individuals, entities and processes to transform them and to achieve specific ends” (Miller and O’Leary, 2007, p.708).

Through the investigation of the relationships between innovation and control within the innovation process for the Italian project Telepass (“an automatic toll collection devise developed to make traffic fast, safe and fluid” – Revellino and Mouritsen, 2009, p.341), Revellino and Mouritsen emphasize how innovation changes and adapts as the project Telepass faces diverse challenges, or “trials”, during its development, such as, “how to identify technology; how to enrol a set of suppliers; how to persuade the user; how to re-organise Autostrade; and how to stabilise and extend the innovation through new
investments and innovations” (Revellino and Mouritsen, 2009, p.365). To manage these challenges, or trials, different types of controls were implemented. In this specific context, controls and the process of innovation co-develop and change over time according to the development of the Telepass project. Specifically, controls mediate between innovation and the other concerns of the organization, its context, challenges and trials (Revellino and Mouritsen, 2009).

Drawing on the idea of accounting calculations as mediating between activities for innovation and the wider concerns of the organization, management accounting calculations are viewed as having the potential to ‘mobilise’ innovation and create dialogue around it (Mouritsen et al., 2009; see also Nixon, 1998). Mouritsen et al. (2009) interpret calculations as short translations measuring the financial effects of an innovative initiative by making innovation activities and their impacts transparent. This practice seems to be helpful in managing cases characterized by an excess of innovation. Long translations, produced by “competing” calculations for instance, develop “problematisation of the role of innovations” (Mouritsen et al., 2009, p.749), their strategies and the technologies adopted. Relying on the notion of short and long translations, Mouritsen et al. (2009) attach a meaning to management accounting calculations that goes beyond simply quantifying and possibly justifying the cost of the innovation activities. The use of management accounting helps managers understand how the innovation is linked to, is coherent with and may assist in the achievement of wider objectives of the organization (Mouritsen et al., 2009; see also Hertenstein and Platt, 2000). Specifically, the calculations offer managers a more in-depth visibility of the process and, in doing so, this vision may influence the development of innovation activities (Mouritsen et al., 2009).

Calculative practices, including accounting calculations, have also been portrayed by the accounting literature as “performative engines” as they make actors orient, re-orient and dis-orient during the innovation process (Revellino and Mouritsen, 2015). These practices “produce drift by inspiring people to ask new questions and to see new opportunities” (Revellino and Mouritsen, 2015, p.47). The use of calculations helps innovation to develop and not remain stable, adding new opportunities to innovation as well as novel things and knowledge within the innovation process (Revellino and Mouritsen, 2015). In analyzing the evolution of the innovation process of Telepass (see
Revellino and Mouritsen, 2009), Revellino and Mouritsen (2015) investigate how calculative practices, including accounting, facilitate this innovation to develop through a trajectory of drifts, making the relationship between calculative practice and innovation “multidirectional, accumulative, and regenerative” (Revellino and Mouritsen, 2015, p.32). In this case, calculations create mediations, which lead to new knowledge that becomes performative (i.e. engaging relations and luring people into action) for the evolution of innovation. To summarize, calculative practices are interpreted as mediators for the evolution of the innovation process.

It is clear that accounting calculations link and mediate between heterogeneous actors and domains (Miller and O’Leary, 2007; Christner and Strömsten, 2015), resulting in enabling and shaping “particular development trajectories” (Christner and Strömsten, 2015, p.50) for innovation. It is interesting to note how the enabling role of accounting calculations (e.g. the market share, the IRR calculations), mediating between different actors and domains, suggests potential directions for the unfolding of the trajectories for innovation. However, accounting calculations, by enabling “particular development trajectories entail [...] the constraining of alternative courses of action” (Christner and Strömsten, 2015, p.50). In the specific case study investigated by Christner and Strömsten (2015), the constraining of particular development trajectories through accounting as a mediating instrument “eventually led to the downfall of the company” (p.65). In summary, the relevance of accounting and its calculations within processes of innovation, and of going beyond a representational role of accounting (Revellino and Mouritsen, 2015), has been acknowledged in previous literature. Accounting calculations, by mediating between different actors, domains, challenges and concerns, engage with and facilitate the unfolding of the innovation process (Christner and Strömsten, 2015; Revellino and Mouritsen, 2015).

3.8 Accounting and hybridization during new product development

A number of studies have demonstrated that the encounter between different sets of expertise – which is likely to take place, e.g., during innovation processes – may lead to hybrid practices or to hybrid expertise (Caglio, 2003; Burns and Baldvinsdottir, 2005; Byrne and Pierce, 2007; Kurunmäki, 2004; Miller et al., 2008; Hyvönen et al., 2009). From the literature reviewed in this chapter, it is clear that both accountants (finance controllers) and non-accountants (such as project managers or design engineers)
practice accounting during processes of product innovation. In the first instance, accounting is performed by accountants who are part of the project team and who become interested in, and closer to, the NPD operational activities (Nixon, 1998; Nixon and Burns, 2012; see also Rabino, 2001). In the second instance, accounting is practiced by non-accountants, such as project managers (Davila, 2000; Jørgensen and Messner, 2009; 2010) or design engineers (Booker et al., 2007; Jørgensen and Messner, 2009; 2010; Nixon et al., 2011). In all cases, the scope of accounting becomes broadened, coming closer to and encompassing elements and dynamics that are typical of the technical and operational activities and practices of the NPD processes.

At this point, it is also interesting to consider a specific strand of research that portrays accounting and control as not only reliant on processes and outputs from the accounting department, but also as “the spread of management accounting work to other functions” (Langfield-Smith, 2007, p.224), with “organisational members increasingly providing ‘accounting’ data in the course of their normal work activities” (Lowe, 2001, p.340). In 1980 Burchell referred to the accountants and their potential to build “connections between accounting and other forms of organizational practice, particularly that of production management” (Burchell, 1980, p.8). It is clear that accounting practices are likely to involve organizational processes other than accounting (see, among others, Nixon, 1998). These practices can permeate “practices of management and find [...] expression in the line functions of procurement, operations, distribution and sales, as well as in staff functions associated with product development, supplier and partner management, human resource management [...] and marketing” (Anderson, 2007, p.498).

Wouters and Roijmans (2011) have interestingly investigated a case (in a medium-sized company in the beverage manufacturing industry) where operations managers deal with accounting. Within their longitudinal case study, the transportation manager, who is “not an accountant”, supports the accountant by participating in the experimentation of an accounting prototype for the development of an enabling performance measurement system. The accountant and non-accountants, by working together and by combining their knowledge for the development of the accounting prototype, contribute to generating knowledge and interdependencies from various domains. This practice generates collaborative effects that improve the development of accounting itself while
the involvement of non-accountants also helps accountants develop awareness of the accounting measures. Accounting and its engagement with other expertise is also explored by Miller (1998), who explores accounting ‘at the margins’, looking at its meeting, its intersections as well as possible conflicts with other disciplines. According to Miller, accounting practices and calculations are continuously redrawn and performed, by and through what is beyond the boundary of accounting, such as engineering and manufacturing. In a sense, accounting becomes ‘permeable’ to other disciplines and knowledge that it meets, which are closer to the product and operational processes. This happens through “relations formed between a complex of actors and agencies, arguments and ideals, calculative devices and mechanisms” (Miller, 1998, p. 617-618).

There are even research studies, such as Langfield-Smith (2007) and Jeacle and Carter (2012), dealing with accounting tools without the involvement of the accounting function and staff. Jeacle and Carter (2012) have described the use of accounting by non-accounting experts beyond the confines of the finance function, within the world of a fashion chain store. Even though accounting tools and practices are used for key decisions and during the daily activities of the organization, such as designing, buying and merchandising, it is interesting to note how the finance function or staff does not manage these tools and practices during daily activities. In particular, while the finance and accounting functions of the case study “provide an important supporting role within the organization, it is the actions of the “non-accounting” personnel, particularly the trinity of designer, buyer and merchandiser, which lie at the heart of the business of high street fashion, and whose daily activities draw heavily on accounting techniques and practices” (Jeacle and Carter, 2012, p.745).

Miller et al. (2008) have associated the encounter of (management) accounting with other disciplines to the concept of hybrids, by stating the following:

[... ] hybrids [... ] can take the form of organisational arrangements [...] of hybrid processes, practices or expertises. In all cases, however, hybrids are defined as new phenomena produced out of two or more elements normally found separately. According to this view, hybrids have distinctive and relatively stable attributes and characteristics, and are not merely intermediary or transitory forms that are tending towards one pole or the other (Miller et al., 2008, pp.943-944).
Moreover, hybrids facilitate lateral relationships, lateral exchange and flows of information, “coordination across the boundaries of organisations, firms, and groups of experts or professionals” (Miller et al., 2008, p.942). A ‘new, hybrid position’ for accountants who are more “business-oriented ‘hybrid’ professionals” is shaped as a result of the process of hybridization of their accounting expertise with other “activities and responsibilities [...] into the business” (Caglio, 2003, p.145). With a specific focus on processes of hybridization of expertise, including accounting, Caglio (2003) refers to the relationships between accountants and the other (non-accounting) disciplines. In her longitudinal case study, the accountants experience a process of hybridization during the introduction of an ERP (Enterprise Resource Planning) system. This new system allows the accountants to broaden and enrich their “range of activities and practices, [...] to gain access to other professional fields” (Caglio, 2003, p.128). However, it is also interesting to note that “such expansion may be matched by a movement in the opposite direction” (Caglio, 2003, p.128) with accountants who “may have to face the erosion of their technical preserve by other adjacent or competing professional groups, depending on the permeability of accounting boundaries and on their ability to protect their occupational jurisdiction” (Caglio, 2003, p.128).

Hybrid accountants are closer and more integrated into the business, supporting the operational managers in focussing on what they need to improve (Burns and Baldvinsdottir, 2005). With the aim of better understanding the role of management accountants, Byrne and Pierce (2007) refer to the emergence of hybrid management accountants, broadening and going “beyond a narrow bean counter role model to include more of a business partner role model” (Byrne and Pierce, 2007, p.493). In particular, Byrne and Pierce reflect on how accountants “penetrate operational domains and legitimise positions in such domains” (2007, p.473).

Previous papers (Caglio, 2003; Burns and Baldvinsdottir, 2005; Byrne and Pierce, 2007) have referred to the hybridization of the accountants’ expertise, who by expanding their role are closer to other disciplines within the organization. The phenomenon of hybridization has also been explored by considering the “opposite direction” (Caglio, 2003), in which non-accountants, and specifically experts or professionals belonging to the operational functions of the organization also increasingly deal with accounting practices. In that respect, Kurunmäki (2004) illustrates how a non-accountant obtains management accounting expertise by preparing
budgets, calculating costs, and setting prices. Specifically, the clinicians in her case study “acquire, with relative ease, a command of core management accounting techniques and skills” (Kurunmäki, 2004, p.336). However, it is specified that such hybridisation of expertise does not transform and turn medical professionals into professional accountants; rather the medical specific-domain skills of the clinicians are “complemented by a new set of techniques” that belong to the management accounting domain and that enable them “to prepare budgets, calculate costs, and set prices” (Kurunmäki, 2004, p.336). In these circumstances, the medical expertise merges with a set of calculative accounting practices.

With the aim of explaining the consequences of, and the reactions to, pressures to develop a new management accounting system within an ERP environment of a military domain (the Finnish Defence Forces), Hyvönen et al. (2009) illustrate the relationships and the dynamics between accountants and hybrid accountants – the latter being military personnel. In this setting “the accountants tasks have traditionally consisted of bookkeeping and reporting, while other accounting tasks such as budgeting, planning and control have been carried out predominantly by military personnel [i.e. hybrids]” (Hyvönen et al., 2009, p.244). In this case, it is interesting to note that the management accountants desired to expand their occupational role and the military officers, as hybrid accountants, resisted that ambition. In this military context, hybrid accountants are very strong in terms of their influence, whereas the accounting profession is quite weak.

From the strand of literature reviewed in this section, it is clear that the role of the accountants, as well as the accounting discipline, is changing and evolving over time, partly because of their increasing integration with the other disciplines involved within the business of the organization. This phenomenon also occurred within innovation and NPD processes. In these contexts, the financial controller practices accounting and also assists engineers in their efforts to lower cost. However, in order to do this the financial controller needs to obtain data from other operational disciplines involved within the innovative initiatives of the NPD process (Nixon, 1998). ‘Routine jobs’ are increasingly eliminated since project managers and engineers also acquire accounting knowledge and carry out accounting practices in these innovation contexts (Davila, 2000; Booker et al., 2007; Jørgensen and Messner, 2009; 2010). These situations lead to a broader role for the management accountant (Miller, 1997; Burns and Baldvinsdottir, 2005; Caglio,
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2003; Scapens and Jazayeri, 2003; Byrne and Pierce, 2007), as well as for accounting as a discipline.

3.9 Chapter Summary

Innovation has been portrayed as “taking advantage of unexpected opportunities, exceptions, new relationships, uncertain outputs, risk and the possibility of failure” (Davila et al., 2009a, p.282; see also van der Meer-Kooistra and Scapens, 2008). NPD is the process which implements innovation by creating a new product and transforming creative ideas into a tangible asset (Davila, 2000). NPD has been mainly described by the accounting literature as a process of product innovation that is structured around phases (Davila, 2000), or stages (Jørgensen and Messner, 2009; 2010), in which multiple and heterogeneous rationales and participants are involved and coordinated (Nixon, 1998).

Up to the nineteen nineties, the literature has predominantly portrayed formal MCS as being detrimental to flexible settings (Abernethy and Lillis, 1995) in general, and to innovation and R&D settings (Abernethy and Brownell, 1997) in particular. In more recent studies, control has been portrayed as favouring and extending innovation in low-innovating firms (Bisbe and Otley, 2004; Mouritsen et al., 2009). Also, accounting and control can be seen to reduce innovation in high-innovating firms (Bisbe and Malagueño, 2009). Control, as part of MCS, inspires and encourages the flexibility and the motivation required for creativity and innovation, while at the same time channelling and directing creative ideas, and coordinating the multiple activities they entail towards a valuable innovation (Adler and Chen, 2011; Davila and Ditillo, 2013; Chiang and Hung, 2014). Within NPD settings, control/firmness and creativity/flexibility may be managed and balanced within boundaries of (minimal) structures (Tatikonda and Rosenthal, 2000; Kamoche and Cunha, 2001; van der Meer-Koistra and Scapens, 2008).

During the NPD process, accounting practices remind the project manager and the design engineers to achieve predefined profitability objectives (Jørgensen and Messner, 2010). Additionally, accounting practices constitute a workable space in which compromises between heterogeneous parts and rationales may unfold and be agreed upon (Jørgensen and Messner, 2010; see also Nixon, 1998). Other than playing a role in
coordinating the heterogeneous and multiple activities and rationales for innovation (Nixon, 1998; Jørgensen and Messner, 2010; Davila and Ditillo, 2013), accounting and control facilitate enhanced communication and consensus, constituting an “integrated vernacular” (Nixon, 1998) between the different parts of the organisation participating in the NPD process. In this context, the accountant, as team member, plays a “pivotal role” (Nixon, 1998) bringing together the heterogeneous parts involved.

In recent accounting literature, the mediating role of accounting calculations during processes of product innovation has been investigated (see, among others, Christner and Strömsten, 2015; Revellino and Mouritsen, 2015). By mediating between different actors, domains, challenges and concerns, accounting calculations engage with, and intervene within, processes of innovation. They influence and stimulate the course of action for innovation. They underpin the evolution of and direct the trajectories of the innovation process (Christner and Strömsten, 2015; Revellino and Mouritsen, 2015). Furthermore, accounting practices also co-develop with innovation (Revellino and Mouritsen, 2009).

Finally, the NPD process has been depicted as a space where multidisciplinary and heterogeneous participants are involved (Nixon, 1998; Jørgensen and Messner, 2010). In this context, project managers and engineers may deal with accounting (Davila, 2000; Jørgensen and Messner, 2010). Alternatively, the accountant, or the finance controller, may be very close to the operational activities of the NPD process (Nixon, 1998). Encounters between different experts take place during innovation processes and can lead to hybrid practices or to the creation and emergence of hybrid expertise. It is also clear that the role of accountants, as well as the role of the accounting discipline, is changing and evolving over time due to increasing integration with other disciplines involved within innovation processes. By relying on the various areas examined in detail in this literature review, as well as on the motivation for this study as outlined in Chapter 1, section 1.4 and Chapter 2, Section 2.6, the research objective and the research questions for this thesis are articulated below, in Chapter 4.
Chapter Four
Research Objective and Research Questions

4.1 Introduction
This research is located within the realm of management accounting and builds on the literature review of the role of accounting within contexts of innovation and NPD. This thesis considers that what constitutes innovation depends on a multi-disciplinary/cross-functional discovery in which the search for innovation is driven by desires, intentions, and motivations of multiple actors at work. The study of accounting, with respect to the intentions (i.e. the multiple purposes and ends at stake and the tensions generated by them – see Quattrone, 2015; Busco and Quattrone, 2016) that characterize NPD processes, has the potential to offer understanding into how accounting can drive and facilitate NPD processes and innovation objectives within these processes.

The motivation for this study (synthesized in Chapter 1, Section 1.4 and explained in detail in Chapter 2, Section 2.6) is reinforced through previously reviewed points in the literature (see Chapter 3). To date, the literature has contributed to a clear understanding of the role and the impacts of accounting and control within contexts of innovation and NPD by offering plenty of insights for understanding the relevance of MCS and accounting, as a part of MCS, for innovation (see Chapter 3, Sections 3.3 and 3.4) and for NPD processes, in particular (see Chapter 3, Section 3.5). In this study, this understanding is advanced by the review of studies: on the balance between firmness/control (accounting and project controls, structures, rules and formalizations) and flexibility/creativity (the need for adaptations and changes) within product innovation processes (see Chapter 3, Section 3.6), the role of accounting facilitating processes of innovation mediating among different actors and domains within these realms (see Chapter 3, Section 3.7) and the hybridization of the professionals’ accounting and non-accounting expertise (see Chapter 3, Section 3.8), considering hybridization as a process that may characterize innovation and NPD realms. From this review, it emerges that firmness and flexibility, mediation and hybridization characterize processes of innovation and NPD. They entail different purposes for and dimensions of innovation (firmness and flexibility, both needed for innovation), the participation of multiple actors, with different aspirations, and the involvement of
different domains and concerns (among which to mediate), where the actors have different expertise (which can hybridize with accounting).

Moving on from the acknowledgement of firmness and flexibility, mediation, hybridization within product innovation (see Chapter 3) and from the motivation for this study that encourages a focus on the rationale for innovation (see Chapter 1, section 1.4 and Chapter 2, Section 2.6), the research objective of this thesis and the research questions are discussed in this chapter. Chapter 4 is organized as follows. In Section 4.2 the gaps in the literature are identified as well as the theoretical and practical problems that these gaps entail. The primary problem is caused by the lack of detailed knowledge of how accounting can drive and facilitate innovation within the unfolding of NPD processes in practice. Next, in Section 4.3, the research objective is articulated. Then in Section 4.4 the research questions are framed to achieve the research objective. Finally, Section 4.5 synthesizes the key point in this chapter.

### 4.2 The gaps and the problems emerging in the literature

Although the multiple and constructive insights acquired from the literature reviewed in this PhD contribute to an understanding of the role of MCS, with accounting as part of these systems, and their impacts within innovation settings and NPD processes, “the literature in this area is still scant” (Moll, 2015, p.9). The literature does not provide significant insights about how accounting can drive and facilitate innovation in practice, within the unfolding of NPD processes. Furthermore, the literature does not clearly reveal the role accounting plays within the rationale for innovation as NPD processes move forward. A detailed understanding of the rationale for innovation during the NPD process is important for better appreciating the relationships between accounting and innovation (see Chapter 1, section 1.4 and Chapter 2, section 2.6). This investigation has the potential to offer new insights on how to theoretically study and practically manage accounting within NPD processes as well as on how the possible interplay between accounting and innovation can influence the achievement of the objectives of the NPD process.

The literature reviewed that regards the relationships between MCS and innovation (see, among others, Bisbe and Otley, 2004; Mouritsen et al., 2009), and creativity (see, among others, Busco et al., 2012; Adler and Chen, 2011; Davila and Ditillo, 2013), and
NPD (see, among others, Nixon, 1998; Davila, 2000; Jørgensen and Messner, 2009; 2010)\(^8\) focuses on the impacts and the role of accounting within innovation and NPD processes. Recent studies have gone beyond the long-standing view (Moll, 2015) of the stream of literature that considers accounting as detrimental or incompatible with innovation (see, among others, Abernethy and Brownell, 1997), by investigating how accounting enables innovation (Bisbe and Otley, 2004; Mouritsen et al., 2009; Christner and Strömsten, 2015; Revellino and Mouritsen, 2015). The compatibility, the effects, the role of accounting and control with respect to the unpredictability (Abernethy and Stoelwinder, 1995), the flexibility (Kamoche and Cunha, 2001; Davila et al., 2009a; Jørgensen and Messner, 2009), the uncertainties (Abernethy and Brownell, 1997; Davila, 2000; Davila et al, 2009b), the strategies (Davila, 2000; Herteinstein and Platt, 2000; Jørgensen and Messner, 2010), the unfolding trajectories (Christner and Strömsten, 2015; Revellino and Mouritsen, 2015) and the modes (Bedford, 2015) that characterise innovation processes have been investigated.

However, it is recognised that these studies do not consider in-depth the possible interplay between accounting and the mechanisms, the relationships, the dynamics that underpin the rationale for innovation, i.e. the purposes and ends upon which processes of innovation build and are moved forward (Quattrone, 2009; 2015). Focussing the study on examining how accounting engages with the rationale for innovation further contributes to the literature, allowing improved understanding of accounting in these innovation contexts, and offering new insights into the way in which accounting practices can help guide NPD processes and in particular innovation-making NPD processes.

Innovation processes in general, and NPD processes in particular, are characterised by heterogeneous, pluralistic perspectives and rationales (Nixon, 1998; Jørgensen and Messner, 2010; Nicolini et al., 2012) that need to be coordinated and managed (Jørgensen and Messner, 2010; Davila and Ditillo, 2013). In this context, the wants and desires for innovation (Busco and Quattrone, 2016), the multiple purposes and ends for innovation, i.e. the intentions (Quattrone, 2015; Busco and Quattrone, 2016), are likely to engage multiple interests and concerns of the professionals/experts involved in the process, revealing “a multiplicity of heterogeneous and often confused decisions made

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\(^8\)See Chapter 3.
by a large number of different and often conflicting groups” (Akrich et al., 2002a, p.191), where everyone may be motivated to defend and promote their own interest. The investigation of all of these dynamics in practice has the potential to facilitate an understanding of the emergence of the very rationale for innovation, underpinning and moving the unfolding of NPD processes forward. The practical context of NPD, where the innovation process unfolds to create a new product (Chandy et al., 2006), constitutes a valuable space in which to study the rationale for innovation. Only through the analysis of the multiple individuals’ interactions and collaborations (Nicolini et al., 2012) involved in the process, and through a detailed study of the heterogeneous activities and functions, as well as an analysis of constraints and objectives such as the cost targets, throughout the unfolding of the empirical NPD process a deep understanding of both the rationale for innovation and the use of accounting in that process emerges.

4.3 From the gaps and the problems they cause to the research objective
Relying upon the gap identified on the interplay between accounting and the rationale for innovation, it is clear that further understanding needs to be developed. Primarily, the concept of innovation should be explored in-depth in order to develop greater knowledge regarding its rationale and the reason(s) and motivation(s) for why processes of innovation move forward. Secondly, there is a need to better understand how accounting engages with the rationale for innovation and, therefore, this should also be investigated.

As discussed in Chapter 2, Section 2.6, this research also builds on previous studies in which it was argued that “without [...] intentio (the end), there is no inventio (the means) and thus no rationes [accounts, calculations]” (Quattrone, 2015, p.19, original emphasis; Busco and Quattrone, 2016, drawing on Carruthers, 1990; 1998). This thesis is further underpinned and developed from this statement, and the meaning of three Latin words (i.e. intentio, inventio, and rationes – see Chapter 2 for a detailed account on this), as well as from the detailed review of the existing literature on accounting and innovation and NPD. Hence, the main research objective of this thesis is to examine in detail the way in which accounting (ratio, rationes) engages with the rationale (underpinned by intentio and intentiones) for innovation (stemming from inventio), during processes of NPD. As mentioned in Chapter 2, Section 2.6, the rationale for
innovation is conceived of as being underpinned by the desires, the intentions and the motivations of many who contribute to the unfolding of innovation. The material used to investigate the elements that support the realisation of this research objective is most likely found in a practical setting of innovation – in a NPD process. The unfolding practices performed to transform creative ideas into a new product, and to study how accounting practices engage with this transformation, is likely to be the most appropriate study setting for achieving the research objective.

4.4 From the research objective to the research questions

As emphasised earlier in this chapter, the NPD context, and its innovation process depends on a multi-disciplinary discovery where the search for innovation is driven by desires, intentions, and motivations of multiple actors at work. The way in which accounting engages with the rationale for innovation, and in particular with the desires, intentions, and motivations underpinning these processes, is relevant for further building novel understanding about the interplay between accounting and innovation and, more specifically, how accounting can drive and facilitate innovation in practice, within the unfolding of NPD processes.

From the literature surveyed for this research, the enabling role of MCS for innovation and NPD processes has been acknowledged by others. By relying on these studies, accounting has been studied from the perspective of the need to balance firmness and flexibility within processes of product innovation (see Chapter 3, Section 3.6). Accounting, being a mediating instrument among different actors and domains within innovation processes, has been reviewed in Chapter 3, Section 3.7 and the hybridization of accounting and non-accounting expertise was noted in Chapter 3, Section 3.8. Firmness and flexibility, mediation and hybridization, which may feature within processes of innovation, are characterized by the engagement of different purposes, objectives and dimensions for innovation (firmness and flexibility), the participation of multiple actors from different domains, featured by different interests and concerns (to be mediated), and also by actors with different expertise (who can hybridize their expertise with accounting). As explained in Chapter 1, Section 1.4 and Chapter 2, Section 2.6, these multiple purposes, perspectives, these different interests and concerns for innovation are considered here as underpinning the rationale for innovation, namely,
the desires, the intentions and the motivations of the multiple actors at work within the NPD process.

The research objective of this thesis, namely, a study of how accounting engages with the rationale for innovation, through the desires, intentions, and motivations for innovation, is approached from studying: 1) firmness and flexibility, 2) mediation and 3) hybridization within the practical unfolding of the NPD process. More specifically, the research objective is expanded into three research questions, with the purpose of achieving a more in-depth understanding and building new knowledge in the field. The research questions explore how accounting engages with the rationale for innovation characterized by firmness and flexibility, within a process characterised by mediation where there is evidence of hybridization. The answers to these three research questions constitute the means of achieving the broad research objective of the thesis, specifically, how accounting engages with the rationale for innovation within the NPD process. The three individual research questions of this thesis are detailed in the remainder of this section.

4.4.1 Research Question 1
The relationship between firmness/control and flexibility/creativity within processes of product innovation has been reviewed in Chapter 3, Section 3.6. From this literature it is clear that firmness/control (including accounting controls and information) and flexibility/creativity characterize and are each required within product innovation settings (Tatikonda and Rosenthal, 2000; Kamoche and Cunha, 2001; van der Meer-Kooistra and Scapens, 2008; 2015). It is also clear that concerns about firmness and flexibility should be balanced (Tatikonda and Rosenthal, 2000), managing flexibility within a structured NPD process. Specifically, firmness/control and flexibility/creativity for product innovation need to be balanced and managed, creating a “synthesis through the concept of ‘minimal structures’” (Kamoche and Cunha, 2001, p.733), a sort of template through which creativity can be stimulated and coordinated by the parties participating in the development of the project (see Chapter 3, Section 3.6).

With the aim of contributing to this strand of literature and achieving the research objective of the thesis, the first research question focuses on exploring how accounting engages in practice with the rationale for innovation by recognising the need for both
firmness and flexibility concerns within NPD processes. This research question is answered in light of the broad research objective, i.e. looking at how accounting engages with the desires, the intentions and the motivations for innovation within the NPD practices dealing with both firmness and flexibility. Specifically, in order to answer this research question, the empirical dimensions of firmness and flexibility of the NPD process are investigated. Subsequently, the interplay between accounting and the rationale for innovation within this setting is also examined, placing attention on the empirical desires, intentions and motivations for innovation. Therefore, the first research question of the thesis is synthesized as follows:

Research Question 1: How does accounting engage with firmness and flexibility in processes of innovation in new product development?

The answer to this research question, in turn, contributes to the achievement of the research objective. It is possible to examine whether accounting balances firmness and flexibility within the NPD and innovation setting. At a minimum, an in-depth examination of the role that accounting plays between firmness and flexibility in the empirical NPD process will lead to a greater understanding of the relationships between accounting and innovation within the NPD process.

4.4.2 Research Question 2

In previous studies the mediating role of calculative accounting practices between discrete domains and actors (Miller and O’Really, 2007), which influence the course and the “trajectories” during the innovation process (Christner and Strömsten, 2015; Revellino and Mouritsen, 2015), has been reviewed (see Chapter 3, Section 3.7). The second research question builds upon these studies and focuses on exploring how accounting engages with innovation through processes of mediation, by looking at the core of these processes within the empirical context of NPD and by analysing the desires, the intentions, and the motivations of the actors involved. The potential role of accounting to mediate among different actors and interests, determining specific directions for the unfolding of innovation processes, is explored in this study in an NPD context.
Therefore, the second research question of the thesis is synthesized as follows:

**Research Question 2:** How does accounting engage with the rationale for innovation through processes of mediation?

Unlike previous studies, the mediating role of accounting is analyzed within the very rationale for innovation, i.e. among the empirical desires, intentions, and motivations for innovation within a specific NPD context. This analysis offers novel insights and a deeper understanding of the interplay between accounting and innovation and the role of accounting within innovation processes.

### 4.4.3 Research Question 3

In the literature reviewed on hybridization and accounting practices, the “encounter” of accounting with other practices and expertise, leading to hybrid practices or hybrid expertise (Miller et al., 2008; Caglio, 2003), has been investigated (see Chapter 3, Section 3.8). The “encounter” (Miller et al., 2008) of accounting with different (non-accounting) actors, disciplines, rationales is likely to take place during innovation processes, in particular within NPD settings. Specifically, the potential of accounting to enable and engage with innovation through processes of hybridization has been identified in Chapter 3, Section 3.8. A deeper understanding of how the use of accounting, by diverse participants in the NPD process, with different backgrounds, influences the unfolding of innovation processes might offer a new understanding of the interplay between accounting and innovation. Therefore, the third research question deals with investigating how accounting engages with the rationale for innovation through processes of hybridization within the NPD setting. This research contributes to previous literature by exploring if there is any evidence of hybridization within the NPD context and what the nature of this hybridisation is. It does so by focussing attention on how accounting engages with the rationale for innovation, i.e. desires, intentions and motivations, within these processes. Therefore, the third research question of the thesis is synthesized as follows:

**Research Question 3:** How does accounting engage with the rationale for innovation through processes of hybridization?
This research question is answered in the course of the thesis by exploring and analysing the unfolding of empirical accounting practices, with a focus on the actors who carry them out and on those who are in charge of undertaking the other operational practices for moving the innovation processes forward. The role of different groups of experts involved in accounting practices during the innovation process that is featured in the empirical NPD process is explored. In doing so, processes of hybridization (Miller at al., 2008) of the non-accounting professionals’ expertise within the empirical case are examined in detail and with them the engagement of accounting with their desires, intentions and motivations.

4.5 Chapter Summary

As illustrated in this chapter, the research objective of this thesis i.e. to examine how accounting engages with the rationale for innovation is intended to be achieved by answering the following three research questions:

1. How does accounting engage with firmness and flexibility in processes of innovation in new product development?
2. How does accounting engage with the rationale for innovation through processes of mediation?
3. How does accounting engage with the rationale for innovation through processes of hybridization?

These three research questions are answered throughout this thesis in light of the broader research objective, which requires an investigation into how accounting engages with the rationale for innovation during the NPD process. In this thesis the empirical NPD process is then explored. The empirical NPD process consists of a process in which both firmness and flexibility are needed and where processes of mediation and hybridization, with the use of accounting, can occur. The insights emerging from the answers to the research questions, in turn, together contribute to the achievement of the broad research objective. The research objective of this thesis is addressed by interpreting the empirical material collected for this study using the concepts of the theoretical framework outlined in Chapter 5. The adoption of these theoretical concepts facilitates interpretation of the data and yields new insights into the interplay between accounting and innovation and thus contributes to the literature in this field. This contribution is defined in the latter stages of this thesis. Prior to this, in the
next chapter the ideas constituting the theoretical framework are reviewed in detail and an explanation is provided, stating how the framework is used to interpret the empirical material collected for this research.
Chapter Five
Theoretical Perspectives

5.1 Introduction
To answer the research questions and achieve the research objective of the thesis, the data collected for this study focuses on the practices (Schatzki, 2001a; 2001b; 2005; 2006; 2007) that unfolded during the empirical NPD process including the “actions, doings, and sayings” (Schatzki, 2001a) involved in the development of innovation for the new product. Attention is focussed on accounting practices and how they engaged with the unfolding process of innovation as seen in the empirical NPD process. How accounting can drive NPD processes, and within these NPD processes innovation objectives, is interpreted by using the theoretical idea of ductus (Carruthers, 1998; 2010). More specifically, the way in which accounting practices can influence the flow, the movement and the direction, i.e. the ductus, of the innovation process is analyzed within the empirical NPD setting. Furthermore, drawing upon the concepts of an epistemic object (Knorr Cetina, 2001; Nicolini et al., 2012), the desire and the wanting (Busco and Quattrone, 2016) of innovation of the actors involved in the NPD process are studied throughout the unfolding process of innovation as well as within the cross-disciplinary collaboration that characterizes this process. How people with their heterogeneous interests and interpretations for innovation work together despite the different social roles involved, and how accounting engages with these dynamics during the unfolding process for innovation, is interpreted through the notion of a boundary object (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012).

This chapter reviews the theoretical concepts used to frame the empirical material collected for this study, with the purpose of achieving the research objective of the thesis i.e. to determine how accounting engages with the processes of innovation. Specifically, in Section 5.2, the concept of practice and practice theory (Schatzki, 2001a; 2001b; 2005; 2006; 2007) are reviewed, given the importance of the range of actions, doings, and sayings that comprise the NPD process. Why practice theory has been chosen over other theories, such as actor network theory or structuration theory is also clarified. Next, in Section 5.3 the theoretical concept of ductus (Carruthers, 1998; 2010) is illustrated. Then, in Section 5.4 the notion of epistemic object is presented
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(Knorr Cetina, 2001; Nicolini et al., 2012) and in Section 5.5 the notion of boundary object (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012) is reviewed. The theoretical framework in which these theoretical ideas are interrelated and how they will be used to make sense of the material collected for this thesis is explained in Section 5.6. Finally Section 5.7 summarizes the key points of this chapter.

5.2 The concept of practice and practice theory

The concept of practice and practice theory are reviewed in this section given the focus of this thesis on the study of the relationship between accounting and innovation during the unfolding of the NPD process in practice. Thus the data collected for this study focus on the practices that unfold during the NPD process (the method of data collection is detailed in Chapter 6), including accounting practices, which consist of the “actions, doings, and sayings” (Schatzki, 2001a) that continuously endeavour to develop innovation for the new product. This thesis intends to study how accounting engages with the desires, intentions and motivations for innovation. In order to do so, attention is given to accounting practices (Ahrens and Chapman, 2007a; 2007b), and how these practices are interrelated with other practices in the NPD process.

Practice theory has been selected as a theoretical perspective for this study and it was chosen over actor network theory and structuration theory. The review of the literature on accounting within organizations as well as the preliminary empirical material collected for this study at the case site led me to consider Actor Network Theory (hereafter ANT) to help frame and interpret the findings of this research study. ANT has inspired accounting research and researchers since the early nineteen nineties (Justene and Mouritzen, 2011). ANT is a research approach developed by Bruno Latour and Michel Callon, and also by other scholars such as John Law, within studies of science and technology (Lukka and Vinnari, 2014). ANT has enriched understanding of management accounting from “consideration of only technical and functional system characteristics to the study of social and organizational contexts in which management accounting operates” (Lukka and Vinnari, 2014, pp.1325-1326). Insights developed from studies of ANT have contributed to describing “the very nature of societies” (Latour, 1996, p.369). These insights do not limit researchers to considering just “human individual actors, but extend [...] the word actor - or actant - to non-human, non- individual entities” (Latour, 1996, p.369). In ANT an actant “is something that acts
or to which activity is granted by others [...]. An actant can literally be anything provided it is granted to be the source of an action” (Latour, 1996, p.373). In ANT studies, any actor is a network as “actors are not conceived as fixed entities but as flows, as circulating objects undergoing trials, and their stability, continuity, isopy has to be obtained by other actions and other trials” (Latour, 1996, p.374). Actor-networks are described “as highly dynamic and inherently unstable. They can be stabilised to some extent when [e.g.] people, technologies, roles, routines, training, incentives, and so on are aligned. This alignment is achieved (or at least, attempted) through ‘translation’” (Greenhalgh and Stones, 2010, p.1287), involving problematisation, interessement, enrolment, and mobilisation (Callon, 1986; Greenhalgh and Stones, 2010).

Within the NPD process, the heterogeneity of the participating humans (e.g. the project leader and the project team members) and non-humans (e.g. the prototypes, projects reports and documents, standardized/structured processes) as well as the “pliable” and flexible nature of these processes initially motivated consideration of ANT as appropriate to interpret and frame the research underpinning this thesis. However, a more in-depth consideration of the appropriateness of ANT as a conceptual and interpretive framework for this study led to the conclusion that Latour’s view that non-humans have agency meant that it was not suitable as a theoretical framework for this PhD study. Although this research seems to have some partial affinity with that literature building on ANT, which portrays accounting phenomena as “enrolled in an actor-network that reconfigures other actors’ interests” (Justene and Mouritsen, 2011, p.176), the same literature also refers to how “accounting technologies and calculative devices are granted a new and prominent role because they are seen as actors that take part in the formulating, construction – and often stabilization – of organizational activities” (Justene and Mouritsen, 2011, p.176). According to these studies, accounting is “adapted and translated” (Justene and Mouritsen, 2011, p.176). As regards the specific case of this thesis, I could not recognize an agency of accounting within Beta. In this study, accounting is viewed as an object that stimulates the interest of the actors involved in the NPD process. Here, accounting is interpreted as a means of translating the different interests at stake during the unfolding of the process of innovation. Accounting is a stimulus for collaborations, discussions, reflections, conversations among the actors but it is not attributed any agency, it does not appear as “something that acts or to which activity is granted by others” (Latour, 1996, p.373). These
reflections explain why ANT was not chosen as the conceptual frame for this study. This study has favoured the use of practice theory instead, as this research is aimed at examining in detail the unfolding practices throughout the NPD process and the subjects and objects which were involved in the unfolding, without pretending any symmetry between subjects and objects. The use of practice theory as a method theory\(^9\) (Lukka and Vinnari, 2014) for this study has allowed me interpret how accounting engaged with the desires, the intentions, the motivations of the subjects involved in the innovation process, by means of examining the series of their actions, doings, sayings, and the objects characterizing and developed during the unfolding of NPD practices.

The interest of this study in the role of accounting during the development of innovation and NPD processes in practice also stimulated consideration of the suitability of Structuration Theory (hereafter ST) as a theoretical lens for this study. The use of ST by researchers has significantly contributed to management accounting research heretofore (Coad and Herbert, 2009). ST has offered a “rich source of concepts to help understand the situated practices of actors as they draw on and reproduce structures over time” (Conrad, 2014, p.133). Those studies dealing with ST in the accounting area have referred to social structure and systems as characterized by a relationship of duality (Englund and Gerdin, 2014). The “rules and resources that actors draw upon in the reproduction of social systems are themselves the product of social action” (Englund and Gerdin, 2014, p.171), where structures provide “the bases upon which agents draw when they engage in social practices” (Coad and Herbert, 2009, p.179, drawing on Giddens, 1979).

The majority of studies based on ST are focussed on “how accounting (and its structural features) is (re)produced as a form of practice (i.e. as a social system)” (Englund and Gerdin, 2014, p.167). The significant interactions between multiple and heterogeneous professionals/agents within NPD contexts with their structured processes consisting of a predetermined sequence of phases (Cooper, 1990) which determine the unfolding of the

\(^9\) In interdisciplinary studies of management accounting, “theories often appear in two distinct roles, domain theory and method theory” (Lukka and Vinnari, 2014, p.1309, drawing on Lukka, 2005). A method theory is an instrumental perspective, a tool, a theoretical lens offering perspectives and “a lever for gaining new insights, which can be more specific but also lead to more abstract or general conclusions” (Lukka and Vinnari, 2014, p.1312). The domain theory “refers to a particular set of knowledge on a substantive topic area situated in a field or domain such as management accounting” (Lukka and Vinnari, 2014, p.1309).
NPD practices, led the researcher to consider ST as a potential theoretical lens for this study. In developing and elucidating ST, Giddens sought to bring together objectivist social theories (which assume that a hard social reality exists independently of individual actors and is to a large extent deterministic of their actions) and subjectivist ones (which assume that no social reality exists except the one that individuals construct in their interpretations and perceptions) (Greenhalgh and Stones, 2010, p.1286, drawing upon Giddens, 1984).

Stones (2005) has provided ST with “more concrete constructs” (Coad and Herbert, 2009), through focus on the “ontology-in-situ of particular structures and agents” (Greenhalgh and Stones, 2010, p. 1288, drawing upon Stones, 2005). This theory, also referred to as ‘Strong ST’, has introduced the notion of position-practices. These are “not merely structural ‘slots’ within which agents are largely interchangeable; rather, they are perpetuated (and changed) through their enactment by active agents within the network of relationships” (Greenhalgh and Stones, 2011, p.1288). Position-practices involve the employment of a quadripartite model of structuration, which comprise external structures; internal structures; active agency; and outcomes (Coad and Herbert, 2009, p.179, drawing on Stones, 2005). Stones (2005) moved “from the overwhelmingly abstract ontological concepts evident in the work of Giddens, towards understanding specific phenomena in a particular time and place” (Coad and Herbert, 2009, p.178).

ST applied to accounting research should require “researchers to be sensitive to [... the] diversity [of phenomenology, hermeneutics and practices of agents engaged in social interaction] through the examination not only of the influence of external structures, but also how they interact with the internal structures of agents in the context of the research study, and how the recurrent reconciliation of these interactions affects the practices of management accounting” (Coad and Herbert, 2009, p.189).

The case material collected for this study does not lend itself to the use of ST as a theoretical lens for the following reasons. The concepts of agency and structures, where agency is understood as it is represented in agency theory and where structures provide “the bases upon which agents draw when they engage in social practices” (Coad and Herbert, 2009, p.179, drawing on Giddens, 1979), were not reflected in the dynamics of
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the empirical context of this study (in Beta). Neither were they considered helpful for the achievement of the research objective - examination of the relationships between accounting and the desires, intentions, and motivations of the agents/experts participating in the NPD process. Furthermore, in the empirical material gathered, no significant relevance was found in the influence of external structures on the practices that unfolded during the NPD. The use of practice theory and the focus on peoples’ understanding, on what made sense to people to do, on the rules of the NPD process, on peoples’ orientation towards Beta’s aim of achieving innovation, their beliefs, hopes and emotions, are considered here to be much more helpful for the collection and understanding of the empirical material and for the subsequent interpretation of the data. Having offered an explanation of why practice theory was chosen over other theories (specifically ANT and ST), the remainder of this section focuses on the insights underpinning the concept of ‘practices’ building on practice theory as developed by Schatzki.

Different meanings by various authors have been attributed to the concept of practice (Schatzki, 2007; Pilerot and Limberg, 2011). This study refers to practices as being “materially mediated arrays of human activity centrally organized around shared practical understandings” (Schatzki, 2001b, p.2). Practices are composed of and performed by “open-ended” actions, doings and sayings (Schatzki, 2001a). Moreover, they are arranged by “a pool of understandings, rules, and teleoaffective structure[s]” (Schatzki, 2001a, p.53; see also Schatzki, 2005). The pool of understandings consists of the knowledge of how to identify and carry out the intended actions that “determine what makes sense to people to do” (Schreiber, 2014, p.349; see Schatzki, 2001a; 2005). The rules “constitute explicitly formulated procedures, instructions, laws” (Schreiber, 2014, p.349, see also Schatzki, 2001a; 2005), which lead and determine the course of the activities. Teleoaffective structures refer to the importance of an orientation toward an end, realizing what things are really important. These structures rely on the principle that the actions are underpinned by ends, “beliefs, hopes and emotions” (Schreiber, 2014, p.349), as well as expectations and intentions to pursue and realize (Schatzki, 2005). Understandings, rules, teleoaffective structures are all arrangements considered to be ‘pivotal’ for the development of an order within the interconnections of multiple practices as well as among their “arrangements of people, artifacts, and things” (Schatzki, 2001b, p.6).
Generally, practices are constructed by individuals (Lowrie, 2014). In that respect, Schatzki emphasizes how the connection between subjects and objects is fundamental during the development of practices (see also Schreiber, 2014). The human agency is within the sayings, doings, and the actions that compose practices (Caldwell, 2012). Additionally, practices may also be based on tacit understandings of the individuals, “comprehended at a bodily level, and enacted in practical ways” (Hodge, 2014, p.168).

The concept of practice, as well as practice theory, has been used by the accounting literature for the interpretation of accounting practices. Ahrens and Chapman (2007a) have referred to practice theory as a means that allows one “to delve into the details of the functioning of subsystems. Practices are about the specific relationships forged between understandings and traditions of social groups and their aspirations and pressing problems” (Ahrens and Chapman, 2007a, p.3). Practices are well understood if their activities are traced carefully (Ahrens and Chapman, 2007a). Practices are not mechanical or repeated activities. “Rather, practices depend on the intended meaningful relatedness between activities with respect to outcomes, clients, practitioners, techniques, resources, strategies, institutions, etc.” (Ahrens and Chapman, 2007b, p.109). When a management control system is conceived of as a practice, it is referred to as a “bundle understood as management control practices plus material and technical arrangements” (Ahrens and Chapman, 2007a, p.10). Specifically, to study and theorize management accounting practices, attention needs to be given to “how people in organizations make specific uses of widely available accounting solutions, how such solutions come to be at their disposal, and how their use might change existing accountings and give rise to new accounting solutions that others can use” (Ahrens and Chapman, 2007b, p.99). Indeed, practices are better understood if the focus of their study lies on their “constitutive activities” (Ahrens and Chapman, 2007a, p.23) and on the people and the “things through which they coexist” (Schatzki, 2001a, p.43). Furthermore, “management accounting practices can enable the resolution of (potential) disagreements because they introduce a common criterion for the evaluation of practices (such as profitability) and/or because they provide a space that allows a workable compromise to be developed” (Jørgensen and Messner, 2010, p.187).
5.3 The concept of ductus

In this thesis the notion of ductus, as articulated by Carruthers (1998; 2010) and used by Quattrone (2015) and Busco and Quattrone (2016), is used to interpret the course of actions, the movement and the flow that the NPD practices and related accounting practices can cause throughout the unfolding process for innovation as seen in the NPD process. Although the word ductus has been attributed with many meanings, its most frequent use is as the past participle of the Latin verb *ducere* (‘to lead’), and means ‘led’ (Carruthers, 2010) or ‘guided’ or ‘commanded’. The concept of ductus has been depicted by Carruthers as “the experience of artistic form as an ongoing, dynamic process rather than as the examination of a static or completed object” (2010, p.190). Ductus “is the way by which a work leads someone through itself” (Carruthers, 2010, p.190). It is a guiding “flow” of something, of a process, also led and directed by motivations and emotions (Carruthers, 2010). Also, the ductus has been depicted as a dynamic process, rather than a product; a guiding movement, a “journey” (Carruthers, 2010, p.198) that passes through various parts of a work or a composition (*modus agendi*) (Carruthers, 2010). Ductus has been portrayed “as the way(s) that a composition, realizing the plan(s) set within its arrangements, guides a person to its various goals, both in its parts and overall” (Carruthers, 2010, p.200). In doing so, a course is determined (like a course of water), a ‘directed movement’, a dynamic process (Carruthers, 2010), a path that is “punctuated” by points (“punctus” – Carruthers, 1998), namely, “by certain spaces where specific activities of image composition needed to be made if a vision of truth was to emerge” (Busco and Quattrone, 2015a, p.1256; Carruthers 1990). In this course, the ductus is also “the means through which the ends were constructed, made practical, and recursively questioned” (Quattrone, 2015, p.26).

Busco and Quattrone (2015b; 2016) have studied the ductus as “a way, a flow and a movement, that begins with the realization of being in perdition and eventually ends with the possibility of making the right choice, of finding salvation and realising a vision of God and truth” (2015b, p.7; drawing upon Carruthers, 1998). Busco and Quattrone (2015b; 2016) and Quattrone (2015) have adopted the notion of ductus specifically dealing with accounting research. Furthermore, Busco and Quattrone (2016) have used the theoretical idea of ductus in interpreting the role of accounting inscriptions, such as the “budget, cost cards and the balanced scorecard” within a fashion industry, which involves processes of innovation within the annual collection.
cycle. These accounting inscriptions allow for the management of interrogations and the maintenance of diversity within the spaces of the ductus. At the same time, these inscriptions also lead to the unfolding of the processes without necessarily reaching the fulfillment of the “right choice” for the annual collection (Busco and Quattrone, 2015b; 2016).

5.4 The concept of epistemic object
In a heterogeneous and pluralistic context involving individuals from various professional backgrounds, objects can support cross-disciplinary collaboration by providing the “motives” and “drive” for collaboration to emerge, and allowing participants to work across different types of boundaries during the activities (Nicolini et al., 2012). The literature has dealt with different categories of objects that work to support cross-disciplinary collaboration in different ways (Nicolini et al., 2012).

Epistemic objects have been portrayed by the literature as objects characterized by a ‘lack of completeness’ and a ‘lack of being something’ (Knorr Cetina, 2001; Nicolini et al., 2012) that encourage motivation within the subjects (experts) to which they relate. Consequently, epistemic objects foster cross collaboration among the experts to fill the absences or voids or vacuums they introduce. For instance, within a collaborating community of physicists, those “partial simulations and calculations, technical design drawings, artistic renderings, photographs, test materials, prototypes, transparencies, written and verbal reports” are all examples of epistemic objects (Knorr Cetina, 2001, p.182). These objects are characterized by an “open-ended nature” (Nicolini et al., 2012, p.614; see also Knorr Cetina, 2001) as they embody something that is not yet known. Their changing character and their lack of ‘object-ivity’ and completeness make them things that can continually ‘explode’ and ‘mutate’ into something else (Knorr Cetina, 2001). Even when epistemic objects are “officially declared ‘finished’ and ‘complete’, the respective experts are acutely aware of [...] their faults, of how [...] these objects ‘could’ have been improved, of what [...] they] ‘should’ have become and did not” (Knorr Cetina, 2001, p.182). Describing epistemic practices as knowledge-centred, creative, constructive practices carried out between experts involving epistemic objects, Knorr Cetina refers to these practices as induced by epistemic “objects providing for the continuation of a chain of wanting through the signs they give off of what they still lack; and the subjects (experts) providing for the possibility of the continuation of
objects which only exist as a sequence of absences, or as an unfolding structure” (Knorr Cetina, 2001, p.185).

Epistemic objects have the capacity to ‘unfold indefinitely’ and they are the source of a continuous motivation to gain more knowledge (Gherardi, 2003, p.357). Gherardi (2003) has linked the features of epistemic objects (Knorr Cetina, 2001; Nicolini et al., 2012) to the concept of knowledge. She depicts the latter as something which continuously triggers itself and which motivates people. In this respect, it is interesting to recall the similarity mentioned between Ulysses and his sailors and a team who work within an organization. They both have similar desires for knowledge; yet, at the same time they want to uncover and discover what is unknown in order to increase their understanding, their knowledge and to improve their everyday performance.

Busco and Quattrone (2015b; 2016) have used the notion of epistemic object to interpret accounting inscriptions. In particular, they refer to the incomplete representations stemming from accounting practices which “provide[…] imperfect but powerful definitions of knowledge and social beliefs” (Busco and Quattrone, 2015b, p.3; Knorr Cetina, 2001). Through “their incompleteness […]accounting inscriptions] offer mechanisms that generate questions and maintain diversity while, at the same time, offering possibilities for moving forward” (Busco and Quattrone, 2015b, p.31, drawing on Knorr Cetina, 2001). The literature has also dealt with another category of object that works to support cross-disciplinary collaboration – boundary object (Nicolini et al., 2012). This theoretical concept is reviewed in the next section.

5.5 The concept of boundary object

Boundary objects have been portrayed as objects that facilitate multi-disciplinary collaboration (Nicolini et al., 2012). Boundary objects do not require that the various participants in the collaboration learn from the others. Their representation, which is “quite vague and at the same time quite useful” (Star, 2010, p.607), instils flexibility in their interpretation (Endrissat and Noppeney, 2013, p.62) and makes them means for translation at the boundaries crossed by the multi-disciplinary collaboration (Nicolini, 2012; Bechky, 2003). These objects, which may be both abstract and concrete, adapt to different viewpoints. At the same time, they are “robust” enough to maintain their identity. As a result, they are a means to manage both diversity and cooperation (Star
and Griesemer, 1989). Boundary objects are “phenomena able to reside within and mediate among diverse actor worlds” (Miller et al., 2008, p.952). They are temporary objects that act as an “anchor” or a “bridge” (Star and Griesemer, 1989, p.414). Examples of boundary objects have been illustrated in the literature: they may be visual slides, shared analytical methods (Nicolini et al., 2012); repositories, standardized forms, sketches and drawings, workflow matrices (Carlile 2002; Star and Griesemer 1989); or prototypes (Bechky 2003; Carlile 2002). Boundary objects are also arrangements through which different groups work together without consensus (Star, 2010).

Carlile (2002) combines the concept of boundary object with the realm of knowledge within NPD processes. The boundary object is something that is used to resolve “the consequences that arise when different kinds of knowledge are dependent on each other” (Carlile, 2002, p.443). In particular, boundary objects are described as a “means of representing, learning about, and transforming knowledge to resolve the[se] consequences that exist at a given boundary” (Carlile, 2002, p.442). The challenges emerging in communicating knowledge between individuals across the boundaries of different functions or disciplines depend on the interpretation of information (Bechky, 2003). Different receivers may interpret the exchanged knowledge according to their specific background – the function/discipline they come from. More specifically, Bechky (2003) investigates misunderstandings between engineers, technicians, and assemblers on a production floor. It is argued that misunderstandings between groups can be reconciled by using boundary objects which make different groups co-create a common ground with joint knowledge and beliefs. Using this common ground, these groups “recontextualize[…] local understandings, providing the context needed to create shared understanding” across them (Bechky, 2003, p.321). In this case, boundary objects, as tangible objects, are interpreted as favouring understandings between groups from various backgrounds each with specialized knowledge. Nevertheless, these objects can also fail in favouring understandings when they do not create common ground (Bechky, 2003, p.326).

The notion of boundary object has also been used by the accounting literature to interpret the nature of accounting and its role within organizations and societies (Briers and Chua, 2001; Busco and Quattrone, 2015a; 2016). For instance, Briers and Chua
(2001) have described the activity based costing model as a boundary object which has a “core […] hard enough to draw diverse parties together and a periphery, which is plastic enough to adapt to local circumstances and facilitate flow across actor-world boundaries” (2001, p.265). Busco and Quattrone (2015b), in their case study based in a fashion industry, have depicted the “provisional budget” as a boundary object. In their case, the provisional budget is interpreted as “a “magnet”, which attracts “different internal and external stakeholders and engag[es…] them in an ongoing dialogue through both formal meetings of management committees or inter-functional workgroups, and informal conversations” (Busco and Quattrone, 2015b, p.20; see also Busco and Quattrone, 2016), without “necessarily produc[ing] a shared understanding and an alignment of interests” (Busco and Quattrone, 2015a, p.1252).

5.6 A possible theoretical framework for interpreting how accounting engages with the rationale for innovation within new product development

The theoretical concepts reviewed so far are used to investigate the relationship between accounting and the rationale for innovation within the NPD process. These theoretical ideas are mobilized to interpret the empirical evidence collected to answer the three research questions of this study (stated in Chapter 4), with the final aim of achieving the research objective. How the use of these theoretical concepts supports this study and how they are related between themselves, with the intention of explaining the interplay between accounting and the rationale for innovation, is illustrated and discussed in the remainder of this section.

The literature on innovation and NPD (see Chapter 2) and accounting within innovation and NPD contexts (see Chapter 3) has portrayed these contexts as being characterized by multiple and heterogeneous activities, carried out by different individuals with different interests, rationales and concerns (see, among others, Cooper, 1996; Nixon, 1998; Akrich et al., 2002a; 2002b). It is considered here that the study of the unfolding empirical NPD process in practice, by building on practice theory (Schatzki, 2001a; 2001b; 2005; 2006; 2007), aids in understanding how the individuals’ desires, wants and intentions for innovation (Busco and Quattrone, 2016, drawing upon Knorr Cetina, 2001) engage, in practice, with the multiple practices (including accounting practices), interests, motivations, actions, doings, sayings (Schatzki, 2001b) of the other individuals involved in the process. Thus the data collected for this study focuses on the
practices that unfold during the NPD process (the method of data collection is detailed in Chapter 6) which consist of the “actions, doings, and sayings” (Schatzki, 2001a) that continuously endeavour to develop innovation for the new product. The individuals’ “beliefs, hopes and emotions” (Schreiber, 2014, p.349), their expectations and intentions to pursue and realize innovation (Schatzki, 2005); how it is “determine[d] what makes sense to people to do” (Schreiber, 2014, p.349; see Schatzki, 2001a; 2005) throughout the development of the new product; the rules and the procedures of the NPD process (Schreiber, 2014, p.349, see also Schatzki, 2001a) are studied. It is believed that all these elements underpinning NPD practices contribute to facilitating the understanding of the unfolding flow, the movement and the direction characterizing the process for innovation in the NPD process. Specifically, the flow and the movement of the NPD process are interpreted by using the theoretical concept of ductus (Carruthers, 1998; 2010), portrayed by the literature (see Section 5.3 of this chapter) as a dynamic flow or a journey where the diversity of interpretations and perspectives are maintained and can facilitate the process of innovation (Busco and Quattrone, 2016). This thesis relies on the description of the flow of the ductus (Carruthers, 1998; 2010) as starting with a challenge and the “realization of being in perdition” (Busco and Quattrone, 2016, p.9), then it continues with the composition of opposite views and concludes with “the possibility of making a choice” (Busco and Quattrone, 2016, p.9; Carruthers, 2010). Furthermore, this study also considers the interpretation of the ductus as a space where a unity between different actors is achieved, without necessarily leading to the alignment of all the actors around a perspective (Busco and Quattrone, 2016).

Drawing upon these meanings for the concept of ductus, the thesis aims to examine and explain how accounting can drive NPD processes, and within these NPD processes, innovation objectives. Through the theoretical concept of epistemic object (Knorr Cetina, 2001; Nicolini et al., 2012), reviewed in Section 5.4 of this chapter, the desires and the wanting (Busco and Quattrone, 2016) of innovation in the unfolding process for innovation, as well as in the cross-disciplinary collaboration characterizing this process are examined and interpreted. Through the notion of boundary objects (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012), reviewed in Section 5.5 of this chapter, this study examines how people work together despite the different social roles involved and the heterogeneous interests and interpretations related to the unfolding
process of innovation, as well as how accounting engages with this process of innovation.

To summarize, this thesis intends to study how accounting engages with the rationale for innovation. In order to do so, attention is given to accounting practices (Ahrens and Chapman, 2007a; 2007b), and how these practices are interrelated with other practices in the process. Relying on the literature reviewed in Chapter 2 and Chapter 3, innovation and NPD processes are portrayed as consisting of diverse interests, rationales, and concerns (see, among others, Nixon, 1998; Akrich et al., 2002b; Jørgensen and Messner, 2010). This thesis intends to further deepen understanding of the role of accounting within the heterogeneous setting of the NPD process. Focus is placed on analysing how accounting engages, in practice, with the diverse interests, purposes and concerns at stake during the empirical process for innovation. These elements underpin the desires, the intentions, and the motivations of the actors at stake and, at the same time, sustain the rationale for innovation (see Chapter 2, Section 2.6). By focussing on the empirical epistemic objects (Knorr Cetina, 2001) unfolding during the process, namely those objects which instil and renew the desires for innovation, the aim is to understand the way in which innovation develops throughout the empirical NPD process. In this setting, and by using the concept of boundary objects, the role of accounting is interpreted among the desires, the intentions, and the multiple motivations for innovation, as the innovation process unfolds. These dynamics have the potential to determine the ductus of the NPD process, in which various objects can contribute to the progressive “composition” (Carruthers, 2010) of innovation and to the direction of the ductus towards innovation.

5.7 Chapter Summary
The interplay between accounting and the rationale for innovation during the NPD process is investigated within a theoretical framework in which the NPD process is characterized by the unfolding of a ductus (Carruthers, 2010) in the search for innovation. This ductus is expected to both encompass and be the result of the unfolding of the NPD practices underpinned by the relationships between the objects and subjects at work (Knorr Cetina, 2001; Schatzki, 2001b). The study of the individuals engagement with epistemic objects involved in the process allows a broader understanding of the unfolding process of innovation. The notion of boundary objects
can facilitate a study of how accounting engages in the multi-disciplinary context of the NPD process, where heterogeneous individuals, with different desires, intentions, and motivations, discuss and reflect on the unfolding innovation. In this context, and through an in-depth analysis of the role of accounting, this thesis achieves the research objective.

To conclude, this study offers novel insights into the interplay between accounting and innovation. In particular, a new understanding of how accounting engages with the rationale for innovation is provided. The empirical evidence collected for answering the research questions of this study are discussed and interpreted building on the theoretical perspectives presented in this chapter, with the final purpose of achieving the research objective and contributing to the literature in the field. In the next chapter the research methodology adopted for this thesis and the ways in which the empirical evidence was collected are illustrated and explained.
Chapter Six

Research Methodology

6.1 Introduction

This chapter illustrates the research methodology that has been used to develop the thesis and which has enabled the gathering, organizing, and filtering of the empirical evidence collected, with the purpose of answering the research questions and achieve the research objective. As discussed in Chapter 4, firmness and flexibility, mediation, and hybridization characterize processes of innovation and NPD. Specifically, the three research questions have been outlined as follows: 1. How does accounting engage with firmness and flexibility in processes of innovation in new product development? 2. How does accounting engage with the rationale for innovation through processes of mediation? 3. How does accounting engage with the rationale for innovation through processes of hybridization? (see Chapter 4, Section 4.4) within the NPD process. The answers to these research questions and the interpretation of these answers through the theoretical perspectives of the thesis detailed in Chapter 5 address the research objective which is to understand how accounting engages, in practice, with the desires, intentions and motivations for innovation, underpinning the rationale for innovation.

Chapter 6 is organized as follows. In Section 6.2 the philosophical stance of the research is illustrated. The philosophical stance adopted here is interpretivist. In Section 6.3, the qualitative research approach is illustrated. In Section 6.4, the research strategy is described. The research focuses on a single in-depth case study based in a company called Beta (pseudonym), described later in this chapter. Names and some details within the operations of the company have been revised to ensure the anonymity. However, the empirical material reported remains accurate. This section is followed by a detailed account of the research method adopted for this thesis in Section 6.5. In this section an account is given of the data collection and analysis, demonstrating the care taken by the researcher in both the collection of the data within the field and the subsequent analysis. The material collected within the field concentrates on the unfolding of the empirical NPD practices (Schatzki, 2001a; 2001b) for the specific project Kappa (pseudonym). Among these practices, particular focus is given to collecting data on the accounting practices (Ahrens and Chapman, 2007a) and how they are related to the multiple
practices of the actors in Beta, in their search for innovation to be embedded within the
new product Kappa. The data were collected from documents, observations, and
interviews. The process used to analyze these data is also provided. Finally, a summary
of the content is provided in Section 6.6.

6.2 The research philosophical stance
Clarifying the philosophical research perspective of the thesis is useful for shedding
light on the way in which the research for this PhD was undertaken within the realm to
be studied (Saunders et al., 2009). The philosophical stance underpins the research
approach, strategy and the research methods. Saunders et al. (2009) focus on four
possible philosophical stances that might be considered: positivism, realism,
interpretivism and pragmatism. Within the positivistic perspective, the researcher works
as a natural scientist, and studies the reality and builds “law-like generalisations”
(Saunders et al., 2009, p. 113, drawing on Remenyi et al., 1998). This perspective is
structured so as to favour replications. Realism builds on the conception that reality is
independent of our knowledge. Interpretivism means that the researcher understands
and interprets the differences of individuals as social actors, according to the meaning
given to their social roles. Pragmatism views the research questions as determining the
selection of the research methods (Saunders et al., 2009). Besides these diverse stances,
the choice of the philosophical perspective is often concentrated between positivism and
interpretivism (Saunders et al., 2009).

The “organizational and social significance” of accounting has been acknowledged
(Burchell et al., 1980). This thesis adopts the interpretivist philosophical stance. It was
decided to not bring a positivistic view to this study because the social world within the
NPD process “is far too complex to lend itself to theorising by definite ‘laws’ in the
same way as the physical sciences” (Saunders et al., 2009, pp.114-115). The complexity
of the NPD process and the multiple relationships and interactions among the social
actors within this process (Cooper, 1990; 1996; Akrich et al., 2002a; 2002b) would be
overlooked if the complexity of this world were “reduced entirely to a series of law-like
generalisations” (Saunders et al., 2009, p.115). This research was conducted among
people with the purpose of interpreting and understanding the humans, their roles as
social actors and how these actors interpret the different situations and events occurring
during the NPD process (Ryan et al., 2002; Saunders et al., 2009). Focus was placed on
the “meanings motivating the actions of social actors in order [...] to understand these actions” (Saunders et al., 2009, p.111). In fact, this research is concerned with trying to make sense of and interpret the way NPD project staff see the world and try to make sense of it, how they interact, how they collaborate or do not collaborate when different purposes and interests agree or disagree. A great deal of the interaction among people and, more frequently, the tensions among the multiple purposes (Quattrone, 2015; Busco and Quattrone, 2016; see Chapter 2, Section 2.6), as well as the ends that are at stake within the innovation context all characterize the setting of this research (see Chapter 2, Section 2.6). Furthermore, focus is placed on making sense and understanding the “motives, actions and intentions in a way that is meaningful” (Saunders et al., 2009, p.111) to address the research questions, that ensures the achievement of the research objective and in so doing to allow the contributions of this study to emerge.

In the thesis the interpretivist philosophical view has enabled the investigation and interpretation of the multiple purposes and interests within the social world of the NPD project, where interactions, relationships, collaborations, different purposes and interests characterize the process. This philosophical stance has also facilitated revealing new understanding in order to build new knowledge regarding the way in which accounting engages with these multiple purposes and ends for innovation and, consequently, the rationale for innovation within the NPD process. More specifically, the interpretivist philosophy has facilitated analyses and the interpretation of the everyday reality phenomena (Johnson et al., 2006) around accounting practices, capturing the actual role and meaning of accounting practices during the NPD process as well as the way in which these practices were dealt with by the different social actors.

6.3 The research approach
As discussed in Chapter 4 (Section 4.3), and recalled also earlier in section 6.1, the research objective is intended to be achieved after having analysed and interpreted, through the concepts of the theoretical framework exposed in Chapter 5, the empirical material gathered to answer the three research questions, where the different motives, ends, purposes and interests for innovation have the potential to emerge (see Chapter 4, Section 4.4 and its sub-sections). In order to answer the research questions and finally achieve the research objective of the thesis, a qualitative approach was used. This
approach was considered as being suitable to delineate and interpret qualitative data and facts regarding the multiple concerns and actors at work in the particular social setting of the NPD process.

Innovation processes are “made of adaptations, [a] series of trial and error and countless negotiations between numerous social actors” (Akrich et al., 2002b, p.207). To capture the meanings and the interpretations given by the actors to these dynamics, in line with the interpretivist approach, qualitative data and facts haven been collected. The use of qualitative data involves “connecting the field and academic worlds via literature-based ideas that illuminate insights garnered in the field and produce knowledge claims viewed as unique contributions” (Golden-Biddle and Locke, 2007, p.4). However, “conver[ting …] field engagement into theoretically relevant insights and claims” (Golden-Biddle and Locke, 2007, p.4) is an iterative rather than a linear process (Morse et al., 2002, p.17; Golden-Biddle and Locke, 2007). To facilitate the emergence of relevant theoretical contributions, the qualitative data needs to be analyzed “through a process of reflection, and going back-and-forth between the data, the literature, and the company” (Wouters and Wilderom, 2008, p.499). The intent is to develop interpretations of the empirical data that has been collected, in light of relevant theoretical concepts, in the expectation that novel meanings might lead to distinctive theoretically relevant insights (Morse et al., 2002; Bowen, 2008).

Doing research and, more specifically, qualitative research, is a process that has to be disciplined in order to build interesting insights and contributions into knowledge (Ahrens and Chapman, 2006). Within the disciplined research process for this specific thesis, a fit between the problem identified within the existing literature, (the need for new understandings of how accounting can drive and facilitate NPD processes and, within these NPD processes, innovation objectives), the research objective, (to examine and explain how accounting engages with the rationale for innovation), the collected data, and the theory (the theoretical framework) is iteratively and cyclically sought out. This occurs through a continuous process of “back-and-forth between the fieldwork and the literature” (Wouters and Wilderom, 2008, p.493). This particular process was continuously performed and repeated during the course of the study, in order to more deeply interpret and understand the insights that gradually emerged. Within this study, constant reflections on the data collected and their positioning against the theoretical concepts were carried out, with the objective of attaching further meaning to those data
and, in turn, developing and exploring further relevant evidence for the achievement of the research objective. The data were collected, bearing in mind what the objective of the study was. Then the data that were deemed valuable for building new theory on the role of accounting within innovation realms were analyzed and interpreted in light of the theoretical concepts which were considered to facilitate the emergence of new knowledge.

6.4 The research strategy
Accounting is “understood and interpreted as a situated, context-dependent practice” (Busco, 2005, p.21). Case studies are relevant for providing the means to understand “the nature of accounting in practice; both in terms of techniques, procedures, systems, etc. which are used and the way [...] they are used” (Ryan et al. 2002, p.143). Building on this statement, the research for this thesis is based on an explanatory case study (Ryan et al., 2002) in which the role of accounting and its relationship with innovation within the NPD context is explained in detail. Focus is placed on the multiple interests and objectives within the NPD process and the impacts on accounting and innovation are explained. The case study is portrayed by Saunders et al. (2009) as a research strategy. This strategy was considered as being appropriate for this thesis because it facilitates the employment of the theory to explain observation (Busco, 2005, p.27, drawing upon Scapens, 1990), and it also enables the study to “filter contextual information in the field research” (Busco, 2005, p.27). The use of a case study also offers a method for understanding a contemporary set of events (Yin, 2014, p.15) such as those that characterize the heterogeneous context of NPD, where multiple people simultaneously carry out collaborative practices for the development of a new product. Therefore, by means of a case study, the investigation enables the different visions of accounting practices to emerge within the organizational context and, more specifically, “the very relationships between organizational context[…] and the functioning of accounting” (Ahrens and Dent, 1998, p.2). The development of the case study for this research was underpinned by the interpretivist philosophical stance, based on gathering and interpreting qualitative data from the worlds of the multiple social actors involved, who express their perceptions of the NPD process and how they understand their role within the NPD process. These multiple actors engage in varying dynamics – such as negotiations (Akrich et al., 2002b), collaborations (Nicolini et al., 2012), which generate
tensions (Busco and Quattrone, 2016). The emerging tensions, in turn, engage social interactions and intentions of these actors, which contribute to these dynamics.

### 6.4.1 Single case study

The case study for this research, based on the collection and analysis of qualitative data underpinned by the interpretivist philosophical stance, has facilitated the examination of the role of accounting practices within the empirical social setting of the NPD in order to understand what and how accounting techniques and procedures are used (Ryan et al., 2002), how they drive and facilitate the unfolding of innovation within the NPD process of Beta. Accounting practices are studied to explain “how people in organizations make specific uses of widely available accounting solutions, how such solutions come to be at their disposal” (Ahrens and Chapman, 2007b, p.99) and how accounting practices engage with the tensions in the search for innovation throughout the NPD process.

The focus on a single case study permitted the concentration of time and resources on a single context, in order to get into the profound details of the accounting practices and eventually analyze in detail how accounting engages with the desires, the intentions and the motivations for innovation during the unfolding of the NPD process in practice, in particular, during the practices engaging the firmness and the flexibility for innovation; within the unfolding practices where accounting plays a mediating role; and within the practices where professionals hybridize their expertise with accounting (see Chapter 4, Section 4.4 for more detail). Although the use of a single case study limits the analysis to only one organizational viewpoint, on the other hand, the adoption of this method offers an opportunity for gathering rich qualitative empirical evidence, allowing the researcher to build a “deeper appreciation of accounting in organizational and social settings [... permitted by a] closer engagement with the field” (Ahrens and Dent, 1998, p.3) and it also facilitates a detailed interpretation within these settings. By using a single case study, all the research time was applied to intensely analyze the practices (Schatzki, 2001a; 2001b; 2005) unfolding during the empirical NPD process, its issues, its complications (Golden-Biddle and Locke, 2007), its actors, how they behaved, how they related to each other, their interests and desires with respect to innovation, as well as the differences in the actors’ interpretations of the meanings they give to these dynamics – as an interpretivist perspective facilitates.
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The reason why a case study was selected for this research, instead of other methods (such as a survey, an experiment, a history), also lies in the characteristics of the case study, as described by Yin (2014, p.17). More specifically, the study of the interplay between accounting and the rationale for innovation during the NPD process required the analysis of many variables and events during the NPD process, especially with its multiple “complications” (Golden-Biddle and Locke, 2007, p.23) and tensions in which different participants were constantly engaged in multiple discussions and collaborations when implementing the NPD process. Using a case study proved to be helpful since it “copes with the technically distinctive situation in which there [...] are] many more variables of interest than data points” (Yin, 2014, p.27). In the specific case of this thesis, the individuals, their behaviours and their relationships that facilitated their collaboration or caused tensions between the interests and purposes involved, the possible complications of the NPD process and the meanings given to them by the professionals involved were all visible to be studied. The main focus was placed on practices, tools, actors, processes, relations, desires, tensions, and other possible variables that were involved in the relationship between accounting and the rationale for innovation. This thesis therefore could rely on “multiple sources of evidence, with data needing to converge in a triangulating fashion” (Yin, 2014, p.27).

In dealing with a single case study, this thesis is also required to “achieve both authenticity and plausibility [...] convey[ing] the vitality and uniqueness of the field situation and also build[ing ...on the] case for the particular contribution of the findings” (Golden-Biddle and Locke, 1993, p.595), regarding how accounting engages with the rationale for innovation within NPD. The case investigation was actually carried out within the field, “without influencing or disturbing the object of inquiry” (Busco, 2005, p.135), and with the purpose of understanding and interpreting how the people in the field perceived and understood their world according to their words – in line with the interpretivist stance (Ryan et al., 2002; Saunders et al., 2009). Building on the qualitative data and facts, what was heard and viewed during the field investigation is “narrated” (Quattrone, 2006) within this thesis. In the remaining chapters of this thesis the plausibility of the research is also demonstrated, revealing the “distinctive contribution” (Golden-Biddle and Locke, 1993, p.593) that this type of research offers. Consequently, both academics and practitioners are likely to be more convinced of the
fact that this story makes sense and enriches previous knowledge on the topic. For this purpose, the thesis conveys “a compelling and accurate empirical portrait of the people and setting [...] studied, and a credible theoretical analysis [and interpretation] of these findings” (Adler and Adler, 2008, p.5).

In addition to the authenticity and the plausibility of the study, the reliability and the validity of the data used in this thesis are fundamental for the study’s credibility. Ahrens and Chapman (2006, p.833) state that “in qualitative field studies matters of reliability and validity cannot be sensibly distinguished”. Reliability deals with demonstrating that the process of data collection and analysis within the study can be repeated and produce the same results by another researcher (Yin, 2014). The threats to reliability may be a greater challenge with a quantitative study due to the positivists’ focus on replication. In fact, the “question of replication studies in qualitative field research is inappropriate” (Ahrens and Chapman, 2006, p.833).

Validity is the extent to which data reflects the real world and is concerned with “findings [that] are really about what they appear to be about” (Saunders et al., 2009, p.157). Validity may be internal and external. Internal validity seeks to establish a “causal relationship, whereby certain conditions are believed to lead to other conditions, as distinguished from spurious relationships” (Yin, 2014, p.46). External validity questions are concerned with the extent to which the findings can be generalized, and if the results are applicable to other organizations.

From this study, results are not expected to be produced that could be replicated exactly if another researcher decides to study the same organization or that could be generalized to all organizations. The task here is “to try to explain what is going on [...] in the particular research setting” (Saunders et al., 2009, p.158) by building with clear coherence an evident link between the problem identified in the literature with the research objective, the research approach as well as the method used to achieve results, in order to draw out the conclusion. Therefore, when deliberating about and considering reliability and validity throughout this study, it was kept in mind that if there was another researcher doing the same research, the descriptions provided in this thesis should be compatible with the descriptions made by the other researcher and the

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10 As concerns the key contributions of this research, they are discussed in detail in Chapter 10.
conclusions reached should not contradict those arrived at by another researcher (Ahrens and Chapman, 2006, drawing on Becker, 1970).

6.4.2 The time horizon

There are two possible time horizons in which a research project is undertaken: cross-sectional and longitudinal (Saunders et al., 2009). The former consists in studying a particular phenomenon, or more than one, at a particular point of time. The longitudinal horizon is concerned with a representation of events over a period of time. The choice and selection of the time horizon for this research was based on the research objective. Since the objective is to carry out a detailed study of the relationship between accounting and innovation throughout the practical unfolding of the NPD process, the longitudinal perspective was deemed to be appropriate for this thesis because it is concerned with the investigation of the unfolding of accounting practices and the role of accounting throughout the period of time necessary for the entire process of product development.

The case study of Beta, a company operating in the field of electronic devices, is longitudinal, where the empirical investigation covered an “elongated period of time, following a developmental course of interest” (Yin, 2014, p.53). The purpose was to examine the entire unfolding, in practice, of a specific NPD process – the development of a new device (with the pseudonym Kappa). This longitudinal investigation also facilitated the study of the complications and tensions throughout the unfolding process and how accounting engaged with the rationale for innovation. Processes that are to be recorded and understood, which in this specific case were NPD processes, require a longitudinal approach since “data must be collected over an extended period of time” (Dent, 1991, p.711). In the case study of Beta, visits with direct interviews took place over a 31 month period. This period of time was appropriate for the investigation, and allowed for examination of the entire unfolding of a specific NPD process that involved project Kappa, by analyzing the accounting practices, the other NPD practices throughout the stages of the process, the actions of the individuals involved, as well as the emerging tensions (Quattrone, 2015; Busco and Quattrone, 2016) and the unfolding “complications” (Golden-Biddle and Locke, 2007). The case study took more time than the duration of project Kappa, which lasted a total of eighteen months. In the five months that preceded the beginning of project Kappa, the researcher studied the culture,
and the nature of the NPD processes implemented within Beta. Throughout the
development of project Kappa, the role of accounting and its effects on innovation
throughout the development process of the new product were analyzed with particular
focus on the complications and tensions that were generated during the process. The
eight months following the completion of project Kappa were used to investigate in
detail and review the development of the new product with the purpose of collecting
additional data that could both validate and further enrich the interpretation of the data
collected and analyzed through the theoretical framework. The longitudinal case study
and the total time spent conducting the case investigation offered sufficient opportunity
for the collection of data to address the three research questions. Moreover, this time
period was not too long to risk falling into the trap of failing to remember or
overlooking data that were collected at the beginning of the study. The process for the
data analysis and the constant attention dedicated to a continuous review of the data
collected from the beginning of the study prevented this problem from happening, as is
demonstrated in the following section.

6.5 The research method
To build a valuable case study, it is important to have sufficient access to data that the
company under investigation has the potential to offer. This data may include interviews
with staff, documents, and/or field observations. When the research aim was originally
articulated as dealing with the study of accounting within NPD processes in practice, it
was determined that a single case study was appropriate for the analysis of the
relationship between accounting and innovation within NPD, facilitating a detailed in-
depth investigation and explanation of how this happens in practice. The reason for
choosing the single case study was explained in the previous section. The criteria
necessary for selecting a suitable company for the case study was that the company
should have a R&D department that is also involved in the complete NPD process.
Three possible candidate companies were identified. The largest company was the first
to be considered since it was very active in producing new products, and it was also
assumed that this company would operate through acknowledged and documented NPD
processes. Therefore, there would likely be a strong potential for collecting a large
amount of material on the role of accounting within NPD processes there. This first
company which for confidential reasons is referred to as Beta was contacted.
Chapter Six: Research Methodology

Contact with the company was not difficult to establish as I knew a person who worked in Beta. Acquaintance with this person and his experience in the company presented advantages and disadvantages. As a result of this contact I was able to review background documents on the company and became aware of the company’s interest in NPD and innovation. Background documents allowed me to develop a deep understanding of the philosophy of the company and better understand their strategic direction and mission. This resulted in a greater capacity on understanding what was observed during the visits, heard during the interviews and read from the documents collected. The advantage to me was a reduction in time for understanding and assimilating the data collected given the background knowledge on the company I was provided with. On the other hand, the disadvantages related to the possibility of neglecting some aspects of what was being investigated as the previous knowledge might have led me to take some dynamics for granted. This potential effect could have led me not to ask some questions or not to give attention to some observations that another researcher, who had never heard about the company, might have done. However, there was awareness from the outset of the advantages and disadvantages of a personal contact with the company which could impact on the reliability and the validity of this interpretivist study, and it was decided, in so far as humanly possible, not to take anything for granted during the investigation. Even though there was some prior knowledge of aspects of the company, such as the business, the kind of expertise characterizing it, the products developed, questions on those aspects were also addressed to the staff interviewed in Beta in the early stages of the gathering of empirical research evidence. In doing so I endeavoured to avoid consideration of any previous knowledge and ensured that questions were asked as if it was the first time I was hearing about Beta, its business, its people, its new products. The adoption of these measures were aimed at mitigating any potential threat to the reliability and validity of the findings of the study. The intent was to reproduce the same results that another researcher, approaching the same study in the same company, would have (reliability) during the processes of data collection and data analysis so as to guarantee that the data collected reflected the real world of Beta and the findings which emerged were really about what they appeared to be about (validity).

The first contact with the company was by email. This message was addressed to the manager of Operations and the manager responsible for the project management office.
(PMO). In this message, the role of the PhD student was explained, the profile of the supervisor for this research was attached, and the objectives for the research project were made clear. The reply to this email was in the form of an invitation to visit the company. The meeting with the senior manager of Engineering and R&D, the manager of Operations and the manager of the project management office (PMO) was arranged by one of the project managers of the company (who had led NPD projects in the past), who subsequently became the point of contact between company Beta and this study. During this meeting, the objectives of this thesis were presented to the small group attending the meeting. The purpose of the meeting was to familiarise staff with the academic research as well as the specific process for this research. During the meeting, a slide presentation was discussed (the summary/agenda is included in Appendix A) with the group identified above. The presentation included an overview of how a PhD course is organized, an explanation of the topic of research, the nature of this specific PhD thesis as well as an explanation of the need for access to information and documentation necessary to complete the case study. By way of offering an explanation of the possible outputs of the academic research, some journal papers written by the supervisor of this PhD project were provided.

The meeting attendees were informed that regular visits to the site to interview staff would be required. It was suggested (and subsequently agreed) that a list of the staff to be interviewed would be given to the project manager and the manager for the PMO before each interview session. The staff to be interviewed were identified gradually throughout the study, as well as after the analysis of the material collected up to that point. It was agreed that each interviewee would be informed by the project manager about the topic of the interview and his/her involvement had to be voluntary (Saunders et al., 2009). All of the interviewees were guaranteed confidentiality and anonymity, and could withdraw from the study at any point. Also it was anticipated that some group interviews would need to be carried out, with the purpose of maximising the reliability and validity of the data. These are found in Figure 6.1 – in which an account of all the formal interviews held in Beta are included – as Groups – and involve from 2 to 5 interviewees. Staff were told that the topic of the interviews would be regarding product innovation, the structure of the NPD process in Beta, the relationship between accounting practices and the other technical practices for the development of a specific innovative new product that was to be selected (how this occurred is illustrated later in
this section), the actors and the roles involved and how they interpret the dynamics occurring during the process. During the interviews the focus would be on processes rather than on numbers or quantities.

This first meeting lasted 75 minutes. Subsequently, an email was sent to the staff who attended the meeting, thanking them for their availability and also attaching the slide presentation that was discussed. After this first meeting, Beta confirmed their agreement to take part in this research and the researcher in consultation with her supervisor decided on it as the single case study for the PhD thesis. Prior to each case visit to Beta, the project manager ensured the availability of the individuals who were to be interviewed. After each interview, the data collected from the company up to that point were analysed\(^{11}\) and then the next interviewees were selected. Once the potential interviewees were identified, this was discussed with the project manager and the manager of the PMO, by email or by phone. These two managers always agreed and booked the meeting room where the interviews took place. No individual refused to be interviewed and no one was uncooperative.

During the interviews at Beta, data on the structure of the NPD process were collected with the objective of better understanding the context of the research. During one interview with the project manager (Interview n.4 in Figure 6.1), the intention of focussing the investigation on the process for the development of a specific new product was discussed. Project Kappa was selected for this thesis by the researcher in consultation with her supervisor, from among three possibilities, because it was considered by the project manager and the manager responsible for the project management office to have a demanding accounting target. At the same time, it was intended that a high level of innovation was to be embedded within the new product (as demonstrated by the project manager at the meeting). These two aspects were at the core of this PhD thesis. The choice of project Kappa was agreed with the manager responsible for the PMO. Project Kappa was expected to develop a new electronic device with more innovative technologies than other new products in development at Beta\(^{12}\). Project Kappa, whose study started in April 2013, was subsequently examined in detail by taking a close look at its unfolding practices, the individuals involved, the

\(^{11}\) A detailed account of the data analysis process is outlined later in this chapter.

\(^{12}\) The description of the new product Kappa is provided in Chapter 7.
objects at work. Focus was placed on the tensions involved during its development. In the next section the methods for collecting data in Beta are explained in detail.

6.5.1 Data collection
Case study evidence may stem from a number of sources, including documents, archival records, interviews, direct observation, participant observation, and physical artifacts (Yin, 2014). The sources of evidence for this study were interviews, observations and documents. These sources each significantly accounted for the data collection for this study and each of them was found to be complementary and useful to support and verify the others. In respect of the interviews, 37 interviews were conducted in the case company. These interviews involved eight participants: the senior manager of Engineering, the manager of Operations, the manager of Engineering, the manager for the PMO, the project manager, the project leader, the management accountant, the manager of Marketing. With the exception of the management accountant, all the interviews’ participants belonged to the functions involved in the NPD process: Marketing, Engineering and Operations. The time of the interviews was variable with interviews lasting from five minutes (only in one case, the next shortest interview was thirty minutes in length) to one hour ten minutes. The variability of the interviews’ duration occurred because the planned interviews were often interrupted. These interruptions were often positive outcomes from a research perspective as they facilitated in-depth observation of elements of the NPD process as they required the researcher and the interviewee to move to other places where the topic under discussion could best be resolved by the intervention of the interviewee and other participants (this approach will be explained in more detail when dealing with the observations at the company premises). Therefore, the time spent in the company of the interviewees was not often limited just to the time for the interview. Also, half-days (five) and full days (four) were spent at the company premises.

Many observations contributed to the data collection. With the exception of a few cases where the observations were planned, in particular when the tour of the company and its departments was organized, opportunities for observations within Beta occurred spontaneously before during and after the interviews. The interviews were often extended by the interviewees with the purpose of further explaining to the researcher what was being discussed. Interviewees sometimes preferred taking the researcher to
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another part of the factory so that she could physically observe that which was being discussed. For instance, during the interviews with the project leader, I was taken to see some drawings of the new product, and prototypes of a component/part of the new product, or other new products. Also, the interviewees often took me to visit the laboratory or the office where another staff member could provide further details of that which being discussed. This happened, for instance, when the project manager took me to see the mechanical engineer and the manufacturing engineer dealing with their work for the development of the new product. Therefore, I was afforded the opportunity to move on from planned face-to-face meetings with key members of the Kappa team to meet with other staff who were in a position to answer questions related to the development of Kappa. These dynamics allowed me to collect additional data from other professionals within the case to enrich my understanding of the NPD process. These observations were recurrent and involved many of the professionals tangentially involved in the development of the new product. Such unscheduled meetings offered me the opportunity to better understand the NPD process and its unfolding accounting practices. Furthermore, coffee and lunch breaks at the company afforded me an opportunity to speak less formally to staff. On these occasions (four lunch breaks and sixteen coffee breaks over two years and a half) I was introduced to other professionals, who did not necessarily participate in the development of other new products. Observing these informal discussions allowed me to develop an appreciation of the wider NPD context.

The data collected for this study also includes an extensive examination and review of relevant documents. These documents were the project report, a document including information on the performance status of the new product development in relation to the triple constraint of cost, time and technical requirements, which was routinely updated and presented at the periodical meetings with top managers; the document describing the formal NPD process followed in Beta (structured around five phases); the product description document, which contained details such as the product’s technical requirements, the product’s financial goals and accounting targets, the intended markets and the project’s expected completion date; the documents required to complete five checklists, namely the checklist to be signed at the end of each NPD project’s phase prior to moving to the following phase; two documents detailing the expected inputs,
tasks and outputs of each phase of the NPD process and some slides presenting the business of the company Beta.

**Table 6.1: Account of the documents reviewed**

<table>
<thead>
<tr>
<th>Documents titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Project report</td>
</tr>
<tr>
<td>• The NPD process (part 1)</td>
</tr>
<tr>
<td>• The NPD process (part 2)</td>
</tr>
<tr>
<td>• Product description document</td>
</tr>
<tr>
<td>• Phase 1 Checklist; Phase 2 Checklist; Phase 3 Checklist; Phase 4 Checklist;</td>
</tr>
<tr>
<td>Phase 5 Checklist</td>
</tr>
<tr>
<td>• Inputs, tasks and outputs in the NPD process (part 1)</td>
</tr>
<tr>
<td>• Inputs, tasks and outputs in the NPD process (part 2)</td>
</tr>
<tr>
<td>• About Beta</td>
</tr>
</tbody>
</table>

In order to store, manage, and quickly retrieve the data being collected from these sources, a case study database was created, with the purpose of maintaining a coherent chain of evidence for this research. In line with the interpretivist philosophical stance, the research was conducted among the people participating in project Kappa, with the purpose of interpreting and understanding the humans and their roles, as well as the meanings and the interpretations they gave to their roles and the dynamics occurring within the NPD process (Ryan et al., 2002; Saunders et al., 2009).

The data collected from the various sources on the practices unfolding during the empirical NPD process of project Kappa aimed to illustrate the “actions, doings, and sayings” (Schatzki, 2001a) in developing innovation for Kappa, individuals’ “beliefs, hopes and emotions” (Schreiber, 2014, p.349), and their expectations and intentions to pursue and realize innovation (Schatzki, 2005). Focus was also placed on the rules and the procedures of the NPD process (Schreiber, 2014, p.349, see also Schatzki, 2001a; 2005), e.g. the formalised NPD process, as well as how people “determine[d] what ma[de...] sense [...] to do” (Schreiber, 2014, p.349; see Schatzki, 2001a; 2005) throughout the development of Kappa. Attention focused on the unfolding accounting practices during project Kappa, e.g. “the specific relationships forged between understandings and traditions of social groups and their aspirations and pressing problems” (Ahrens and Chapman, 2007a, p.3) and tensions, with attention to “how
people in organizations [...made] use[...] of widely available accounting solutions, how such solutions [...came] to be at their disposal” (Ahrens and Chapman, 2007b, p.99) and engaged within the unfolding process for innovation.

The data collected for this research consisted in a varied range of documents directly related to Kappa – project proposals, progress reports, and NPD process checklists for each stage of NPD (Yin, 2014, p.106). The direct observations allowed the development of insights and understandings concerning the actions and interactions of individuals. Direct observations concentrated on the manufacturing and research facility, its layout and the organization of the work spaces, the arrangement of the people, the activities performed and the relationships among the staff, which all related to the new product Kappa.

The interviews allowed an in-depth examination of the actions, the human interactions and the individuals’ relationships as they evolved during the NPD process. The interviews were an element of the qualitative approach adopted for this research where preparation for interviews followed “a process of reflection, and going back-and-forth” (Wouters and Wilderom, 2008, p.499) between the data, the literature, and the theory. The interviews helped in recalling and deepening the data collected after having interpreted and reflected on the previous material. The interviews also constituted a means for asking the staff to give interpretations and analysis of the processes being investigated. The interviews here were not intended as structured queries. Instead, they were conducted as conversations guided by the questions that were coherent with the line of inquiry (research objective) decided upon for this research after a thorough literature review. However, it is also worth noting that the line of inquiry did not solely lead the discussions held during the interviews, also questions were posed and conversations were adapted to data emerging during interviews. Generally, the open questions that guided the interviews in the field began with the word ‘how’, and were generally followed by additional questions which began with ‘why’, with the aim of further investigating and better understanding what was discussed, as well as encouraging the interviewees to explain more. In general, all the interview questions were open-ended, in the sense that they were aimed at encouraging the interviewee to answer with a discussion and an explanation, rather than short answers, such as ‘yes’ or ‘no’. Furthermore, the interviews were conducted in a friendly manner, as they had to
appear “nonthreatening” (Yin, 2014) because the interviewee needed to feel comfortable and be at ease. On the whole, all conversations during interviews maintained a clear focus on the research objective, namely, to collect empirical evidence that contributed to understanding the way in which accounting engaged with the rationale for innovation, in practice, during the NPD process of project Kappa.

At Beta, a total of 37 interviews were conducted. An account of all the formal interviews (37) carried out within the company is reported in Figure 6.1. In particular, in Figure 6.1 the people interviewed (detailing a group or individual interview) and the primary topics of the discussion are shown. It was noted that there is no precise number of interviews that must be conducted for the investigation of any research project. Saturation of data\textsuperscript{13} (Morse et al., 2002; Bowen, 2008) was achieved when the case visits and the interviews held did not return anything new to be added to the information collected during the earlier interviews. At this point, the data set was deemed complete and sufficient to answer the research questions and offer possibilities to develop new theoretical insights. Additional data in interview number 31 only led to replications and redundancies (Bowen, 2008). From this point – Interview 31 – no new participants in the interviews were identified in the study since it was considered they would be just providing replicated data (Morse et al., 2002). It was also realised that the point of data saturation had been reached when the researcher met staff at Beta casually during coffee breaks and lunches and no new data disclosed to add to the researcher’s understandings about accounting within the NPD process of Kappa (Bowen, 2008).

Interviews in Beta were recorded after the second case visit. Assurances were given that the recordings of the interviews would be destroyed after the completion of the study. The practice of recording made it possible to better follow the conversation with the interviewee and promptly react to the input that came up, since it was not necessary to concentrate on taking detailed notes of the discussion. However, notes were taken on emerging points that were considered potentially important, and later these were brought up in the interviews as they progressed. All the interviews were transcribed immediately after each case visit. Even though the activity of transcription required time

\textsuperscript{13} Saturation of data: “continuing bringing new participants into the study until the data set is complete and data replicates” (Morse et al., 2002, p.20, note 4).
and energy, it was a useful process since later it was possible to recall the conversation, yielding further interesting insights.

**Figure 6.1:** Detailed account of the interviews carried out within Beta

<table>
<thead>
<tr>
<th>#</th>
<th>Interviewee</th>
<th>Primary topics of the discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Group</em>: Senior Manager Engineering and R&amp;D; Manager of Operations; Manager PMO; Project Manager</td>
<td>- The company and its history&lt;br&gt;- The role of the NPD process within the organization, the main features and requirements of this process, possible difficulties in carrying it out</td>
</tr>
<tr>
<td>2</td>
<td>Manager of Engineering</td>
<td>- The role of the NPD process within the organization</td>
</tr>
<tr>
<td>3</td>
<td>Manager PMO</td>
<td>- The role of the NPD process within the organization, the main features and requirements of this process</td>
</tr>
<tr>
<td>4</td>
<td>Project Manager</td>
<td>- The role of the NPD process within the organization&lt;br&gt;- Selection of the project</td>
</tr>
<tr>
<td>5</td>
<td>Project Manager</td>
<td>- The structure of the NPD process in Beta</td>
</tr>
<tr>
<td>6</td>
<td><em>Group</em>: Project Manager; Manager of Operations</td>
<td>- The structure of the NPD process in Beta</td>
</tr>
<tr>
<td>7</td>
<td>Manager of Operations</td>
<td>- The unfolding NPD process of Project Kappa</td>
</tr>
<tr>
<td>8</td>
<td>Manager PMO</td>
<td>- The unfolding NPD process of Project Kappa</td>
</tr>
<tr>
<td>9</td>
<td>Manager of Engineering</td>
<td>- The unfolding NPD process of Project Kappa</td>
</tr>
<tr>
<td>10</td>
<td><em>Group</em>: Senior Manager Engineering and R&amp;D; Manager of Operations; Manager PMO; Project Manager; Management Accountant</td>
<td>- The unfolding NPD process of Project Kappa: The role of the management accountant&lt;br&gt;The role of the project manager&lt;br&gt;The relationship between the project manager and the management accountant&lt;br&gt;The relationship between the project team and the management accountant&lt;br&gt;The project report and focus on its accounting figures</td>
</tr>
<tr>
<td>11</td>
<td>Project Manager</td>
<td>- The unfolding NPD process of Project Kappa</td>
</tr>
<tr>
<td>12</td>
<td>Management Accountant</td>
<td>- Project Kappa and the role of the management accountant&lt;br&gt;- The Accounting function in Beta</td>
</tr>
<tr>
<td>13</td>
<td>Project Manager</td>
<td>- The unfolding NPD process of Project Kappa&lt;br&gt;- Issues during Project Kappa</td>
</tr>
<tr>
<td>14</td>
<td>Manager PMO</td>
<td>- The unfolding NPD process of Project Kappa</td>
</tr>
<tr>
<td>15</td>
<td>Project Leader</td>
<td>- The unfolding NPD process of Project Kappa</td>
</tr>
<tr>
<td>16</td>
<td>Manager of Operations</td>
<td>- Issues during Project Kappa</td>
</tr>
<tr>
<td>17</td>
<td>Project Manager</td>
<td>- The unfolding process of Project Kappa&lt;br&gt;- Issues during Project Kappa&lt;br&gt;- A deeper analysis of the relationship between the project manager, the project leader and the project team</td>
</tr>
</tbody>
</table>
The case study’s data collection was also enriched with informal meetings and discussions held with the staff from the company during the lunch and coffee breaks, since the time spent at Beta was longer than just the time necessary for the interviews. This additional time aided in understanding what was discussed during the formal and recorded interviews and also provided an opportunity to enrich the study with views from other informants that were not formally involved in the interviews, but who were met during the improvised breaks at the factory ‘cafeteria’. These informal meetings constituted a further opportunity for data collection facilitating further understandings
of the social context, further interpretation of the role of the social actors as well as being a source for corroboration of the interpretations that were elaborated up to that point. Furthermore, forms of communication from a distance with the company also comprised a small element of the research data collected within Beta, such as telephone calls (4 in total). An account of these telephone calls, in particular who the conversation was with, the nature of the conversation and when they were held is illustrated in Figure 6.2.

**Figure 6.2: Account of the telephone calls with Beta**

<table>
<thead>
<tr>
<th>Who the conversation was with</th>
<th>Nature of the conversation</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager</td>
<td>The formalised NPD process in Beta</td>
<td>After Interview 4</td>
</tr>
<tr>
<td>Project Manager</td>
<td>The product description document</td>
<td>After Interview 12</td>
</tr>
<tr>
<td>Manager PMO</td>
<td>The unfolding process of Project Kappa</td>
<td>After Interview 20</td>
</tr>
<tr>
<td>Manager PMO and Project Leader</td>
<td>Phase Three of Project Kappa and the sequence of prototypes</td>
<td>After Interview 37</td>
</tr>
</tbody>
</table>

Finally, throughout the empirical material collection process, the data, memos or notes which had been written were studied, in order to “refine and keep track of ideas that developed” (Bowen, 2008, p.145), identifying possible patterns, insights, or concepts that could be promising in the light of the research objective and the development of the theoretical contributions. Data displays were created that helped to better understand and examine the data (Yin, 2014) throughout the case investigation. This approach was underpinned by the qualitative approach as described in Section 6.3 – based on a continuous process of data collection and data analysis in light of the interpretations informed by the literature and the selected theoretical framework on the topics under investigation for this study.

**6.5.2 Data analysis**

There is no standardized process for analyzing data (Saunders et al., 2009). The possibility of using a dedicated software program to support the qualitative analysis of the data was initially considered but ultimately rejected in favour of manual analysis of the data. A qualitative data analysis software (QDAS), such as NVivo (Bazeley and Jackson, 2013), provides software tools which assist researchers who undertake analysis of qualitative data. More specifically, using NVivo for a qualitative analysis of the data can help the researchers to manage data, manage ideas, query data, visualize data and
report from the data (Bazeley and Jackson, 2013). However the use of a software for qualitative data analysis can also detach researchers from their data, neglect other analytic activities, “mechanize analysis” (Bazeley and Jackson, 2013). Having considered the advantages and disadvantages of using software, a decision was taken to manually analyse the data.

The use of NVivo software facilitates the researcher in capturing concepts, exploring links, elaborating ideas, among a significant amount of data, in a quicker, accurate and straightforward manner. A decision not to employ NVivo, or more generally a QDAS for data analysis, means that the researcher has to “undertake routine qualitative data management tasks manually such as sorting […] data into categories and locating subsets of these data according to specified criteria” (Saunders et al., 2009, p.481). In the specific case of this research, it was decided to sort the data collected using an iterative manual approach. The same day the data were collected, or the following day at the latest, the data garnered were reduced and categorized manually (these two processes will be described in detail in the next section). The analysis consisted of reducing the data to concise and clear sentences, devoid of noise, namely without considering that material which was not deemed significant for the study such as when interviewees discussed related issues to Kappa but not pertinent to the research objective of this study. Subsequently, the data reduced were distributed among the categories – the ‘themes’ of the data contributing to answering the research questions and achieving the research objective of the thesis (these themes will be detailed later in this section). As soon as the data were collected, they were coded (as detailed later in this section) and analyzed. This process ensured that not much time passed between the collection of the data and the analysis of the data: the short time gap between completing these two processes facilitated timely analysis of the data. This also explains why the need for software to reduce the time for the data analysis was not considered an issue during the study. Additionally, through the manual analysis I was able to recall and to a certain degree memorize the data collected and in this way deepen my awareness of data and interconnections between different aspects of the data and their meaning, further facilitating increased understanding of the data thereby allowing me to answer the research questions of this thesis. This procedure was considered an opportunity to address some of the disadvantages of using NVivo, such as the mechanized process of analysis, which can detach researchers from their data.
Some researchers may perceive that “the use of a computer helps to ensure rigour in the analysis process” (Bazeley and Jackson, 2013, p.2), e.g. when querying data. Through facilitating query procedures, the software allows one to include every recorded use of a term or a concept in the interpretation, ensuring a more complete set of data than in the case of a manual process of data analysis (Bazeley and Jackson, 2013). In this specific case, the data analyzed and studied after the case visits, the interviews transcribed, the notes taken, and the categorization and coding of the data, were conducted in such a way that it was deemed that nothing relevant for the research was lost.

NVivo allows the researcher to simultaneously manage and code data stemming from diverse sources, such as word and pdf files, audio and video files, as well as sets of data, images and even tweets. For this thesis, this performative aspect of the software was not considered necessary given the few and simple formats of the data to be analysed (e.g. the text form of the transcription of interviews, documents, and notes taken both during interview and describing what was observed). Finally, NVivo also presents a sort of platform or repository where the data collected can be stored and organized in an ordered manner and from where they could be easily retrieved. Even though NVivo was not used for this study, the data collected were stored, managed, and quickly retrieved through the use of a case study database, namely a folder organized into additional folders which facilitated the maintenance and the consultation of a coherent chain of evidence for this research. To summarize, the process of data analysis, working manually, undertaken for this study has been arranged in a way that the disadvantages of not using NVivo were addressed. The way in which the analysis for this study was performed is explained in detail in the remainder of this section.

The data collected for this research were analyzed at the end of each case visit and were triangulated with the other data collected up to that point – documents, observations and previous interviews, to assess their accuracy. The process of data collection and analysis was interactive. When, at the end of each case visit, the data were analyzed, the subsequent interviews and other sources of data collection were planned. This process was underpinned by a qualitative research approach aimed at continuously and iteratively making sense of the data collected, in light of the literature on the topic, which originally had led to outlining the research objective, and the choice of the
theoretical framework subsequently adopted to understand and interpret the data. There are many possible procedures for analysing qualitative data, including data display and analysis, template analysis, analytic induction, grounded theory, discourse analysis, narrative analysis (Saunders et al., 2009). From these techniques, the researcher’s data analysis was inspired by the data display and analysis approach, which consists of the following three processes for the analysis:

- data reduction;
- data display;
- drawing and verifying conclusions (Saunders et al., 2009, p.503, relying on Miles and Huberman, 1994).

This approach to the analysis for this study was implemented iteratively, as shown in Appendix B. At the end of each case visit, the three processes (data reduction, data display, and preliminary drawing and verifying conclusions) were carried out. The results were gradually integrated as the case visits were extended to include more data. In the process of data reduction, (see Appendix B), the data collected were synthesized into a list of concise sentences with the relevant data for the thesis. Beside each sentence within this list, the source of the data was recorded (interview, observation, documentation). The sentences within the list were integrated with other sentences synthesizing the notes taken during and after the case visits. Other than facilitating the management of the data collected and their organization, this process of data reduction was aimed at eliminating what was considered the ‘noise in the data’. The noise was represented by those data collected through interviews, observations or documents, that were not considered significant for this research, as they did not contribute to answering the research questions of the thesis. For instance, a noise within the data was represented by those pieces of interviews or observations where the project manager described a new methodology for project management, more flexible and less structured than the stage-gate model characterising the NPD process in Beta. As illustrated in the first matrix of Appendix B (see the crossed row), this noise in the data was removed as the identified data were not considered relevant for this study.

After the data reduction process, the data were displayed by creating categories for them, such as shown in Appendix B. These categories (see the columns of the second matrix as part of Appendix B) were the themes that were identified as those needed to
be clarified, expanded upon and understood in order to answer the research questions and thereby achieve the research objective. The rows of this matrix were populated and updated with the data analyzed and reduced in the previous step. This process was iterative as well, and the matrix was updated after each case visit. Also in the matrix there was a note indicating the source of that data and the relevant quotes in order to understand the processes under investigation, considering the interpretations and meanings of the actors involved – in line with interpretivism. The updated matrix at the end of each case visit made it possible to draw preliminary conclusions, which were built in light of the theoretical framework.

The data that corresponded with the research questions were analyzed at the stage of the preliminary conclusions (see the final part of Appendix B). These data were subsequently interpreted in light of the concepts of the theoretical framework. This stage of the analysis was conducted in line with the qualitative approach explained earlier in this chapter. Specifically, the analysis of the data stemmed from an iterative back-and-forth between data, literature and theory to see whether what was found had “precedents” in the literature, but also whether new concepts and knowledge were discovered (Gioia et al., 2013). Also, this stage of analysis was conducted in line with interpretivism (Ryan et al., 2002; Saunders et al., 2009). Considering that the NPD setting is characterized by multiple actors, who have different interests and purposes for innovation, the analysis of the data was based on the interpretation of NPD and accounting practices of the actors’ perceptions and meanings and of their interests and purposes for innovation.

The data for this study were focussed on the practices (Schatzki, 2001a; 2001b; 2005; 2007) unfolding during the empirical NPD process, which consisted of the “actions, doings, and sayings” (Schatzki, 2001a) that were involved in developing innovation for Kappa. All the practices featuring the NPD process facilitated the unfolding of the flow, the movement and the direction characterizing the NPD process, having the feature of a ductus (Carruthers, 1998; 2010), a dynamic flow, and resembling a journey in which the diversity of interpretations are maintained and enabled in the process of innovation (Busco and Quattrone, 2016). Through the concept of the epistemic objects (Knorr Cetina, 2001; Nicolini et al., 2012), the desire and the wanting (Busco and Quattrone, 2016) for innovation are analyzed studying the unfolding process for innovation in
practice, as well as the cross disciplinary collaboration characterizing this process. Through the notion of boundary objects, the concepts regarding how people work together despite the different social roles involved and with their heterogeneous interests and interpretations for the unfolding process for innovation, and how accounting engages with the unfolding process for innovation, are interpreted. These theoretical concepts were used to interpret the empirical findings and contributed to the preliminary conclusions, as well as to make evident the need for further collection and analysis leading to the final achievement of the research objective.

6.6 Chapter Summary
This chapter has exposed the research methodology that has been used to develop the thesis. With the purpose of collecting empirical material to be filtered and interpreted to examine the way in which accounting engages with the rationale for innovation in practice, an interpretivist philosophical stance was used. Furthermore, an approach based on qualitative data and facts was adopted for this study. The thesis builds on the single longitudinal case study of Beta. Documents, observations and interviews constituted the sources for an accurate data collection and detailed analysis.

In the next chapter, the empirical material collected is illustrated. Following an initial description of the company Beta, the empirical data gathered is presented with a focus on the evidence considered relevant in light of the research objective. Specifically, the next chapter is descriptive, illustrating the empirical NPD process and its accounting practices with a focus on how the accounting practices are carried out and by whom, during project Kappa. These practices are then analysed and interpreted in the following chapter.
Chapter Seven

Findings 1 - The case of Beta

7.1 Introduction
In this chapter the empirical material collected is illustrated. After the presentation of the case study, referred to as Beta, on which the investigation for this thesis is based (Section 7.2), the material collected focuses on the NPD process within Beta (Section 7.3), which is structured around a stage-gate system (the main features of a stage-gate system were illustrated in Chapter 2, Section 2.5). The material collected in the field study concentrates on the unfolding practices throughout the five stages/phases of the NPD process of the new product Kappa (Section 7.4). Data on the accounting practices, specifically the periodical tracking of the performance of the new product in development through the use of accounting figures and measures, are synthesized in Section 7.5. Section 7.6 focuses on the role of the professionals dealing with accounting practices, as well as on the role of the management accountant at Beta, and during project Kappa in particular. Then in Section 7.7 the unfolding process for innovation is described, as observed during project Kappa, i.e. the process through which innovation materialized to eventually be embedded in the new product. The empirical relationships between accounting, innovation and NPD at Beta are illustrated in Section 7.8. Finally, Section 7.9 summarizes the key points of this chapter.

7.2 Overview of the case study
The case study for this research is based on a manufacturing company, referred to as Beta, operating in the field of electronic device solutions. The strategic objective of Beta is to maintain and enhance its success by constantly designing and developing more innovative and technically valuable products for the marketplace. Using a simple physical description, these devices are principally composed of electronic parts contained within a mechanical box. Beta employs six-hundred workers. The R&D department at Beta includes engineers, primarily electronic and software engineers. The development of new products in Beta is based on a formalised NPD process, inspired by
an understanding of processes of NPD, promoted by the literature and consolidated in practice, such as the stage-gate system by Cooper (1990 and his subsequent works)\textsuperscript{14}.

\textbf{7.3 Overview of the new product development process within Beta}

The NPD process within Beta is formalised into five phases, indicated as follows: \textit{Concept, Feasibility and Planning, Design, Qualification, and Pre-production}. Figure 7.1 illustrates the phases of the NPD process at Beta. A requirement for the NPD process is that passage from one phase of the NPD process to the next requires the completion of a “check” and is controlled by a group of senior managers, called ‘gatekeepers’, who rely upon checklists to monitor all progress. The checklists indicate the mandatory deliverables (e.g. tasks or documents) that have to be accomplished or completed in each phase prior to the advancement of the new product to the next phase. The checklist for each phase ensures that any unique requirement or condition is captured and managed within that process. The gatekeepers of the process are senior managers of the main functions involved in the NPD process, such as Engineering and R&D (hereafter simply referred to as Engineering), Marketing, Operations, Finance, and Sourcing. They are in charge of verifying the deliverables that are expected during the process (established at the beginning of the process and updated throughout it when needed) and approving, as a team, the closure of each phase before moving to the next. Over the whole five phases of the NPD process, the project manager is committed to ensuring that the checklists are unanimously signed before closing each phase and moving the process forward. The formalised NPD process is contained in a document which outlines the main activities, inputs-outputs and deliverables expected throughout the five phases. In the remainder of this section the phases of the formalised NPD process are illustrated.

\textsuperscript{14} The stage-gate system as developed by Cooper (1990; 1996) was described in Chapter 2, Section 2.5.
**Figure 7.1:** The phases of the New Product Development process in Beta

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
<th>Phase 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept</td>
<td>Feasibility and Planning</td>
<td>Design</td>
<td>Qualification</td>
<td>Pre-production</td>
</tr>
</tbody>
</table>

Source: The NPD process. Internal Company Documents (adapted)

**Phase 1 – The concept**

Phase 1 of the NPD process is called *Concept*. This phase starts with a preliminary draft of the Product Description Document, hereafter PDD, prepared by the marketing product manager (hereafter simply referred to as product manager) by drawing up and describing the new product to be developed for the market. In the PDD details of the new product’s specifications – the product’s expected technical requirements and functions are included. Also accounting targets are delineated here, e.g. the expected cost of goods sold for the new product, with details of the expected cost of the bill of material – BOM, and labour cost, as well as the expected selling price and the expected gross margin. The PDD also includes the expected completion date of the new product.

By drafting the PDD, the product manager builds a sort of authorization request to start a new product development project for the market. This request is delivered to the gatekeepers of Phase 1, who analyze the PDD and verify whether the project can be started. These individuals analyze the product’s specifications and broadly figure out whether there are enough resources to achieve the technical and accounting targets outlined within the PDD. At this point, the gatekeepers might require some changes to the requirements within the PDD in line with the interests and resources constraints stemming from the functional areas they are responsible for. In these circumstances, practices of negotiation (with the product manager and the senior manager of Marketing, the boss of the product manager) to amend the PDD are likely to emerge in order to make the product and the project feasible. The requests to amend the PDD may
or may not be accepted by the senior manager of Marketing. These requests generate discussions that contribute to finally producing the first formal version of the PDD, the output required at the end of the first NPD phase to pass to stage two. If the gatekeepers give their approval to start a new product development project, a project manager is then appointed. The project manager is responsible for the new product development project.

“The project manager is in charge of activating, coordinating and controlling the activities during the following phases of the NPD process. He arranges and channels these activities to be in line with the objectives of cost, technical requirements, and timeliness of the project – as outlined within the PDD” (Manager PMO).

At the end of Phase 1, a second manager with technical expertise – the project leader is identified by the senior manager of Engineering and is responsible for the innovativeness, the technical choices and functionality of the new product. At this point, the product manager gives the PDD to the project manager and the project leader.

Phase 2 – Feasibility and Planning
A fundamental input of Phase 2 is the PDD, including relevant information on the product’s technical requirements, its cost targets, and the expected end date of the project. Importantly, during this phase, the project development team (hereafter simply referred to as the team) is formed. The team is a multi-disciplinary group composed of members belonging to the different functions required for the development of the new product: Marketing, Engineering and Operations. The team is responsible for carrying out the activities for the development of the new product throughout the NPD process. The project manager is in charge of forming the team. In practice, the project manager builds the team by negotiating, and “obtaining”, human resources from the front-line functional managers within the company (of Engineering, Marketing and Operations).

Phase 2 is a crucial phase. It is the phase in which the project manager, the project leader and the team analyze in detail the feasibility of the project for the new product, as outlined in the PDD. In Phase 2, the project manager and the project leader may also negotiate requests for changes in the specifications with the product manager (along with the senior manager of Marketing) to increase the feasibility of the project. “If
Phase 2 is performed with attention and diligence, it is less likely for the team to run into big issues during the following phases” (Senior Manager of Engineering). Once the team is complete, it is responsible for the activities necessary for executing the project.

The feasibility study consists of producing a preliminary layout of the product (by the project leader and the electronic engineers), a draft of the mechanical design (by the mechanical designer/engineer), a sketch of the software scheme and functions (by the software engineers), and a preliminary design for manufacturing (by the manufacturing engineer) and testing (by the testing engineer) of the new product. This study allows the team to assess whether the technical requirements and expected specifications outlined within the PDD can be fulfilled and met. During this feasibility study in Phase 2, the project manager is responsible for coordinating the team. The project leader also leads the team as well as participates in the technical activities of the team. After the feasibility study is complete, a planning activity is carried out during Phase 2. It consists of outlining the time necessary for the project, namely a timeline estimating the times and durations of the relevant tasks that make up the activities for the project. It is the project manager’s responsibility to create, maintain, control and update this project timeline, called a schedule, as the project evolves through the remaining phases.

An important activity of the Feasibility and Planning phase consists of doing a preliminary product cost analysis. In light of the feasibility study conducted by the project leader in collaboration with the team, the project manager estimates the BOM and labour cost of the new product with the aim of assessing whether the target reported in the PDD is achievable. After this analysis, the project manager and the project leader may require the product manager to review the product’s cost target in the PDD to favour the feasibility of the project.

**Phase 3 - Design**

Phase 3 is called Design and is usually the longest phase of the NPD process. This phase is crucial, as it represents the heart of the project, where the product is designed in light of the previous feasibility study. The main tasks of this phase are the formal design of the electronics, the design of the mechanics and the product’s packaging, the software development, the BOM creation, the design for manufacturability, the design for testing, the material procurement for the prototypes, the design of manufacturing
tooling and the update and production of the product’s documentation. As a result of the outputs produced by these tasks, the prototypes of the new product are assembled. To do so, the BOM of the new product is created and gradually updated within the database used by the company. The composition of the new product’s BOM is an activity that has to be continuously monitored and updated in real-time. The BOM has to be recorded in the company’s database because all the activities linked to the prototype production, including the material procurement and the assembly arrangements, as well as the materials cost estimate, rely on the updated information in the BOM.

During the design phase, at least two or more versions of the new product prototype are typically assembled. Each team member needs the availability of physical prototypes to carry out their own tasks during the project. For instance, the electronic engineers (from Engineering) need samples to verify the product’s electronic features and hardware; the software engineers (from Engineering) need to test the product’s software; and the testing engineers (from Engineering) need to perform their preliminary tests. The manufacturing engineer and quality engineer (from Operations) ask for prototypes to study the product and to arrange the production phase, to write the documentation, such as the assembly and testing procedures, to design the equipment and the tooling for testing and production and, finally, to train the production department’s technicians. Having gathered all the requests for prototypes by the team members, the project manager organizes their physical assembly.

Phase 4 – Qualification

Phase 4 is the Qualification stage. During this phase, the testing engineers on the team verify that all the product’s functionalities outlined within the PDD perform in the required different circumstances and contexts. The activities of this phase also deal with the technical certification of the new product. Obviously, if some issues occur during the activities for the product’s certification or because of a lack of compliance with some PDD requirements, a review of the design has to take place. Importantly, during this phase the project manager also organizes and coordinates the material procurement for the assembly of the pre-production units. In Phase 4 the manufacturing, quality, and testing engineers prepare and arrange in scrupulous detail the equipment and documentation needed for production.
**Phase 5 – Pre-production**

Phase 5, *Pre-production*, starts with the manufacturing of the new product units with the aim of verifying that the production process runs without any problem. Once this phase is approved by the gatekeepers, the project can be considered closed and mass-production of the new product can take place.

### 7.4 The development of the new product Kappa

In this section an account is offered of the journey through the empirical NPD process involving the development of an innovative electronic device in Beta, referred to in this study as Kappa. With Kappa, Beta aimed to build a new product by introducing new technologies that were also to be incorporated into some of the future products in Beta. The reason that underpinned the choice of project Kappa for this study was explained in Chapter 6, Section 6.5. The five phases of the NPD project under investigation lasted eighteen months for Kappa. In the next section, the practices that unfolded throughout the five phases for project Kappa are analyzed.

**Phase 1 - Concept**

Phase 1, Concept, began when the product manager delivered the PDD to the gatekeepers of the phase – who were the senior managers of the following functions: Engineering, Finance, Marketing, Operations, Safety, and Sourcing. As stated earlier:

> “the PDD lists all the requirements to develop the product, from the technical to the accounting goals. This document also includes a recommendation to develop new technologies for Kappa, so as to fulfil the technical requirement goals of the company” (Manager of Marketing and Product Manager).

The senior manager of Engineering (one of the gatekeepers), having had a glance at the PDD, discussed the requirements of the product with the senior manager of Marketing (also one of the gatekeepers) and expressed his preliminary considerations and doubts about the feasibility of the project as it was then currently outlined within the PDD. After the preliminary and broad discussion between senior managers of the engineering and marketing functions, the senior manager of Engineering decided to study in detail Kappa’s technical requirements involving a group of his subordinates (belonging to the function of Engineering). These individuals analyzed in detail the information within the PDD, with special attention to the new product’s technical requirements as well as
to the accounting and scheduling goals. This analysis concluded with the final and unanimous decision that some changes in the PDD were needed in order to make the project feasible. More specifically, some electronic technical requirements, as well as the accounting targets, were identified as needing. Once this analysis was complete, the senior manager of Engineering reported the outcomes of the analysis made by his subordinates to the senior manager of Marketing. Some of the requested changes were accepted and the product manager updated the PDD accordingly. Nevertheless, the senior manager of Marketing did not agree to review everything suggested by the senior manager of Engineering. For instance the target of the product's cost was not amended and this decision was postponed to Phase 2, since this required a more accurate study of feasibility and a deeper analysis in this respect.

In Beta, the senior manager of Marketing as well as the product manager of this project had a technical background. They were electronic engineers with Master degrees. Furthermore, they had worked as electronic designers in the research and development laboratories of Beta for long time. As a result they were aware of the technical know-how of the staff at Beta as well as of the skills of its engineers, who they knew very well. For this reason, the product managers in Beta were quite precise in drawing out the set of technical specifications for the new product in the PDD. Despite this, the engineering staff were upset about the lack of coherence between the technical specifications and the cost targets within the PDD, as the following comment by the manager of Engineering demonstrates:

“They [the marketing senior manager and the product manager] know how it works in the laboratory. However, in this case they have prepared a PDD where the cost target and the technical requirements cannot be fulfilled simultaneously! He [the product manager] should review the expected cost and margin” (Manager of Engineering).

At the end of Phase 1 the gatekeepers gave their approval to develop the project Kappa. Then, the senior manager of Engineering decided on the individuals who were to be in charge of this new and complex project – the project leader and the project manager. The project leader was responsible for the technical performance of the new product. He was accountable for both the innovativeness and the correct functionality of Kappa.
Whereas the project manager was responsible for the NPD process; the project manager was in charge of coordinating, facilitating, and managing the project activities. Before closing Phase 1, the project manager succeeded in receiving all the signatures on the checklist. He created the project folder in which the documentation on Kappa had to be stored by the team throughout the NPD process. He also created the project report for the Kappa project (and this is reproduced in Figure 7.2), which had to be updated periodically with information reporting the status of the project, in terms of cost performance, tracking of the schedule, activities accomplished, challenges identified.

With this information, the project report showed the different constraints (such as timeline goals and cost targets) and challenges at stake during project Kappa.

Figure 7.2: The project report in Beta

| Source: The project report. Internal Company Documents (adapted) |

Phase 2 – Feasibility and Planning

When the Feasibility and Planning phase for project Kappa was started, the first recommendation made by the senior manager of Engineering to the project manager and project leader was to:

“give the right emphasis to this phase as this project is required to introduce new technologies for our next products, hence the feasibility study of each of these innovations will be crucial” (Manager PMO).

The development team for product Kappa was supervised by the project leader (who was an electronic engineer), and was composed of 2 electronic designers, 2 software
designers, 2 testing engineers, a quality engineer, a manufacturing engineer, a mechanical designer and a product manager. Figure 7.3 below illustrates the team assigned to project Kappa. Once the team was formed, for the rest of this phase the project manager organized several ‘mini meetings’. In each meeting the project manager always involved the project leader and a group of team members who were to collaborate together to carry out a subset of similar or interdependent activities for the project. In these meetings, the project manager created a space in which the project was clearly explained to the team members involved and where the latter were made accountable for their activities and contribution to the project. In these circumstances, the project leader also revealed the direction he intended the project to take “in order to achieve the innovation desired by him for Kappa, as well as fulfilling the requirements on the PDD” (Project Manager). Each team member evaluated his own contribution to the development of the product in light of the function to which he belonged. Each added to the feasibility of product Kappa through the drafting of its layout (by the electronic designers), its mechanical design (by the mechanical designer), the software architecture (by the software designers), the preliminary design for manufacturing (by the manufacturing engineer) and design for testing documents, as well as the qualification test plan (by the testing engineers). The project team were eager to work and influence the development of the new product Kappa, drawing upon the expertise and the features of their functional background. This was confirmed by the manager responsible for the PMO:

“The members of the project team, given this preliminary development of product Kappa, are motivated to intervene to make further contributions to the development of the new product” (Manager PMO).
Figure 7.3: The representation of the team of project Kappa

During the feasibility study, the innovative technologies that the project leader intended to introduce within Kappa, and that also had to be in line with the technical requirements outlined within the PDD, were analyzed. The project leader intended to introduce new technology for the mechanics of Kappa. The lack of experience in the new technology for the mechanics required a deep analysis by both the project leader and the mechanical designer, who both had to enrich their know-how. Additionally, a new system for the closure of a mechanical element of Kappa was conceived of and included in the study of the project leader and the mechanical designer. Finally, the product manager also required the development of a new aesthetical design for the product. The new aesthetical concept focused on the handle and the mechanical cover of the product. All these innovations required an in-depth feasibility study and analysis by the project leader as well as by the team. This feasibility study for Kappa was coupled with the cost analysis, which aimed to verify whether the cost targets within the PDD could be achieved. The assessment of the product’s cost in Phase 1 (by the Engineering staff) already revealed a rough cost estimate, which was higher than the target (this aspect is dealt with in the next section, which gives a detailed account of the accounting practices throughout project Kappa).

Phase 2 also included a planning stage where the project manager organized several meetings with each member of the team. The project manager called to their offices to
identify each member’s activities for the project and their start times and duration. When there were task interdependences, the project manager met all the members involved in order to understand how to schedule their development. With the list of the project’s activities, their inter-relationships and precedents, the resources available to them and the time required, the project manager prepared a schedule that was subsequently shared with the project leader and then submitted for consideration by the senior manager of Engineering. Close to the end of Phase 2, the project manager organized a meeting, attended by the project team members, the project leader and the senior manager of Engineering, in which the project manager gave a short presentation describing the new product to be developed, its schedule. He focussed on the most important deliverables as well as on the challenges of the technical innovations the project leader aimed to introduce. After this meeting, the project manager submitted the checklist of Phase 2 to the gatekeepers (involving senior managers belonging to the following functions: Engineering, Marketing, Operations, Safety, and Sourcing) who signed it and authorized the project manager to go ahead with the next phase. The project manager also updated the Kappa project report.

Phase 3 - Design

Throughout the Design phase (phase 3) of project Kappa, the primary activities consisted of the electronic, software and mechanical design of Kappa, the assembly of prototypes and their study. The project leader and the two electronic designers started working on designing the circuits of Kappa. In this phase the software designers, together with the project leader, started programming the product software. The project leader together with the mechanical designer studied and designed the new mechanics and their new esthetical design, taking into consideration the aesthetical features expected by the product manager.

When the designers had a clearer idea about a feasible product configuration and its components, and the suppliers of the components were almost ready to send their first samples, the project manager arranged the assembly of the first version of the product’s prototypes. Once the assembly took place and the first samples were available, the project manager organized regular design review meetings, usually every week, with all the team, to analyze the prototypes produced and to understand the status of the project. The project leader and the team attended these meetings. The participants in the design review meetings discussed together the status of the ongoing activities, issues,
challenges and solutions, as well as the status of the project’s objectives/constraints in terms of cost, technical functionality, and time. They did so by relying on the available prototypes. During these meetings the project manager took notes and summarized the discussions recently held in the meeting minutes, which were shared with the team members by email. After those meetings, the schedule and the project report were updated.

On these occasions, practices of negotiations were also observed in order to address conflicts and contradictions between “the choices of the project leader and the functional concerns of the other team members” (Project Manager). This happened, for instance, when the sourcing manager asked the project leader and the mechanical designer to change the special technology conceived of for the cover of the mechanics and some details of the new handle within the mechanical drawing of the new product. This solution was complex and would have required the cooperation of the suppliers. Furthermore it was expensive and the BOM cost would have proved to be higher than the target cost, resulting in red traffic lights within the project report signalling the overrun on targeted cost (Figure 7.2). The quality engineer underlined the possible quality issues related to the sophisticated mechanical cover whose quality checks would have taken a long time with higher costs, thus impacting the financial performance, resulting in red traffic lights in the project report. He also suggested a simpler solution for the cover.

Furthermore, the manufacturing engineer suggested:

“changing the positioning of some components within the layout, in order to facilitate the assembly process, thus reducing the labour time and thereby the cost of the new product to be reported within the project report” (Manager of Operations and Boss of the Manufacturing Engineer).

Other meetings took place during Phase 3. For instance, the project leader, the manufacturing engineer and the mechanical designer attended a meeting where the mechanical engineer received requests for amending the mechanical design of the prototype to facilitate the manufacturability of the product and lower the labour cost. Also, in light of the available prototypes, the quality engineer, the manufacturing engineer and the mechanical engineer met “to update the design for manufacturing document, the assembly procedures and finalize the design of the equipment and tooling
needed for the production” (Manager of Operations and Boss of the Manufacturing Engineer). During phase 3, other meetings involved the project leader, the testing engineers and the software designers, who updated and discussed the design for testing and the plan for the qualification of the product. Furthermore, as stated by the manager responsible for the PMO:

“Meetings between the project leader and the team members are promptly arranged by the project manager when requests for amending the design are advanced by some designers of the team ... Each time the need for a new version of prototypes emerges from these discussions, and once they are available, further cycles of design review meetings and other meetings are recursively arranged to analyze the new sample” (Manager PMO).

When the first version of prototype for Kappa (out of the three versions developed throughout Phase 3) was available, the manufacturing engineer commented, again, that “the project leader should change the disposition of some components within the layout in order to facilitate the manufacturing technicians’ assembly procedures, thus reducing the labour cost [to be reported within the project report]” (Manager of Operations and Boss of the Manufacturing Engineer). When the second version of the prototype was produced, the sourcing manager asked to change the mechanical technology, “because expensive, and increasing the materials cost within the project report” (Project Manager). When the third version of prototype was available, the sourcing manager and the quality engineers commented and requested:

“a change in the system used for the closure of a mechanical element of Kappa, and the innovative way in which it is conceived of, because it increases the product’s cost within the project report” (Project Leader).

**Phase 4 – Qualification**

At the beginning of the Qualification phase (Phase 4) the testing engineers of the Kappa project were not ready to run the tests for the qualification of Kappa. The reason for the delay was the lack of the resources available for undertaking the tests since they were allocated to other parallel projects with a higher priority. Therefore, a great deal of time was spent waiting for the testing engineers and the Kappa schedule was delayed.
Meanwhile, other activities were carried out. Several meetings involving the staff from the manufacturing department, the project leader, and some team members, such as the software designers, the mechanical designer, the manufacturing engineer, were organized with the aim of ensuring that the manufacturing department was ready to deal with the pre-production of Kappa. The project manager in collaboration with the sourcing, purchasing, marketing functions and the planners also coordinated the delivery of materials according to the production schedule for the pre-production phase. Finally, Phase 4 was completed, although later than expected.

Phase 5 – Pre-production

There were two main stages involved in Phase 5, the pre-production validation and the mass-production authorization by the gatekeepers. At the beginning of Phase 5, everything was ready for the pre-production. After the production of a significant number of units of Kappa, it was found that the production of the new product ran without difficulty and the project could be closed-off. Once the gatekeepers signed the checklist, project Kappa closed and mass production began.

7.5 Accounting within project Kappa

Every month throughout the development of project Kappa, the project manager and the project leader attended a meeting known as the active project global meeting within Beta. This regular meeting involved all the project leaders and the project managers of the active NPD projects in Beta, and the top management composed of senior managers of functional areas. During this meeting the status of the projects, with respect to the accounting performance of the new products in development, the status of the activities, the challenges of the projects and the project timelines, were discussed. This information was included within the project report (in Figure 7.2). The project report is the document that was updated monthly by the project manager and was discussed by the project leader during the active project global meetings. Focus is placed in this section on the analysis of the accounting performance of the new product Kappa, as reported within the updated project report, which consisted of a comparison of the current estimate of the product’s cost, made up from the estimates of materials and labour costs, with the targets set within the PDD. The accounting performance of product Kappa was indicated and accounted for by the project leader during the monthly active project global meetings.
At Beta, significant importance was placed on the accounting performance of the new products in development. “We need to fulfil the product’s cost target in order to make our innovations marketable and profitable” (Manager of Engineering). This explains why senior managers were really interested in understanding and asking detailed and specific information about the accounting performance of the new products during the *active projects global meetings*. In particular, besides launching an innovative product into the market, which fulfilled, at least, the technical requirements outlined on the PDD, Beta had to launch a product that fulfilled the expected accounting targets.

> Accounting practices [for the NPD process] involve estimating, controlling and monitoring the performance of the new product in development in accounting terms, and accounting for them [at the active project global meeting] ... These practices constitute an important activity throughout the development of new products” (Manager PMO).

To summarize, during project Kappa the accounting practices essentially consisted of periodical tracking of the performance of the new product in development through the use of accounting figures. In the remainder of this section, how accounting practices unfolded during project Kappa is illustrated. Particular focus is placed on how people in organizations made use of accounting practices (Ahrens and Chapman, 2007a, p.99; Ryan et al., 2002). These practices throughout the phases of project Kappa, the professionals involved, and their outcomes are synthesized and shown in Table 7.1.

**Table 7.1: Synthesis of the accounting practices, the professionals involved and the outcomes**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Accounting practices</th>
<th>Professionals</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>Definition of the product’s cost target (e.g. materials and labour costs)</td>
<td>Product manager (in collaboration with the Senior Manager of Marketing)</td>
<td>Targets for the materials and labour costs within the PDD</td>
</tr>
<tr>
<td></td>
<td>Rough analysis of the cost targets</td>
<td>Engineering staff and Senior Manager of Engineering</td>
<td>Request for change of the cost target within the PDD</td>
</tr>
<tr>
<td>Phase 2</td>
<td>Analysis of the feasibility of the product’s cost target</td>
<td>Project manager, Project Leader, Sourcing Manager, Manufacturing Engineer</td>
<td>Request for change of the product’s cost target and update of the PDD</td>
</tr>
<tr>
<td>Phase 3</td>
<td>Periodical tracking of the performance of the new product in development through the use of accounting measures (i.e. materials and labour cost estimates)</td>
<td>Project Manager, Project Leader, Sourcing Manager, Manufacturing Engineer</td>
<td>Update of the project report to be presented at the active project global meeting</td>
</tr>
<tr>
<td>---------</td>
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</tr>
<tr>
<td></td>
<td>Comparison of the cost of the new technologies with the traditional solutions</td>
<td>Project Manager, Project Leader</td>
<td>The new technologies are not expensive</td>
</tr>
<tr>
<td></td>
<td>Elaboration of the product’s cost- reduction plan</td>
<td>Project Manager, Project Leader</td>
<td>Plan of cost-reduction to be presented at the gate review meeting to go to the next phase</td>
</tr>
<tr>
<td></td>
<td>Accounting for the product’s cost estimate through the updated project report at the monthly active project global meeting</td>
<td>Project Leader and Project Manager</td>
<td>Discussion with the participating senior managers (how to improve the cost performance)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 4</th>
<th>Periodical tracking of the performance of the new product in development through the use of accounting measures (i.e. materials and labour cost estimates)</th>
<th>Project Manager, Project Leader, Sourcing Manager, Manufacturing Engineer</th>
<th>Update of the project report to be presented at the active project global meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Execution of the cost- reduction plan</td>
<td>Project Manager, Project Leader, Team</td>
<td>Estimate of a lower materials cost</td>
</tr>
<tr>
<td></td>
<td>Accounting for the product’s cost estimate through the updated project report at the monthly active project global meeting</td>
<td>Project Leader and Project Manager</td>
<td>Discussion with the participating senior managers (how to improve the cost performance)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 5</th>
<th>Final tracking of the performance of the new product in development through the use of accounting measures (i.e. materials and labour cost estimates)</th>
<th>Project Manager, Project Leader, Sourcing Manager, Manufacturing Engineer</th>
<th>Final update of the project report to be presented at the active project global meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elaboration of the product’s cost-reduction plan after the launch</td>
<td>Sourcing Manager and Manufacturing Engineer</td>
<td>Plan of cost-reduction to be presented at the gate review meeting for the closure of the project</td>
</tr>
<tr>
<td></td>
<td>Accounting for the product’s cost estimate through the updated project report at the monthly active project global meeting</td>
<td>Project Leader, Project manager</td>
<td>Discussion with the participating senior managers (how to improve the cost performance)</td>
</tr>
</tbody>
</table>
Phase 1 – Concept

In the Concept phase (phase 1) of the project, the gatekeepers analyzed the viability of the project by also verifying the achievability of the accounting targets and financial goals as outlined by the product manager within the PDD (see Section 7.4). The accounting targets reported included the BOM cost target, namely, the expected cost of the new product’s components (or materials), and the labour cost target. These two values were included in the calculation of the product’s cost. Moreover, with the expected selling price of the new product, the PDD also reported the expected gross margin. In analyzing the requirements of the PDD, when the senior manager of Engineering involved his staff (see Section 7.4), these individuals also analyzed the accounting targets established for the new product. In light of their previous experience as designers in Beta, the Engineering staff assessed the BOM target to be too challenging.

Additionally, there were also doubts about the achievability of the labour cost target. Even though the senior manager of Engineering reported these doubts, advanced by the Engineering staff to the senior manager of Marketing, the accounting targets within the PDD were not reviewed in this phase. Although the senior manager of Engineering did not completely accept the cost targets of the PDD, he signed the phase 1 checklist together with all the other gatekeepers. In light of the innovations that the project leader intended to introduce in product Kappa (see Section 7.4), a broad study was needed in terms of cost feasibility with respect to the targets stated in the PDD.

Phase 2 – Feasibility and Planning

In the phase of Feasibility and Planning (phase 2), the viability of the product’s cost targets as outlined within the PDD was studied in detail by the project manager in collaboration with the project leader, the sourcing manager, and the manufacturing engineer. After the feasibility study of the technical requirements of the PDD (see Section 7.4), the BOM (or materials) cost target analysis was carried out. The project manager managed to do so by requiring a preliminary list of the new product’s components, drafted by one of the two electronic designers on the team, in light of the preliminary decisions on the new product, as made by the designers, such as the project leader, the software and the mechanical designers. Subsequently, the preliminary
estimate of the cost of these components was produced involving the collaboration of the project manager, the project leader and the sourcing manager. They analyzed the list of the preliminary components and also noted the costs of the components that were already used in other products produced by Beta. New technologies and new components were also going to be introduced within Kappa. At this stage, the (cost) estimates of the new components, for developing the new technologies for Kappa, were based on the preliminary bids that the sourcing manager received from the first suppliers. Some tension between the sourcing manager and the project leader emerged. In particular, the sourcing manager complained about the continuous changes of the drawings of the new product’s components by the project leader. These components were becoming more complex than the drawings and specifications originally evaluated by the suppliers. As a result, the costs of some of the new components were likely to be higher than the costs reported within the last suppliers’ bids and those considered during the feasibility study in Phase 2. From the BOM analysis it resulted that the preliminary estimate of the materials cost in Phase 2 was higher than the target compiled in Phase 1. Therefore, the project manager, the project leader and the senior manager of Engineering decided to ask the marketing senior manager (the boss of the product manager) to increase the target of materials cost, otherwise the project could have been stopped (by the gatekeepers of Phase 2) because it did not fulfil the expected accounting targets. Finally, because of the new technologies that were intended to be introduced within Kappa, and on the basis of the feasibility study of Phase 2, the marketing senior manager and the product manager realised that the product’s cost target was probably too aggressive. So they increased the BOM cost target and updated the PDD accordingly (see Table 7.1). Afterwards, the project report was updated with new values (target and estimate).

During Phase 2, the project manager also had to verify the feasibility of the labour cost target, in collaboration with the project leader and the manufacturing engineer. In particular, the manufacturing engineer was in charge of producing the labour cost estimate, also in light of the preliminary design for manufacturing document that he prepared during the feasibility study of the technical requirements (see Section 7.4). Nevertheless, in this specific case, the manufacturing engineer was not ready to elaborate a precise estimate of the labour cost, as he did not possess “enough information which allow an estimation of the cost, nor the time needed to assemble
Kappa!” (Project Manager). Even though the labour cost analysis did not have accurate results, the Phase 2 checklist was signed and Phase 3 began.

**Phase 3 - Design**

During the Design phase (Phase 3), with the purpose of tracking the accounting performance of the product Kappa through accounting measures (BOM and labour costs), the project manager arranged periodic meetings with the project leader and the sourcing manager to study the status of the materials (or BOM) cost; and with the manufacturing engineer and the project leader to analyze the status of the labour cost (see also Table 7.1). The materials cost analysis in Phase 3 consisted of examining a document that reported the BOM of the product and the current cost of its materials. The BOM document used for project Kappa is illustrated in Figure 7.4. The sourcing manager updated the reported materials costs, depending on the last price negotiated with the suppliers. At the end of this analysis, when the estimate of the BOM cost was higher than expected, a recalculation was needed, consisting in reviewing the product’s components in order to reduce the costs. Additionally, in this circumstance, the sourcing manager was also required to further negotiate the prices of the components with the suppliers.

**Figure 7.4:** The document used to analyze the materials cost of the new product Kappa

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>MATERIAL TYPE</th>
<th>SUPPLIER</th>
<th>COST</th>
<th>SUPPLIER</th>
<th>COST</th>
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<tbody>
<tr>
<td>xxx</td>
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</table>

Source: Internal Company Documents (adapted)

In Phase 3, the BOM cost analysis was more detailed because the electronic engineer had already “populated” the BOM document with most of the components that were supposed to be used for Kappa. Moreover, the specifications and the drawings of the new components were more accurate by this phase; therefore, their costs were expected to be more accurate as well. Furthermore, at this stage of the project, the manufacturing
engineer, having been provided with prototypes of Kappa, had studied their process of production and was able to make an analysis and estimate of the labour costs.

As mentioned in Section 7.4, when the first prototypes were available in Phase 3, evidence was gathered by the manufacturing engineer who commented that the project leader should have changed the placement of some components within Kappa’s layout in order to facilitate the assembly procedures of the manufacturing technicians and reduce the labour cost (which had to be reported within the project report). Also, the manufacturing engineer suggested building a box within the mechanics of Kappa in order to better arrange the placement of some components. This suggestion was first analyzed and then accepted by the project leader and other members of the team and the product’s drawings were amended accordingly.

When the prototype’s second version was produced, the sourcing manager asked the project leader to change the new mechanical technology which characterized the prototype of Kappa with the mechanical technology currently used in Beta, and which was already consolidated in the other products produced at Beta. According to the sourcing manager the new technology implemented was complex to be managed as it “requires the cooperation of the suppliers and a new tooling for the production of the mechanical parts” (Manager of Engineering). Furthermore it was expensive, increasing the materials cost within the project report (in Figure 7.2). Nonetheless, the project leader was convinced that this new technology for the mechanics would save money in terms of both materials and labour cost. To demonstrate this, once the prototype of Kappa with the new mechanical solution was assembled, the project leader, in collaboration with the mechanical designer, the manufacturing engineer and the project manager, compared the cost of the new solution for the mechanics with that being adopted for a similar product to Kappa (and which was proposed by the sourcing manager), which could be considered the previous generation of Kappa. From this analysis it emerged that:

“the two mechanical solutions are comparable in terms of materials cost. As concerns the labour cost, the estimate of the labour cost with the new solution is lower than the labour cost from the previous generation of Kappa” (Project Leader).
The discussions between the project leader, the sourcing manager, the manufacturing engineer, which reflected their different interests as well as the tensions between them regarding the adoption of the new mechanics Kappa, are shown in the illustration in Figure 7.5. As illustrated in Figure 7.5, the discussions led to reinforcing the intention of the project leader to use the new mechanics. This occurred because the practices undertaken for analyzing the cost performance of the new technology revealed an acceptable cost for this new technology.

**Figure 7.5:** Mapping of the emerging tensions and discussions concerning the adoption of the innovative mechanics for the new product Kappa

When the third prototype of product Kappa was available, the sourcing manager and the quality engineer made a request to the project leader for a change of the new system for the closure of a mechanical element of Kappa. The way that this system was conceived of by the project leader (supported by the mechanical designer) “requires the shipment from its manufacturer to the mechanical supplier, who would assemble it within the mechanical box by employing a special technology using glue” (Project Leader). The
sourcing manager did not agree with the project leader about this solution, “which entails higher cost than that incurred if the system is assembled within the mechanical box in-house” (Project Manager). The quality engineer also disagreed with the project leader (and the mechanical designer). Both the sourcing manager and the quality engineer were interested in managing and assembling the system in-house. On the other hand, the manufacturing engineer did not disagree with the proposal of the project leader concerning the assembly of the system at the mechanical supplier. As concerns the proposals of the sourcing manager and the quality engineer, the manufacturing engineer wanted to make clear that if this system had to be assembled in-house, the technology of the new system using glue should have been changed because it was not possible to wait until the glue dried on the production line, leading to higher costs. The emerging tensions and discussions about this matter are synthesized in the illustration in Figure 7.6.

**Figure 7.6:** Mapping of the emerging tensions and discussions concerning the adoption of the new system for the closure of a mechanical element of Kappa

The discussions between the project leader, the sourcing manager, the quality engineer reflected their different interests as well as the tensions between them regarding the new
system for the closure of a mechanical element of Kappa. As illustrated in Figure 7.6, the discussions led the project leader to conceive of a new system for the closure of the mechanical element of Kappa. This occurred because the practices undertaken for analyzing the cost performance of the new technology did not reveal an acceptable cost. The new solution conceived was less expensive than the technology proposed by the project leader. Also, it was assembled in-house.

From the last monthly meetings of Phase 3, the product’s labour cost estimated by the manufacturing engineer was only a rough estimate. Concerning the materials cost, this was still off target, even with some improvements. The project leader and the project manager prepared a cost-reduction plan (see Table 7.1), to be discussed in the following phase, with the aim of further reducing the materials cost and, possibly, although the labour cost estimates were still rough, reducing the time needed to assemble the product. The gatekeepers, having analyzed the cost-reduction plan, decided to close Phase 3 since they appreciated the progress that the project leader and the project manager were making in addressing the cost issue.

**Phase 4 – Qualification**

The Qualification phase (Phase 4) got started despite the cost issues above. Meanwhile, the project team and the project manager had to continue collaborating and making progress on executing the cost-reduction plan. As the BOM was almost complete, the sourcing manager concentrated on negotiating the prices with the suppliers in order to lower the costs and be in line with the quotes reported in the reduction plan. The project leader made some changes in the placement of some components and also in the materials in order to reduce the product’s cost. The project manager ensured that the cost-reduction plan was executed.

**Phase 5 – Pre-production**

In Phase 5, the final estimate of the product’s cost was prepared by the project manager. The product’s cost was revealed to be higher than the target, although not significantly for the gatekeepers who decided to close this project despite the cost issues. They deemed that these issues could be ignored since “it has been verified that the staff involved in the project Kappa has done their best to fulfil the cost constraints, therefore, they can be now relaxed” (Project Manager). Moreover, the lack of fulfilment of the
cost target could also (probably) be due to having no previous experience with the new technologies that were being introduced and approved (by senior managers) during project Kappa.

7.6 Accounting by engineers during the new product development

From the previous sections, it is clear that multiple and heterogeneous individuals from the NPD team dealt with the accounting for the new product throughout project Kappa. In particular, the product manager, who was professionally qualified as an electronic engineer and had responsibility for Marketing, managed accounting for the new product Kappa. Besides dealing with marketing activities, including the market analyses, the marketing campaigns, the launch plans and the organization of exhibitions, he also dealt with accounting. He managed to do so by calculating and outlining the accounting goals expected for the new product within the PDD. He examined in detail the product’s cost target, estimating the materials cost as well as calculating the expected labour cost. Subsequently, as the NPD process unfolded, he was interested in questioning the project manager about the cost of the new product.

The project manager, who was responsible for the NPD process of project Kappa, was an electronic engineer who dealt with accounting. In particular, he was in charge of tracking and reporting the accounting performance of the new product. He prepared and updated the periodical project report (Figure 7.2). Other than being in charge of activating, coordinating, and monitoring the processes, the activities and the tasks that the team had to carry out in order to achieve the objectives of project Kappa (in terms of cost, technical functionality, and time), he had to organize the meetings, encourage the coordination and the collaboration of the engineers in order to become aware of and monitor the accounting performance of the new product. Furthermore, when accounting issues occurred, namely when the estimated product’s cost was higher than the target, he enabled the actions and the tasks by organizing further meetings and more detailed collaborations, in order to work out a solution for the emerging problem.

The project leader, who was responsible for the innovativeness, the technical choices and functionality of the new product, was an electronic engineer. He also practiced accounting during project Kappa. Besides dealing with his ‘specific domain’ of technical activities, such as striving to design and develop an innovative and functioning
new product, designing its electronic layout and coordinating the team during the technical design and development activities, he also contributed to producing the estimates of the product’s cost during the multidisciplinary meetings and collaborations for both labour and materials cost estimates. He worked – with the project manager – on preparing the cost-reduction plan (see Section 7.5 and Table 7.1) by getting into the details of the accounting measures. The manufacturing engineer, who possessed a technical diploma, also dealt with accounting by producing labour cost estimates, in addition to dealing with the design for manufacturing document, the assembly procedures of the products and the design of the packaging.

During the unfolding of project Kappa, these engineers managed the accounting data without having any accounting education. They did not limit themselves to simply verifying whether the product in development fulfilled the cost targets. As stated by the project manager:

“Both alone in our offices or laboratories and during the meetings arranged to update the product’s cost, we deal with the accounting measures for the new product’s cost performance by calculating the estimates of the cost, preparing documents detailing cost analyses for both material and labour cost reduction. This happened, for instance, during the analysis of the innovative mechanical technology” (Project Manager).

These engineers dealt with accounting by also drawing upon their past experience and the knowledge acquired during previous NPD processes that they had participated in and the accounting analyses of the new products in development that were conducted during these earlier projects. As stated by the Manager of Engineering:

“The experience in other projects contributed to build knowledge on the dynamics within the NPD processes as well as the accounting implications of certain decisions on the new product ... This made us able to estimate the cost of the new product without involving, for instance, the management accountant” (Manager of Engineering).

The empirical evidence collected demonstrated that the management accountant did not have a clear role or intervene during NPD. The management accountant was not accountable for controlling costs and neither did he report on the accounting
performance of the new product during its development. There was no dialogue between the project manager and the management accountant during the NPD of Kappa; nor between the management accountant and the other individuals involved in the NPD processes concerning accounting for Kappa. “The management accountant did not play a role during project Kappa and generally during any of the NPD process” (Manager of Operations).

When this absence was clarified by the management accountant, he stated the following:

“The accounting function does not participate in the NPD processes at Beta. We do not practice accounting and control for any of the new products in development here. Rather, the management accountant is almost totally involved in accounting, financial, and invoicing activities that concern the organization as a whole” (Management Accountant).

The role of the management accountant was more distant than integral to the NPD process. “The accounting function is a service on demand to those involved in the NPD processes” (Management Accountant). The management accountant was never involved during specific NPD processes, but were there to be asked some questions often without knowing or needing to know the project that the questions were about. More specifically, it sometimes happened that the product manager, when he was defining the accounting targets to include within the PDD, asked the management accountant for some cost information quickly without even informing the management accountant about the new product that the question referred to. As stated by the management accountant:

“The product manager called my office and asked information on the costs of some products...He asked questions such as: Can you tell me the cost of the product [...]? ... Can you tell me the cost of the BOM of the product [...]?” (Management Accountant).

Also, the project leaders and the project managers, while carrying out accounting analyses for a new product, sometimes asked the management accountant questions, such as what was the actual current BOM cost of an existing product, as happened when the project manager and the project leader of project Kappa wanted to compare the cost
of the mechanics for the new product Kappa with a previous generation product (see Section 7.5; see Figure 7.5). Again, this happened without the project leader and manager specifying the details of the analyses they were carrying out or the new product they were managing. With few exceptions, the management accountants at Beta were seldom familiar with the new products in development. They generally became familiar with a new product only at the end of the NPD project, once the product was launched into the market and started being commercialized. Then the accounting function began dealing with the new product and its specific domain of activities in relation to production and commercialization.

7.7 The unfolding of innovation for Kappa

This section illustrates the empirical material regarding how the process for innovation of Kappa unfolded, i.e. the process which resulted in the materialization of innovation within the new product Kappa. Beta is a company that is committed to innovation:

“Beta employs many engineers within the research and development department. These engineers like being innovative, challenging and stimulating their creativity, with the purpose of always designing and releasing more innovative products” (Manager of Operations).

The need for innovation inhabits the culture of Beta:

“When a NPD project is set up, we [the project leader, the project manager, the team members] are all aware that we are in charge of building innovations and new technologies for the market” (Project Manager).

When the project leader of Kappa, who is responsible for the innovativeness and the technical performance of the new product, was asked about what innovation is, he answered as follows:

“Innovation is the result of the NPD process ... it is what emerges from striving to fulfil the objectives and the constraints of the NPD project [in terms of cost, functional requirements, and time] ... innovation stems from the collaboration within a heterogeneous team ... it stems from the tensions within the team ... innovation begins with my desire to create something I consider new, innovative, and technologically valuable” (Project Leader).
During project Kappa, its NPD process was sustained by the innovative ideas for Kappa as conceived of by the project leader. Specifically, these ideas encompassed innovative technologies the project leader desired to develop within the new product. The desire for innovation and its realisation has been identified here as one of the relevant passions (Akrich et al., 2002b) that underpinned the process for innovation – as emphasized by the project leader in the quote above. Moving from the description of project Kappa in Section 7.4, and having examined the role of accounting as part of project Kappa in Sections 7.5 and 7.6, the purpose here is to describe the empirical process for innovation throughout the phases of project Kappa.

**Phase 1 – Concept**

In phase 1 of project Kappa, the unfolding of the process for innovation began from the PDD, which was prepared by the product manager. The preliminary version of the PDD partially described the new product Kappa. The recommendation to develop innovative technologies for Kappa in line with specific requirements (see Section 7.4), as outlined within the PDD, constituted a challenge for the project leader, who started conceiving of innovation ideas to be featured in the new product.

**Phase 2 – Feasibility and Planning**

At the beginning of Phase 2, the PDD was the source of inspiration for the project leader to conceive of his creative ideas for the new product to develop. The project leader enriched the requirements of the PDD with innovative technologies, stemming from his desires for innovation, “adding to product Kappa innovative features that fulfilled both the requirements in the PDD and, at the same time, made product Kappa an innovative product developed by Beta” (Project Leader).

As stated by the manager of Engineering:

“The project leader spends a great deal of time conceiving the innovative technologies for the new product. He focuses more on the technical features that are missing in the PDD and that can make Kappa a valuable innovation (Manager of Engineering).”
Also, the project manager stated as follows:

“During phase 2, I had to stop the project leader many times in his study of innovation for Kappa since he would not have stopped figuring out new technologies for the new product to be added to those [already] in the PDD” (Project Manager).

In doing so, the project leader thought of multiple ways for developing Kappa, desiring to introduce new mechanics based on an innovative technology, a new system for the closure of a mechanical element of Kappa, and a new cover defining a new aesthetical design for Kappa, with a new handle. Moreover, “the project leader worked overtime. He changed and re-changed again and again the features and components in his drawings of Kappa with the purpose of fulfilling his desire for innovation” (Project Manager).

Even though the project leader was responsible for the innovation and the technical performance of Kappa, he was not the only person in charge of developing it. The team members were in charge of executing the NPD activities. During the feasibility study, the project leader needed to interface with the team and draw on their heterogeneous know-how, in order to analyze the product under development in detail from the perspectives of the various organizational functions, so as to assess the viability of his desires and intentions for innovation. From the beginning of Phase 2, the project leader produced his sketches and drawings of the design and development of Kappa. During the feasibility study, the project leader, with his ideas, desires, beliefs and aspirations, started facing up to the different constraints and interests regarding the development of project Kappa. In these occasions, the idea of the new product, as conceived of by (the desires and intentions of) the project leader, was analyzed and challenged or agreed, depending on the interests of the other staff involved in the team and who intervened to further develop Kappa. Further three examples are offered here. The sourcing manager asked the project leader and the mechanical designer to exclude a special technology designed for the cover of the mechanics and some details of the new handle in the mechanical drawing of the new product. This solution was expensive and the BOM cost (Figure 7.4) would have shown higher cost figures (than the target) and resulted in a red traffic light within the project report (Figure 7.2). The quality engineer denounced the possible quality issues related to the sophisticated mechanical cover whose quality
checks would have taken a long time to carry out at a higher cost, thus impacting on the performance reported within the project report and represented by a red traffic light. The manufacturing engineer suggested changing the positioning of some electronic components in the layout in order to facilitate the assembly process, thus reducing the labour time and the cost of the new product as reported in the project report.

The feasibility study of the new product Kappa was carried out via a series of discussions between the project leader and the other Kappa NPD team members who represented and defended the interests of their functions, regarding the development of Kappa, which were at times at odds with the desires and intentions for innovation of the project leader. During these discussions, the staff often dealt with the cost impacts of the innovative technologies conceived of by the project leader. The feasibility report created at the end of this phase had become a new evolved version describing the new product Kappa.

**Phase 3 – Design**

During Phase 3, as mentioned in Section 7.4, three consecutive versions of Kappa prototypes were developed. In a sense, these prototypes gradually and tangibly demonstrated how the innovation process for the development of Kappa was evolving. “The project leader is never fully happy with the prototypes of Kappa and he continues improving the last prototype by adding new things which can make it perfect” (Project Manager). The project leader assessed the prototype “as having something lacking, where a new feature could be always added” (Manager of Operations). In Section 7.5 an account was given of two empirical examples (see Figures 7.5 and 7.6) that demonstrated how the encounter between the desires and the intentions for innovation of the project leader (on the adoption of the new technology for the mechanics – see Figure 7.5 and of the new system for the closure of a mechanical element of Kappa – see Figure 7.6), with the other staff involved within project Kappa, such as the sourcing manager, the manufacturing engineer and the quality engineer, engaged “tensions” (project leader) between them in which everybody could challenge the interests of the others. The discussions led to further reflections, which sustained the project’s leader intention – in the case of the new mechanical solution, or change the technology adopted – in the case of the new system for the closure of a mechanical element of Kappa, and which led to improve the current work in progress or prototype of Kappa
**Phase 4 – Qualification and Phase 5 – Pre-production**

Once Kappa was qualified (in Phase 4), the process for innovation concluded with the pre-production and then mass-production of the new product Kappa. Even though the checklists of Phase 5 were signed off by the gatekeepers, the project leader was not “happy with Kappa. He would have continued improving the last prototype of Kappa, adding new technologies which would have made it ‘the innovation’” (Project Manager).

In conclusion, during project Kappa, the project leader and his ideal of innovation had to confront and engage with the multiple interests, regarding the development of Kappa, of the staff involved in the NPD process. The emerging tensions between the desires of the project leader and other interests and concerns of other professionals involved in project Kappa led to discussions, questionings, reflections, and debates among the organizational staff involved, which gradually transformed and evolved into work in progress and prototypes of product Kappa: the PDD (at the end of Phase 1), the multidisciplinary documents of the feasibility report (in Phase 2), the multiple versions of the product’s prototype (in Phase 3), developed further into the new product (between Phase 4 and Phase 5) – see Figure 7.7.

**Figure 7.7:** The unfolding work in progress and prototypes throughout the process of innovation during project Kappa
These artefacts all represented the evolution of the innovation and, according to the project leader, the incomplete and unfinished forms that were to be further developed. From this analysis, it emerges that a process of innovation which relied only on the project leader’s desires for innovation would have unfolded indefinitely. However, these desires, after being transformed into a series of activities carried out by the team (to meet the requirements of the PDD), and after facing up to the interests of the staff involved in the process, prevented this process from going on indefinitely. Instead, the constraints of the process as articulated in the accounting requirement helped to engage others in discussion and decision making and resulted in the creation of a new product that was satisfactory in terms of both the technical requirements and the accounting performance, as outlined within the PDD.

7.8 The relationship between accounting and innovation during project Kappa

As illustrated in Section 7.5, accounting was recurrently practiced at Beta as it allowed the project manager, the project leader and the project Kappa team to produce information that revealed the impacts of the creative ideas of the project leader on the accounting performance of the new product in development. In particular, accounting translated the creativity, i.e. the ideas reflecting the desires of the project leader concerning aspects such as the “choice of the product’s components, the arrangement of its internal layout, the material technologies to adopt and the functionalities to implement” (Manager of Engineering) in terms of the cost of the new product. Throughout project Kappa, the impacts of creativity on the cost performance of the new product were periodically identified and analyzed during the meetings and collaborations between the project manager, the project leader, the sourcing manager, the manufacturing engineer, in which the cost of the new product in development (materials and labour costs) was estimated and compared with the target (see Table 7.1). The accounting figures produced during these meetings were inscribed within the project report, the document that illustrated the status of project Kappa to the gatekeepers at the end of each phase and to senior managers during the monthly active project global meetings.

Even though the status of the product’s cost performance was updated monthly in the project report, it was observed that accounting practices, analyses and discussions of the
impacts of creativity on the cost performance of the new product occurred nearly every day.

“The project leader and the team are constantly stimulated by me to think about the effects of their choices on the cost performance of the product Kappa. This happens because the accounting performance of the new product is assessed by the gatekeepers at the end of each phase, through the analysis of the updated project report, in order to determine the closure of that phase and the beginning of the next” (Project Manager).

However, it is also worth noting that during project Kappa it sometimes happened that the cost issues (i.e. product’s cost estimate being higher than the target) were neglected at the gate review in order not to spend too much time on the analysis of the cost performance, in order not to miss the opportunity to launch the innovation on the market soon. This happened at the end of Phase 3 and at the end of Phase 5. Even so, the project leader did not want the project to be undermined by accounting. The project leader never wanted the process towards his desired innovation hindered because of poor accounting performance. This need to meet the cost target could induce a limit to the creativity for innovation, as it was likely to restrict the choice of the product’s components, the arrangement of its internal layout, the technologies that were to be adopted, and the functionalities to be implemented in favour of a lower cost. Nonetheless, as stated by the project leader:

“During project Kappa, when cost issues [namely the product’s cost estimates were higher than the target] occurred, the actions I conducted to avoid or address these issues and to fulfil the cost target resulted in further stimulating and enhancing my creativity for innovation ...also, the meetings and the actions aimed at addressing the accounting issues, by investigating how to decrease the cost impacts of the choices and ideas for innovation, led to discover alternative and interesting ideas that were not considered before ... These ideas even enhanced the innovation I intended to develop during the NPD process” (Project Leader).

The accounting constraints could jeopardize what was conceived of for the new product until then, such as the creative ideas of the project leader, the ideal of innovation as desired by the project leader, the work in progress and the prototypes developed up to
that point. The actions undertaken by the project leader and the team for addressing the issues often put back into play everything that was assumed until then. They focused the team on searching for alternatives and less expensive solutions by:

“changing materials, looking for alternative components or suppliers; by reviewing the internal layout, looking for an easier procedure of assembly which would have required less time, in terms of manpower and machine; reviewing the technologies to adopt, in order to find a solution to reduce cost” (Project Manager).

While the project leader and the team collaborated in carrying out these actions, and even though, in doing so, they were mainly dealing with accounting analyses and managed cost figures, it was realised:

“how these accounting actions also offered an occasion to further reflect on and study in detail the technical features of the work in progress of the new product as developed up to that point ... in these circumstances, the active stimulation of creativity led to the discovery of technical solutions that enhanced the work in progress during the process of pursuing innovation” (Project Leader).

To summarize, if accounting constraints initially appeared to jeopardise the work in progress of Kappa and limit the creativity for its featuring innovation, this limitation has been converted into an opportunity to enhance the development of innovation. Furthermore, the project leader of Kappa highlighted the importance of a periodic analysis of the accounting performance of the new product in development, not only for determining, controlling, monitoring and reporting the financial and accounting performance and results; but above all, it allowed for a broader and more detailed understanding of the ongoing process for innovation as well as its challenges and new possibilities.

7.9 Chapter Summary
The material collected within the empirical case of Beta describes the empirical accounting and innovation practices that unfolded during the development of the new product Kappa. From the beginning of project Kappa, the accounting performance of the new product in development was continuously monitored by the project manager by facilitating accounting practices in order to update the project report. The accounting
performance was analyzed in light of the cost targets defined by the product manager within the PDD from Phase 2 of the project. The results of this analysis were periodically (monthly) reported to the senior managers of Beta during the so-called active project global meetings. The accounting performance of the new product was also verified by the gatekeepers at the end of each phase of the NPD process. In practice, the accounting performance of Kappa was analyzed through the use of the following accounting measures: labour and materials costs, which were periodically estimated and compared with their targets and updated within the project report. This occurred during the meetings that the project manager organized periodically, generally monthly. In particular, the project leader and the sourcing manager were involved in the estimation of the materials costs, while the project leader and the manufacturing engineer were expected to participate in the meetings for the estimation and analysis of the labour cost.

The individuals involved in the NPD processes in Beta were the project manager, the project leader and the experts inside and outside (such as the gatekeepers and the sourcing manager) the team. The project manager was in charge of coordinating and managing the NPD process by leading the team to work in line with the objectives of the project, in terms of cost, technical functionality, time-to-market, and the other requirements in the PDD. The project team executed the activities and the tasks for developing the new product Kappa. The project leader was responsible for the innovativeness and the technical performance of the new product. The project leader participated in, coordinated, and supervised the ‘technical’ activities to be carried out, constantly striving to realise the innovative technologies he conceived of for Kappa. Still building on the material collected within the case, the empirical process for innovation as featured in the new product and observed within the context of project Kappa at Beta is articulated as an unfolding of work in progress and prototypes that led to the creation of a new product, i.e. Kappa, which did not entirely fully fulfil the desires and the intentions for innovation of the project leader. However, it has also been demonstrated that the need to fulfil the cost targets led to discussions and tensions among the project leader and other staff that resulted in stimulating creativity for innovation. Moving on from the material described in this chapter and building on further empirical material that is considered to be helpful, the answers to the research questions are articulated in detail in Chapter 4.
Chapter Eight

Findings 2 - How Accounting engages with Innovation

8.1 Introduction
In the last section of Chapter 7, it was illustrated how accounting, even though it may initially appear to constrain the development of innovation for Kappa, in fact stimulates creativity and facilitates innovation for the new product Kappa. In this chapter studies and literature outlined previously in Chapter 3, which: review the balance between firmness/control and flexibility/creativity within product innovation processes (see Chapter 3, Section 3.6); review the role of accounting within processes of mediation among different interests and concerns (see Chapter 3, Section 3.7); review processes of hybridization of expertise (see Chapter 3, Section 3.8), are relied upon here to interpret and frame the contribution of the empirical material. The present chapter provides the answers to the three research questions formulated in Chapter 4, Section 4.4. Therefore, the aim here is to illustrate and explain, from an analysis and interpretation of the empirical material gathered, how accounting engages with innovation. Focus is placed on how accounting engages with the multiple interests, purposes and concerns characterizing processes of innovation, and its underpinning rationale, including the desires, intentions, and motivations for innovation (see Chapter 2, Section 2.6).

As explained in Chapter 4, firmness and flexibility, mediation and hybridization characterize processes of innovation and NPD. They entail different dimensions of and purposes for innovation (firmness and flexibility), the participation of multiple actors from different domains, featured by different interests and concerns (to be mediated), and also by actors with different expertise (who can hybridize their expertise with accounting). It is shown here how the interaction of the interests and concerns at stake in the NPD process can generate tensions within the rationale for innovation by drawing on accounting information and in so doing they have the potential to facilitate the process of innovation.

This chapter is organized as follows. First, Section 8.2 answers the first research question: how does accounting engage with firmness and flexibility in processes of innovation in new product development? It explains how accounting engages with the
process of innovation involving project Kappa (i.e. the process from which innovation materialized featuring in the new product) through firmness and flexibility (see, among others, Kamoche and Cunha, 2001; Chapter 3, Section 3.6). Next, Section 8.3 answers the second research question: how does accounting engage with the rationale for innovation through processes of mediation? It illustrates how accounting engages with the process of innovation by facilitating mediation (see, among others, Miller and O’Leary, 2007; Chapter 3, Section 3.7) among the professionals involved in project Kappa. Then Section 8.4 answers the third research question: how does accounting engage with the rationale for innovation through processes of hybridization? It analyses how accounting engages with the process of innovation through processes of hybridization of expertise (see, among others, Miller et al., 2008; Chapter 3, Section 3.8) within project Kappa. Finally, Section 8.5 summarizes the key points of this chapter.

8.2 Research Question 1: How does accounting engage with firmness and flexibility in processes of innovation in new product development?

The NPD process in Beta was structured around five phases: Concept, Feasibility and Planning, Design, Qualification, and Pre-production (see Chapter 7, Sections 7.3 and 7.4). The organization of the NPD process in Beta reflects the stage-gate system (Cooper, 1990; 1996 – see Chapter 2, Section 2.5, for a review of this system). The stage-gate system is a process management tool, a roadmap or a template, which introduces a “gating mechanism, featuring a series of rigorous go/kill decision points or “gates” throughout the process” (Cooper, 1996, p. 471). During project Kappa, the passage from each stage to the next was checked and monitored through the phase checklists, namely, the lists of mandatory deliverables in terms of tasks to be accomplished or documents to be prepared. In particular, members of senior management, who function as a team of gatekeepers, were in charge of tracking and verifying that the deliverables were accomplished at each phase review, and also that the cost, technical functionality and time performance (Atkinson, 1999) of the new product were in line with the targets, prior to approving the closure of the current stage and the beginning of the next.

The stage-gate process for project Kappa (see Chapter 7, Sections 7.3 and 7.4 for a more in-depth review of this empirical process at Beta) reflects a firm process, structured
around predetermined stages, each having a specific procedure to follow (the formalised NPD process – illustrated in Figure 7.1), rules to comply with (fulfilment of cost, time, technical requirements targets on the PDD and checklists to be signed), a predetermined report to be produced and updated (the project report – see Figure 7.2), as well as fixed periodic meetings to be arranged (design review meetings in Phase 3 and monthly active project global meetings). These fixed and firm arrangements of the NPD process were considered to be important for the success of the NPD process since they provided fixed points of structured review of its performance, in terms of time, cost, technical functionality of the new product. However, too much attention placed on formal processes and structures can reduce the uncertainties and discourage the flexibility and the creativity that contexts of innovation both entail and need in order to provide opportunities for innovation (Kamoche and Cunha, 2001). In the remainder of this section, it is demonstrated how this formal process (Tatikonda and Rosenthal, 2000; Kamoche and Cunha, 2001), in particular the firmness of its accounting constraints, namely, the cost targets on the PDD and the predetermined review meetings, contributed to making the NPD process of project Kappa more flexible. This was made possible by adapting to changing situations and new opportunities as they arose (Abernethy and Lillis, 1995) and, moreover, by engaging with the rationale for innovation (desires, intentions and motivations underpinned by the multiple purposes and ends for innovation) in order to facilitate the unfolding of the process of innovation that characterised project Kappa. Therefore, this study aims to provide the answer to the first research question, as follows: how does accounting engage with firmness and flexibility in processes of innovation in new product development?

During project Kappa, the desires and the intentions of the project leader to adopt the new technologies for Kappa inspired questions from the other individuals involved in the project who were moved by different interests regarding the development of Kappa (see Chapter 7). The questioning and interactions caused further discussions between the project leader and other staff on the team, who were moved by their motivation to fulfil their functional interests since they were in charge of developing the new product Kappa. The staff often drew upon accounting figures and the failure to meet the cost target of the new product (a firm constraint of the NPD process) in order to challenge the unfolding innovation and stimulate further and different ideas for the new product. This happened, for instance, in Phase 2 of project Kappa, when the manufacturing
engineer, quality engineer, the sourcing manager suggested amendments to the positioning of some components and to the cover of Kappa (see Chapter 7, Sections 7.4 and 7.7) and in Phase 3, when the first prototype of Kappa became available.

At times the desires and intentions of the project leader and the motivations of other staff (such as the sourcing manager) were revealed to be “in-tension” (Busco and Quattrone, 2016) and this led to discussions which resulted in the reinforcement of innovation objectives as intended by the project leader. This happened in Phase 3, when the second version of the prototype became available (see Figure 7.5; see also Chapter 7, Section 7.5). In other instances outlined in detail in the previous chapter, the tensions (e.g. between the project leader and the sourcing manager and the quality engineer) resulted in additional opportunities for thinking of better technologies to adopt for the new product, and made the process for innovation flexible to change. This happened in Phase 3, when the third version of the prototype was available (Figure 7.6, see also Chapter 7, Section 7.5).

In acknowledgement of the firmness of the cost targets of the NPD project and the resultant tensions among the various interests that resulted, it emerged that the firmness (Kamoche and Cunha, 2001) of the accounting constraints within the NPD process led the individuals involved in the NPD team to think flexibly (Kamoche and Cunha, 2001) about solutions for the new product in development. This enabled and at times enhanced the innovation featured in the new product Kappa. Furthermore, as observed in Chapter 7, Section 7.8, during project Kappa the project leader “absorbed” (Kamoche and Cunha, 2001) the accounting targets of the NPD process within his changing desires and intentions, without considering them as actually constraining innovation. Consequently, the accounting targets induced the project leader to further discover, in greater detail, the technical aspects, challenges, alternatives and potentialities for innovation. Furthermore, the other individuals involved used accounting targets to support and defend their functional concerns and interests (see Chapter 7, Section 7.5) for further developing and advancing Kappa. During project Kappa, the accounting targets were seen as an opportunity for innovation as they stimulated the project leader’s creative ideas and generated tensions with other staff, which facilitated discussions that also led to new possibilities for innovation. This, in turn, facilitated creativity, a prerequisite for innovation. Furthermore, practicing accounting to fulfil the firmness of the cost targets
allowed the project leader to avoid the error of pursuing too many creative ideas, stemming from his desires for innovation, which could have lead led him to neglecting the feasibility of Kappa and ultimately may have undermined the commercialization of Kappa, if the cost targets of the product had not been respected (Busco et al., 2012; Davila and Ditillo, 2013).

So, **how does accounting engage with firmness and flexibility in processes of innovation in new product development?** To conclude, the answer to the first research question is articulated as follows. At Beta, accounting practices allowed the individuals involved in the NPD process to sustain and move forward, in a flexibly way, with the unfolding of the NPD process. This facilitation was given by accounting practices which provided constraints, which both facilitated making choices and allowed individuals and the team to adapt to the changing situation and new opportunities for innovation as they arose (Abernethy and Lillis, 1995). This happened through the firmness of project Kappa, specifically through the accounting constraints that stimulated the rationale for innovation, i.e. the desires, intentions and motivations for innovation that were at stake, by establishing the challenges in the form of cost over runs which created tensions among the team. Underpinning these challenges and tensions were accounting practices which revealed and flexibly triggered new possibilities for innovation. At Beta it became evident that both firmness and flexibility stemmed from accounting practices and accounting information inscribed in project reports. The new opportunities for innovation featured in product Kappa were discussed in cross-disciplinary collaboration (Nicolini et al., 2012) among the actors involved (each with their desires, intentions, and motivations for innovation). In these spaces the flexibility for innovation was triggered by the firmness of the cost targets.

### 8.3 Research Question 2: How does accounting engage with the rationale for innovation through processes of mediation?

As discussed in Chapter 7, Section 7.5, during project Kappa accounting practices consisted of estimating and analyzing the accounting performance of the new product in development, in light of the cost target defined within the PDD, as well as accounting for these costs to senior managers at the pre-defined review meetings. These practices involved the project manager, the project leader, and the sourcing manager for the materials cost, and the manufacturing engineer, the project leader, and the project
manager for the labour cost (see Chapter 7, section 7.5, see also Table 7.1). The discussions and collaborations on the accounting performance of Kappa resulted in the emergence of the multiple interests and concerns at stake for project Kappa, involving both the staff in charge of the accounting practices (non-accountants), as well as other staff within the team of project Kappa.

In the next subsections, building on the two empirical instances illustrated in Chapter 7, Section 7.5 (see also Figures 7.5 and 7.6), how the multiple interests, concerns and purposes at stake during project Kappa caused tensions among the desires, the intentions, and the motivations of the participating actors is explained. The study of how accounting mediated among the multiple interests, concerns and purposes at stake, regarding the unfolding of project Kappa, facilitates understanding of how accounting engaged with the rationale for innovation during the project and, consequently, how accounting facilitated the unfolding of the process for innovation. The analysis conducted in the next subsections leads to the answer of the second research question: **how does accounting engage with the rationale for innovation through processes of mediation?**

### 8.3.1 How the mediation of accounting supported the desires and the intentions for innovation

In the first periodical meeting for the estimate of the materials cost of product Kappa in Phase 2, the sourcing manager expressed his disagreement with the project leader’s intention to adopt the new mechanics for product Kappa. During this meeting, the project leader responded by emphasizing that the new mechanical solution for product Kappa would have generated significant advantages in the mechanical performance and, more importantly, for the entire functionality of the new product as well. In Phase 3, when the prototype for Kappa was available with the new mechanics (see Chapter 7, Section 7.5), the sourcing manager emphasized his interest in adopting the traditional technology for the mechanics of Kappa, which was a solution that had already been consolidated within the other products at Beta. The new technology was complex and would have required the cooperation of the suppliers. In challenging the intentions of the project leader with respect to innovation, the sourcing manager referred to accounting figures that were based on the suppliers’ quotations, showing how the adoption of the new mechanics was expensive. In doing so, the sourcing manager
stimulated the project leader to re-examine the innovation. This involved him carrying out a further, in-depth study of the new mechanical technology he intended to adopt since he was motivated by the desire for that innovative technology for Kappa. The project leader performed an in-depth analysis of the accounting impacts of the new mechanical technology in order to contest and respond to the accounting figures presented by the sourcing manager and reported within the BOM cost document (see Figure 7.4). By relying on the support of the mechanical designer and the manufacturing engineer, who had interests that were in line with the intentions of the project leader and who were also interested in this new mechanical solution, the project leader “defended” (project manager) his intention by relying on accounting practices (see Figure 7.5).

The manufacturing engineer who was interested in implementing the new mechanical solution, since this would have simplified the assembly of the product, supported the project leader’s interest in pursuing innovation by demonstrating that the estimate of the labour cost to assemble the new mechanics was lower than the cost currently incurred for a similar product with the same dimensions as Kappa, but assembled with the traditional mechanical technology used at Beta (the one suggested by the sourcing manager). Moreover, the project leader, the project manager and the mechanical designer studied and compared the number of the mechanical parts used in this product that was similar to Kappa, adopting the traditional mechanical technology, and its cost, with the number of the mechanical parts, and their cost, required for the adoption of the new technology. From this analysis, it emerged that there was no significant difference between the two mechanical solutions in terms of cost. Even though the mechanical components of the similar product analysed were less expensive than the components designed for Kappa, the new product required fewer mechanical parts due to the introduction of the new technology. Therefore, Kappa would have had fewer and more expensive mechanical components whose total cost was comparable to the total cost of the mechanical components for a similar product considered for this comparison. The analysis conducted by the project leader, in collaboration with these other staff, demonstrated that the adoption of the new mechanics did not generate a higher cost than the traditional mechanical components insisted upon by the sourcing manager (see Section 7.5 and Figure 7.5). The result of this analysis using accounting data clarified that the new mechanical technology did not have a high impact on the cost of the new product as stated in the project report.
The challenge by the sourcing manager of the project leader’s intention to adopt a new mechanical part opened up a space for discussion and reflection in which the project leader and other staff on the team subsequently evaluated the innovative technology for the mechanics in detail. The tension between the sourcing manager and the project leader opened up many spaces for discussion and reflection where the interests of the different experts, motivated to defend their interests in the project, were mediated by accounting, specifically by the accounting figures of the project report (the materials and labour cost figures). The project report and the accounting figures regarding the materials and labour costs (see Figure 7.2) were revealed to be in the centre of every conversation and discussion of the multiple actors involved. The project report with the accounting figures, linking the different interests at stake for innovation, mediated within the discussions and reflections in which everyone mobilised accounting to sustain their various interests. Playing a mediating role, accounting indicated “to all the actors involved what [...] was needed from each of them” (Miller and O’Leary, 2007, p.703) – namely reflections based on accounting – in their intervention to address the tensions and facilitate the unfolding process for innovation. Consequently, accounting facilitated the emergence of a choice for innovation (Miller and O’Leary, 2007; see also Christner and Strömsten, 2015; Revellino and Mouritsen, 2015), e.g. the adoption of the new mechanics in Phase 3, after the assembly of the second prototype of Kappa (see Chapter 7, Section 7.5). This occurred since the mechanical solution, in which the technical advantages were significant, was not as expensive as shown in the project report. It resulted that the desire and intention of the project leader for the new mechanical technology were sustained through the mediation of accounting among the different interests and motivations at stake for Kappa, which made it possible to address and manage the tensions with the sourcing manager, whose interest (i.e. the adoption of the mechanical technology currently used which was consolidated at Beta) in this instance was not fulfilled.

8.3.2 How the mediation of accounting did not support the desires and the intentions for innovation

When the third prototype of Kappa was available in Phase 3, a new system for the closure of a mechanical element of Kappa was implemented. The project leader, with the support of the mechanical designer, had conceived of this system that, as also explained in Chapter 7, Section 7.5, required shipment from the manufacturer to the
mechanical supplier, who then had to assemble it within the mechanical box with a special technology using glue. The sourcing manager did not agree with the project leader about the proposal for the shipment of this system from the manufacturer to the mechanical supplier, which was complex and would have required the cooperation of the suppliers. Furthermore, this proposal entailed a higher cost than the cost incurred if it were to be assembled in-house. The quality engineer also disagreed with the project leader and the mechanical designer on this point (see Figure 7.6). Both the sourcing manager and the quality engineer were interested in managing and assembling the new system in-house at the lower cost.

The various interests that were emerging about the acquisition of the new system for the closure of a mechanical element of Kappa opened up chains of reflections and discussions that subsequently turned into conversations about the effects of accounting on the project leader’s intention (see Figure 7.6). Those who had different interests from the project leader (i.e. the sourcing manager and the quality engineer) claimed that the adoption of this solution would have caused higher production costs and a negative cost performance reported to the senior managers in the project report. In this vein, the intention of the project leader, also sustained by the mechanical designer, was challenged by opposite interests from other staff, ultimately generating tensions among them. Accounting linked the different interests at stake (of the sourcing manager and the quality engineer) and the intentions of the project leader thus facilitating their discussions. By playing a mediating role, accounting indicated “to all the actors involved what [...] was needed from each of them” (Miller and O’Leary, 2007, p.703) – namely reflections based on accounting – as they addressed the tensions and facilitated the unfolding process of innovation. Similarly to the previous instance, accounting is shown to provide a means through which interested parties can intervene within the process, thus influencing the course of the process for innovation (Miller and O’Leary, 2007; Christner and Strömsten, 2015; Revellino and Mouritsen, 2015). Therefore the intention of the project leader was not granted or permitted because the final decision was to not incorporate the new system for the closure of the mechanical part in Kappa. The technology supported by the project leader was not adopted. This happened as a result of the accounting arguments that were advanced by other staff, e.g. the quality engineer and the sourcing manager, which demonstrated a high cost for the system, with a significant impact on the project report. This led the project leader and the mechanical
designer to redesign the new system for the closure of the mechanical element of Kappa without the need to use glue on the device, in a way that made in-house assembly possible.

Relying on the two instances discussed above, accounting was in the middle of the conversations and reflections on the unfolding materialization of innovation, (i.e. the prototypes), and accounting was used to link, represent (Miller and O’Leary, 2007) and defend the single interests and concerns of the actors at stake. By playing a mediating role, accounting indicated “to all the actors involved what [...] was needed from each of them” (Miller and O’Leary, 2007, p.703) – namely reflections based on accounting – in their intervention to address the tensions and facilitate the unfolding process of innovation. Accounting was used to challenge, or support, the desires and intentions put forward by the project leader, and represented a means for intervention (Miller and O’Leary, 2007; Christner and Strömsten, 2015; Revellino and Mouritsen, 2015) within the process of innovation, resulting in reinforcing or reinventing the project leader’s desires and the intentions for innovation. In doing so, accounting facilitated choices for innovation.

So, how does accounting engage with the rationale for innovation through processes of mediation? Accounting engages with the rationale for innovation through the encounter between the project leader’s desires and intentions for innovation and the motivations of staff more interested in fulfilling their functional interests. More specifically, accounting mediated in the discussions and reflections generated by the tensions among the different interests. In mediating among the tensions at stake, accounting facilitate both the unfolding of the prototypes for Kappa and the materialization of innovation in incremental improvements during the NPD process.

8.4 Research Question 3: How does accounting engage with the rationale for innovation through processes of hybridization?
At Beta, multiple professionals participated in the NPD process of project Kappa and in doing so they built on accounting during the course of their normal activities for the development of the new product (see Chapter 7, Sections 7.5 and 7.6). These individuals, including the project manager, the project leader and the manufacturing engineer, practiced accounting by periodically estimating and tracking the accounting
performance of the new product and reporting (the project manager and the project leader were in charge of this activity – see Chapter 7, Section 7.5) this performance to senior managers at the periodical reviews. Building on the research into processes of expertise hybridization (Caglio, 2003; Kurunmäki, 2004; Miller et al., 2008; Hyvönen et al., 2009 – see Chapter 3, Section 3.8), the empirical hybridization of staff expertise with accounting during project Kappa has been identified, as well as the potential for this process to engage with the multiple purposes and interests of the professionals at stake, influencing their desires, intentions and motivations regarding the unfolding innovation. In this section, the answer to the third research question is provided: how does accounting engage with the rationale for innovation through processes of hybridization?

The multiple professionals dealing with accounting during project Kappa have been described in Chapter 7, Section 7.6. In Phase 1 the product manager set the accounting targets for product Kappa. He included this information within matrixes on the PDD. As illustrated in Chapter 7, Section 7.5, from Phase 2 to Phase 4, accounting practices consisted of estimating, monitoring, controlling and accounting for (i.e. reporting) the new product’s cost performance. In particular, the project manager, the project leader, the sourcing manager periodically estimated the status of the materials cost. The project manager, the manufacturing engineer, the project leader periodically estimated the status of the labour cost. These materials and labour cost estimates were fundamental to understanding the status of the product’s cost versus the target as defined in the PDD, and were used to update the project report and the accounting figures reported therein (in Figure 7.2). In Phase 5, the project manager determined the final estimate of the product’s cost before its launch into the market.

Within Beta, non-accounting professionals (e.g. the product manager, the project manager, the project leader and the manufacturing engineer) with an engineering degree or with a technical diploma, who had not completed any finance course or a MBA, dealt with accounting during the development of the new product. Different experts on the team “increasingly provide[d project Kappa with] “accounting” data in the course of their normal work activities” (Lowe, 2001, p.340). They hybridized (Kurunmäki, 2004; Hyvönen et al., 2008; see also Miller et al., 2008) their expertise as they expanded and combined accounting with their specific functional expertise. This means that they did
not limit themselves to verifying whether Kappa fulfilled the cost targets or not during its development. Rather, they dealt with doing accounting and calculations, preparing the documentation with cost analyses cost reduction plans, project reports. Consequently, they got into the details of the formulas and the figures for the product’s cost calculation and they collected and managed all the information to account for the data elaborated at the reviews by presenting the project report. To summarize, during project Kappa, the project manager, the project leader and the manufacturing engineer complemented their specific-domain expertise with “a new set of techniques” (Kurunmäki, 2004, p.336) that belonged to the management accounting domain and that was used in “calculate[...ing] costs” (Kurunmäki, 2004, p.336) and accounting for these costs through accounting figures in the project report. Importantly, the use of accounting allowed these diverse experts to better understand the effects of their functional work on the new product in light of the accounting effects as well. This in-depth awareness led these professionals to carry out their specific-domain activities for the NPD process with an additional purpose of contributing data and measurement to the accounting report and also intervening through discussion in endeavouring to improve the accounting performance of product Kappa.

Furthermore, during the discussions and reflections on the unfolding work in progress and on the prototypes of Kappa, in which the project leader’s desires and intentions for innovation encountered the motivations of other experts who had different interests (see the previous Section 8.3), these non-accounting professionals translated their interests to the others by building upon the accounting impacts of the unfolding innovation featured in the work in progress and the prototype of Kappa. As a consequence, the project leader was encouraged to further analyze the unfolding innovation, by drawing on accounting (see Figure 7.5, for instance). These processes of hybridization of the professionals’ expertise with accounting practices motivated the staff to defend their interests stemming from the concerns of the functional areas they belonged to by building upon accounting practices including the update of the project report. Consequently, accounting was revealed to play an enabling role in the NPD process for a variety of participants from different backgrounds. This resulted in opportunities for participants to better understand the unfolding innovation. It also provided opportunities to enhance the innovation (see Chapter 7, section 7.8) by reinforcing (see Figure 7.5) or
changing (see Figure 7.6) the direction set out by the project leader, and underpinned his desire and intentions to deliver innovation as part of the NPD process.

So, **how does accounting engage with the rationale for innovation through processes of hybridization?** Drawing upon accounting allowed the hybridized non-accounting (Kurunmäki, 2004; Hyvönen et al., 2008; see also Miller et al., 2008) professionals involved in project Kappa to use accounting in different ways, such as tracking and reporting the accounting performance of Kappa, as well as supporting, questioning, challenging, and further understanding the unfolding innovation and considering the multiple interests at stake. In doing so, accounting engaged with the rationale for innovation. More specifically, the project leader hybridized his expertise with accounting in order to further support his desire and intention for innovation. The motivations of the other experts led them to hybridize their expertise with accounting and use it to support, challenge or question the unfolding innovation, in light of their own interests. At the same time, accounting enabled the participation of a variety of participants from different backgrounds in the NPD process. The sharing of the outcomes (the discussions) of the focus on the accounting data emerging from accounting practices contributed to providing these experts with further understanding about what it made sense to do (Schreiber, 2014, p.348; see Schatzki, 2001a) during project Kappa, by supporting (see Figure 7.5) or not supporting (see Figure 7.6) the intentions of the project leader and facilitating the process for innovation to move forward.

### 8.5 Chapter Summary

In this chapter further understanding is offered on how accounting facilitated innovation to emerge in practice during project Kappa, by answering the three research questions set out in Chapter 4, Section 4.4. This was possible through an analysis of the empirical dimensions of firmness and flexibility within the empirical innovation process (Tatikonda and Rosenthal, 2000; Kamoche and Cunha, 2001), as well as through a study of the empirical processes of mediation through accounting among the multiple professionals that formed the Kappa team (Miller and O’Leary, 2007; Revellino and Mouritsen, 2015) and finally through the hybridization of these professionals’ non-accounting expertise with accounting (Miller et al., 2008; Kurunmäki, 2004; Hyvönen et al., 2009) throughout the unfolding of project Kappa. Consequently, the ways in
which accounting engaged with the rationale for innovation, i.e. the desires, the intentions and the motivations of the actors at work during project Kappa has been revealed. More specifically, the ways in which accounting enabled innovation by providing the project with firmness, which in turn engaged flexibility, have been revealed. In particular, it emerged that the firmness of the NPD process was a source of flexibility for new opportunities for innovation. Moreover, the different interests involved in the NPD process of Kappa were mediated through accounting. As a consequence, accounting was in the middle of every conversation and reflection on the unfolding innovation. It was used to represent (Miller and O’Leary, 2007) and defend each individual interest, stemming from the disciplines and the functions of the staff involved, and to simultaneously challenge or support the intentions put forward by the project leader. In doing so, accounting intervened (Miller and O’Leary, 2007) within the process of innovation by reinforcing or reinventing the desires and the intentions for innovation of the project leader. This resulted in facilitating the unfolding of the process for innovation. Finally, the project leader hybridized his expertise with accounting practices in order to further affirm his ideal and objectives for innovation. The motivations of the other professionals involved in the project led them to hybridize their expertise with accounting to reinforce or question the reinvention of the unfolding innovation, in light of their own functional interests. In these cases, accounting facilitated the participation of a variety of experts from different backgrounds in the NPD process.

The answers to the research questions elaborated in this chapter constitute the material for understanding firmness and flexibility, mediation and hybridization which characterized project Kappa and through which accounting engaged with the desires, intentions and motivations of the experts participating in the innovation process. These answers constitute the basis for the achievement of the research objective of the thesis. Specifically, an interpretation through the theoretical perspectives presented in Chapter 5 helps in the analysis for this purpose. The interpretation of the unfolding work in progress and prototypes of Kappa as epistemic objects (Knorr Cetina, 2001; Nicolini et al., 2012), engaging relationships with the individuals involved in the NPD practices, enables an in-depth understanding of the process of innovation and the underpinning desires, intentions, and motivations at stake. The theoretical concept of boundary object (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012), and its use in analysing in-
detail how accounting engages with the multi-disciplinary context of the NPD process (Nicolini et al., 2012), aids further understanding of how accounting engages with the unfolding of innovation within the NPD process, in which heterogeneous individuals, with different ends and purposes for innovation, discuss and reflect on innovation. By building on these interpretations and discussions, and drawing upon the theoretical idea of ductus (Carruthers, 1998; 2010), the ways in which accounting engages with the rationale for innovation within the NPD setting is explained in detail. In the next chapter, the findings articulated in this chapter are discussed in-detail by building on the theoretical perspectives (for detail on this see also Chapter 5), with the final objective of contributing to the literature through new understanding and knowledge about the interplay between accounting and the rationale for innovation.
Chapter Nine
Discussion of Findings

9.1 Introduction
The empirical material collected through the case of Beta focused on the key phases of the NPD process (from Concept to Pre-production) related to project Kappa. This process was recurrently and collectively performed by multiple participants as they engaged, collaborated, and discussed while attempting to develop a new product, i.e. Kappa. The case material illustrates how accounting was interconnected with innovation. Accounting practices provided both the firmness and stimulated the flexibility within the NPD process, which sustained the mediation among heterogeneous interests and concerns and permitted the hybridization of non-accounting professionals’ expertise within the NPD project (see Chapter 8). Consequently, accounting facilitated the unfolding of the process for innovation within NPD process by engaging the desires, the intentions and the motivations of the multiple professionals at stake, with different interests, purposes and concerns in their search for innovation.

This study was supported by the case material that focused on the practices unfolding during the empirical NPD process of project Kappa, illustrating the “actions, doings, and sayings” (Schatzki, 2001a) that developed innovation for Kappa; the “beliefs, hopes and emotions” (Schreiber, 2014, p.349) of the project leader; his expectations and intentions for innovation to pursue and realize (Schatzki, 2005); how people “determine[d] what [...] to do” (Schreiber, 2014, p.349; see Schatzki, 2001a; 2005) throughout the development of Kappa; and finally, the rules and the procedures of the NPD process (Schreiber, 2014, p.349, see also Schatzki, 2001a; 2005), e.g. the formalised NPD process. Focus was placed on the unfolding accounting practices during project Kappa, with attention of establishing “how people in organizations [...]made] specific uses of widely available accounting solutions, how such solutions [...]came] to be at their disposal” (Ahrens and Chapman, 2007b, p.99) and engaged with the unfolding process for innovation.

The purpose of this chapter is to interpret and discuss the case material, see Chapter 7, and the answers provided to the research questions, see Chapter 8, in light of the
theoretical constructs of the thesis illustrated in Chapter 5. The discussion here allows
the examination and understanding of how accounting engaged with innovation, in
practice, during the empirical NPD process at Beta.

In Section 9.2 the unfolding process for innovation within project Kappa, as illustrated
in Chapter 7, Section 7.7, is interpreted as being shaped by epistemic objects (Knorr
Cetina, 2001; Gherardi, 2003; Nicolini et al., 2012 – see also Chapter 5, Section 5.4),
i.e. objects characterized by “lack of completeness and being” (Knorr Cetina, 2001,
p.182). In this context, as accounting engaged with the epistemic objects, a pragmatic
and feasible solution for the new product is chosen through the firmness of the
accounting targets on the project report. However, the incompleteness of the new
solution also allowed the NPD process to flexibly open up to new possibilities for
innovation. In Section 9.3, the project report, with its accounting figures, is interpreted
as a boundary object (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012 – see
also Chapter 5, Section 5.5), which sustained the mediation in the discussions and
reflections among multiple professionals, with different interests, purposes and concerns
for innovation, especially when there were tensions among them and when there was no
consensus. Various professionals within the Kappa team created and used accounting
data. It was actually these accounting practices that ritually triggered and sustained new
possible solutions for innovation in Kappa, by engaging people in continuous
achievement and renewal of compromises. In Section 9.4, the theoretical concept of
ductus (Carruthers, 1998; 2010; Busco and Quattrone, 2016 – see also Chapter 5,
Section 5.3) is drawn upon to explore how accounting can drive NPD and innovation
objectives. In this instance this happened by sustaining, challenging and facilitating
innovation through discussion of data emerging from accounting practices. Specifically,
accounting, acting as a boundary object among heterogeneous perspectives of the
professionals involved in project Kappa, facilitated, reinforced and reinvented the
direction of innovation in the NPD process, by calling on its unfolding epistemic
objects.

9.2 Accounting engaging with the incompleteness of innovation during project
Kappa
As described in Chapter 7 (Section 7.7), the unfolding of innovation featuring the new
product Kappa materialized through work in progress/prototypes (see also Figure 7.7).
These objects represented incomplete versions of the new product and are here interpreted as epistemic objects (Knorr Cetina, 2001; Nicolini et al., 2012), namely, objects whose inherent incompleteness stimulated the professionals involved in the process – the project leader, the sourcing manager, the quality engineer and the manufacturing engineer, to conceive of a number of alternatives for the development of Kappa, relying on their different expertise, purposes and following their different interests. In particular, as the different intentions and motivations of the various staff came together during the innovation process, their heterogeneity generated discussions and reflections, which, stimulated by the incompleteness of the unfolding work in progress/prototypes of Kappa, in turn led those involved to conceive of further possible solutions about how Kappa could be developed. How accounting engaged with the incompleteness of these objects, building on the empirical perspectives of firmness and flexibility featured in Kappa’s process of innovation (analysed in Chapter 8, Section 8.2), is discussed in this section.

Between Phase 1 and 2 of project Kappa, the product manager delivered the PDD to the project leader (see Chapter 7, Section 7.4). This document included details such as the product’s technical requirements, the product’s financial goals and accounting targets, the markets, the certification required and the project’s expected completion date. Among the technical requirements, there was a list of the technical features that Kappa had to embed. In the PDD, which was the first work in progress for Kappa (see Chapter 7, Section 7.7), there was also a message in which the product manager recommended the development of innovative technologies for Kappa in order to fulfil the technical requirements (see Chapter 7, Section 7.3).

Instead of focusing on the technical requirements for the new product, (outlined in the PDD by the product manager and that were supposed to guide the project leader in his work), the project leader concentrated more on the information that he considered was lacking in the existing descriptions of Kappa, as stated in the PDD (Knorr Cetina, 2001). “The project leader spends a great deal of time conceiving the innovative technologies for the new product. He focuses more on the technical features that are missing in the PDD and that can make Kappa a valuable innovation” (Manager of Engineering) – quoted earlier. The project leader thought of multiple ways for developing Kappa, desiring to introduce new mechanics based on an innovative
technology, of the new system for the closure of a mechanical element of Kappa, and a new cover defining a new aesthetical design for Kappa, with a new handle. “The project leader worked overtime. He changed and re-changed again and again the features and components in his drawings of Kappa with the purpose of fulfilling his desire for innovation” (Project Manager) – quoted earlier. Also, as the project manager stated, he “had to stop the project leader many times in his study of innovation for Kappa since he would not have stopped figuring out new technologies for the new product to be added to those [already] in the PDD” (Project Manager) – quoted earlier. This work was stimulated by the incompleteness of the PDD, which did not outline a full description of Kappa but rather left open spaces in which the project leader could elaborate his creative ideas for the innovation featuring in the new product. In this work, the project leader was also challenged by the firmness of “the cost target and the technical requirements [which could not ...] be fulfilled simultaneously” (Manager of Engineering) – quoted earlier. The PDD represented Kappa and its associated innovation only partially. This incompleteness of the PDD, here interpreted as an epistemic object (Knorr Cetina, 2001; Nicolini et al., 2012), attracted the attention of the project leader who conceived of infinite potential possibilities for innovation within Kappa. The project leader also called for the collaboration of the project team in filling, in practice, the gaps in the descriptions in the PDD, in his search for innovation to be featured in Kappa.

As Phase 2 of project Kappa advanced, the project leader and the other professionals in the team collaborated in exploding (Knorr Cetina, 2001) the PDD into differentiated studies and interpretations, stimulated and led by its own incompleteness. The project leader, the project manager, the team members were aware that they were “in charge of building innovations and new technologies for the market” (Project Manager) – quoted earlier. The studies and interpretations led to the production of (both technical and accounting) documents prepared by the various professionals, which stimulated the search for a new and advanced version of Kappa. This version was illustrated in the feasibility report (see Figure 7.7). In Chapter 7, Section 7.4, it was described how, in this phase, the electronic designers outlined the layout of the product, the software designers prepared a scheme of its software, the manufacturing engineers elaborated a preliminary design for manufacturing, the mechanical designer produced the preliminary mechanical drawings, the testing engineers worked on a preliminary design
for the testing document and the project manager prepared the first update of the project report, supported by the project leader, the sourcing manager and the manufacturing engineer. All these documents were included within the feasibility report and resulted from the collaboration between the project leader and the professionals on the team in the search for innovation.

The multiple possibilities for innovation generated by the desires and the intentions for innovation of the project leader, when confronted with the incompleteness of the PDD, were refined within the collaborations engaged in for the preparation of the feasibility report in Phase 2 of project Kappa. This was only possible as a result of the discussions and negotiations between the project leader and the other professionals on the team. In these circumstances, accounting, specifically the firmness (Kamoche and Cunha, 2001) of the accounting targets within the project report (see chapter 8, section 8.2), was drawn upon. The accounting targets challenged the project leader from the beginning of project Kappa. As quoted earlier:

“They [the marketing senior manager and the product manager] know how it works in the laboratory. However, in this case they have prepared a PDD where the cost target and the technical requirements cannot be fulfilled simultaneously! He [the product manager] should review the expected cost and margin” (Manager of Engineering).

Furthermore, the challenge of the accounting targets was emphasized in Phase 2, when the project team (in charge of developing Kappa) intervened in the project. “The members of the project team, given this preliminary development of product Kappa, are motivated to intervene to make further contributions to the development of the new product” (Manager PMO) – quoted earlier. This happened, for instance, when the sourcing manager asked the project leader and the mechanical designer to change the special technology that was conceived of for the cover of the mechanics and some details of the new handle in the mechanical drawing of the new product. This solution was expensive and the BOM cost (Figure 7.4) would have shown a higher cost than the target, with red traffic lights in the project report (Figure 7.2). The quality engineer underlined the possible quality issues related to the sophisticated mechanical cover whose quality checks would have taken a long time with higher costs, thus impacting on the financial performance with red traffic lights in the project report. He also suggested
a new solution for the cover. The manufacturing engineer suggested changing the positioning of some components within the layout, in order to facilitate the assembly process, thus reducing the labour time and thereby the cost of the new product that would be reported within the project report. The staff drew on accounting, specifically the accounting figures in the project report (in Figure 7.2), to shape the NPD process, and the multiple possibilities for innovation conceived of by the project leader, towards more feasible and pragmatic solutions.

The incompleteness of the preliminary illustration of Kappa in the feasibility report, interpreted here as an epistemic object (Knorr Cetina, 2001; Nicolini et al., 2012), presented open spaces for discussions and reflections among the professionals involved in the project. The team, drawing upon accounting, specifically the cost targets set for this product, moved and oriented each other towards multiple possible solutions for innovation. These possible solutions emerged from the various groups of experts involved and led the team ultimately towards pragmatic and feasible solutions. The project team was attracted by the incompleteness of the feasibility report and intervened within the process to adapt flexibly the unfolding of the process for innovation of Kappa in light of the accounting targets and in so doing further develop the new product (see Chapter 7, Section 7.7; see Chapter 8, section 8.2). The work in progress, represented by the PDD and the feasibility report, i.e. epistemic objects illustrating an incomplete version of the new product, coupled with the challenge of the firm cost targets, facilitated this collaboration (Nicolini et al., 2012) among the staff, from which other possibilities for innovation in Kappa were proposed and finally a new pragmatic solution emerged.

In Phase 3, from the development of Kappa’s first prototype, the project leader considered the prototype as an incomplete version of the new product, in which “something was still missing” (Endrissat and Noppeney, 2013, p. 70). As quoted earlier, the project leader was never “happy with Kappa. He would have continued improving the last prototype of Kappa, adding new technologies which would have made it ‘the innovation’” (Project Manager). The prototype looked like an early version of the new product. However, the prototype only partially embedded the ideal of innovation the project leader had conceived of. It was not yet the Kappa he wanted to see launched into the market. Each time a new prototype was developed, the project leader assessed this
version of Kappa as “having something lacking, where a new feature could be always added” (Manager of Operations) – quoted earlier. The aspiration to create the desired product Kappa ‘tormented’ the project leader, who was obsessed by the desire to improve the product prototype by developing several and better versions of it, while continuously thinking of several ways/paths for its evolution.

The developing prototypes of Kappa are interpreted here as epistemic objects (Knorr Cetina, 2001; Nicolini et al., 2012) that attracted and renewed the desire of the project leader in the search for innovation featured in Kappa. The project leader continuously endeavoured to address their deficiencies and to create the innovation he desired (see Chapter 7 – Section 7.7). The incompleteness of the prototype also attracted the attention of the other staff, who commented/criticized it, suggesting new possible solutions for the development of that incomplete version of the new product.

As illustrated in Chapter 7, Sections 7.4 and 7.5, when the first version (out of the three versions developed throughout Phase 3) of the prototypes was available, the manufacturing engineer commented that the project leader should have changed the disposition of some components within Kappa’s layout in order to facilitate the assembly procedures for the manufacturing technicians and reduce the labour cost (to be reported within the project report). When the second version of prototype was produced, the sourcing manager commented and asked the project leader to change the mechanical technology because this solution was complex to manage. Furthermore, it was expensive, increasing the materials cost in the project report. When the third version of the prototype was available, the sourcing manager and the quality engineers commented and requested a change in the new system for the closure of a mechanical element of Kappa because the way in which this was conceived was complex and increased the estimates of the product’s cost in the project report. See Figures 7.5 and 7.6 where these tensions between the project leader and the other staff, regarding the innovative solutions featured in Kappa, are illustrated. The Kappa team, attracted by the incompleteness of the prototypes, still only partial versions of Kappa, questioned the current work in progress/prototype through the firm constraint of the accounting targets and, thus, were encouraged to find new possible solutions for making the Kappa product better in terms of innovative features, in light of the discussions based on accounting. The incompleteness of these objects, coupled with the accounting targets, generated
tensions and spaces for reflection and discussion among the professionals involved. This allowed the staff to manage multiple possibilities for innovation, instilled by the incompleteness of the prototypes, ultimately towards pragmatic and feasible solutions which, as stated by the project leader, (see Chapter 7, Section 7.8), could also represent opportunities for further enhancement of innovation.

Every time a new work in progress/prototype was developed, the project leader always desired to improve this epistemic object because of its failure to represent the innovation he intended to achieve for Kappa. Even though the project leader’s desire for continuous improvement and perfection in the search for innovation did not stop, the NPD process did stop when the last version of the prototype was deemed to be in line with the PDD during the final phase review by the gatekeepers. Even when the checklists of Phase 5 were signed off by the gatekeepers, the project leader was not happy with Kappa and he would have continued improving the last prototype of Kappa, adding new technologies which would have embedded the innovation he desired. At the end of Phase 5, when project Kappa was “officially declared ‘finished’ and ‘complete’” during the last gate-review, the project leader was still thinking “of how it [the new product] ‘could’ have been improved, of what it ‘should’ have become and did not” (Knorr Cetina, 2001, p.182). Despite this, at this stage a solution to the endless possibilities was chosen in light of the firmness of the process, its constraints of time to market, technical functionality and cost, as illustrated in the project report that was produced and circulated at the active project global meeting before the closure of the project at Phase 5. The project report included information which allowed top managers to define the closure of the NPD process, translating the last prototype into the final new product to be commercialized, even though it did not reflect and embed the innovation desired by the project leader.

To summarize, during the empirical NPD process studied at Beta, accounting engaged with the incompleteness of the materialization of innovation as featured in Kappa. It did so by building on the firmness and the flexibility generated by the accounting targets/constraints. Specifically, the unfolding incompleteness of the epistemic objects (work in progress/prototypes) stimulated the project leader’s desires and intentions for innovation towards multiple possibilities for innovation. These epistemic objects also “provided the motives and drive for collaboration to emerge” (Nicolini et al., 2012,
p.612) between the project leader and the other staff participating in project Kappa. Accounting, and the firmness of the accounting targets underpinned the individuals’ collaboration and facilitated the choice of the most practical and feasible solution within the multiple possibilities for innovation. However, each time a practical solution was achieved and a work in progress/prototype was developed, the new version of the work in progress/prototype still represented an epistemic object, and the discussions and reflections generated by the incompleteness of these objects, based primarily on accounting conversations, flexibly generated and renewed possibilities for innovation. In Kappa this process continued even though the new product was launched into the market, since the desires and intentions of the project leader in the search for innovation did not stop.

To conclude, throughout project Kappa the incompleteness of the unfolding innovation, coupled with the firmness of the accounting targets, recursively and flexibly stimulated new possibilities for innovation. Accounting, engaging with the incompleteness of the epistemic objects, i.e. work in progress/prototypes, sustained this potential infinite process through shaping the innovation process featuring project Kappa and attempted to lead to the resolution of the incompleteness through practical and feasible solutions for Kappa. However, for the project leader the incompleteness of Kappa was not resolved.

9.3 The role of accounting as a boundary object generating temporary compromises for innovation

In Chapter 8, Section 8.3, it was acknowledged how accounting practices and the accounting figures included within the project report, by sustaining the mediation among different desires, intentions, motivations of the professionals involved in project Kappa – with different interests, purposes and concerns for innovation, facilitated the unfolding of the process for innovation as featured in project Kappa. Accounting was in the middle of every conversation and discussion on the materialization of innovation. Accounting linked the multiple professionals involved in project Kappa with each other and with the unfolding work in progress/prototype. Playing a mediating role, accounting indicated “to all the actors involved what [...was] needed from each of them” (Miller and O’Leary, 2007, p.703) – namely reflections based on accounting – as seen in their intervention that addressed the tensions and facilitated the unfolding process for
innovation. As a consequence, accounting facilitated the emergence of choices for
innovation (Miller and O’Leary, 2007; see also Christner and Strömsten, 2015;
Revellino and Mouritsen, 2015), e.g. the adoption of the new mechanics in Phase 3,
after the assembly of Kappa’s second prototype (see Chapter 7, Section 7.5).

More than playing a mediating role, the project report and, specifically, its accounting
figures presented the features of boundary objects as they were used as a means for
translating the interests at stake outside the boundaries of the single and specific
disciplines, or functions, interconnected by the discussions/conversations/reflections of
the project team (Beckhy, 2003; Endrissat and Noppeney, 2013; Nicolini, 2012). These
discussions were not aimed at achieving agreements and consensus. As noted earlier,
innovation also “stems from the tensions within the team” (Project Leader), with
multiple and heterogeneous interests and concerns regarding the development of Kappa.
The project report allowed the functional experts to talk and discuss across the
boundaries of their disciplines (Nicolini et al., 2012). The project report played the role
of boundary object, for instance, when the sourcing manager did not agree with the
adoption of the new mechanics. As illustrated in Chapter 7, Section 7.5 (see also
Chapter 8, Section 8.3.1 and Figure 7.5), the sourcing manager did not want to deal with
the new mechanical technology, because this technology was complex. The sourcing
manager translated and defended his interest by building on the cost impacts of that
technology – to be reported in the project report, based on the quotations of the first
suppliers who proposed a high cost for the new mechanical solution that was proposed
by the project leader. The challenging and the questioning of the project leader’s
intention by the sourcing manager opened up a space for discussions and reflections
where the innovative technology for the mechanics was then assessed in-depth by the
project leader and other experts, facilitated by the fact that their expertise was
hybridized with accounting. Therefore, the tension between the sourcing manager and
the project leader created multiple discussions in which some members of the team,
such as the manufacturing engineer, also participated – see Figure 7.5.

Although the sourcing manager did not agree with the choice to introduce the new
mechanics, he still participated in this and other discussions on the new product and he
still mediated through accounting – as happened during the later sampling where the
sourcing manager still used accounting to challenge the adoption of the new system for
the closure of a mechanical element of Kappa (see Chapter 8, Section 8.3.2). Despite tensions and the lack of achievement of consensus (Star, 2010), accounting was still a boundary object that mediated and sustained the collaboration among all the parties participating in the NPD process.

During project Kappa, accounting and the figures on the project report, playing the role of boundary object, facilitated a choice (e.g. the adoption of the new mechanics or the change of the new system for the closure of a mechanical element of Kappa) and led to the achievement of compromises among the staff involved, without consensus – as demonstrated earlier. These compromises were revealed to be temporary, consecutively achieved and promptly broken with a new work in progress/prototype (epistemic object), and challenged, in turn, through the concurrent updating of the project report. This happened because the failure in fully reconciling the multiple purposes and interests “in-tension” (Busco and Quattrone, 2016) attracted and renewed the participation, the engagement, and the questioning of the professionals in discussions, with the potential to include further innovations. However the NPD process was sustained and concluded through the project report, which was used by the senior managers at the final gate review of the NPD stage-gate process.

9.4 Through the ductus of project Kappa: how accounting engages with the rationale for innovation

The unfolding of project Kappa at Beta resembled a ductus (Carruthers, 1998; 2010 – see Chapter 5, Section 5.3), a journey (Carruthers, 2010) that began with the preparation of the PDD and ended when the new product Kappa was created. Specifically, the journey of project Kappa departed from an initial starting point, i.e. “[the statis or status] a place-from-where” (Carruthers, 1998) the project began, with the concept of the new product – for Kappa this was outlined in the PDD by the product manager in Phase 1. It then moved on to achieve its objective, “the skopos [the end]” (Carruthers, 1998), i.e. the production of an innovative new product, i.e. Kappa (Davila, 2000) in Phase 5. The path/flow between the status and the skopos (Carruthers, 1998; 2010) of the empirical NPD process is interpreted as a ductus (Carruthers, 1998; 2010 – see Chapter 5, Section 5.3).
The flow of the ductus starts with a challenge and the “realization of being in perdition” (Busco and Quattrone, 2016, p.9) then continues with the composition of opposite views and concludes with “the possibility of making a choice” (Busco and Quattrone, 2016, p.9; Carruthers, 2010). The challenge, the opposing views and the choice within the ductus of Project Kappa are illustrated in Figure 9.1. Specifically, the ductus of project Kappa, started with the delivery of the PDD to the project leader (between Phase 1 and 2). Through this document, the project leader was challenged by the product manager and, consequently, by the senior managers who had approved the PDD at the end of Phase 1. As discussed in Section 9.2, the challenge consisted of the incompleteness of the PDD, coupled with the firmness of “the cost target and the technical requirements [which had to ...] be fulfilled simultaneously! (Manager of Engineering) – quoted earlier. At this stage of the process, the project leader focussed on “adding to product Kappa innovative features that fulfilled both the requirements in the PDD and, at the same time, made product Kappa an innovative product developed by Beta” (Project Leader) – quoted earlier. In doing so, the project leader found himself in a sort of “perdition” (Busco and Quattrone, 2016, p.9) given the endless possibilities for innovation opened up by the PDD as an epistemic object. As noted earlier, “the project leader worked overtime. He changed and re-changed again and again the features and components in his drawings of Kappa with the purpose of fulfilling his desire for innovation” (Project Manager). Within this perdition status, the project leader conceived of new technologies for Kappa, such as the new system for the closure of a mechanical element of Kappa, a new cover defining a new aesthetical design for Kappa, and a new technology for the mechanics.

The ductus continued with the emergence and the management of multiple purposes and interests of the other staff who, attracted by the incompleteness of the unfolding work in progress/prototypes and in charge of executing the activities during project Kappa, engaged with the process for innovation. The participation of the staff in project Kappa continued despite the lack of complete reconciliation of their diverse interests and concerns for innovation during the unfolding NPD process. These views of individuals often differed to the desires and the intention of the project leader and resulted in discussions of opposing views under tension (Quattrone, 2015; Busco and Quattrone, 2016). The opposing views/interests/purposes of these professionals (e.g. the project leader, the sourcing manager, the manufacturing engineer and quality engineer) led to
dialogues and conversations around the unfolding innovation of the new product Kappa. During these conversations, the project report and its accounting figures attracted and linked the different professionals together. Consequently, accounting, interpreted as a boundary object, sustained mediation among the different interests at stake, opening up a common space for discussion and conversation about the product Kappa and its incomplete work in progress/prototype. For instance, this happened when the team reflected on the new mechanics for Kappa (see Figure 7.5) and the new system for the closure of a mechanical element of Kappa (see Figure 7.6). In these circumstances, the staff involved drew and relied upon the project report and the firmness of its accounting figures in order to defend their own interest in the project, causing a flexible unfolding of the process by adapting to the choices made.

The spaces for discussion and reflection, and their outcomes, which characterised the ductus of project Kappa, constituted points (the punctus – Carruthers, 1998) that marked the direction of the ductus. Accounting facilitated the staff involved generating and selecting choices in a ritualistic manner from the various possibilities for innovation, stimulated also by the incompleteness of the unfolding epistemic objects (see section 9.2). This resulted from discussion of accounting data that drove the course of the NPD process and its process for innovation, by engaging with the interests stemming from the different purposes/ends/concerns for innovation and accounting goal achievement, ultimately leading to the choice of solutions and, at the same time, opening the way for new possibilities for innovation.

**Figure 9.1: Challenge, opposing views, choice within the ductus of Project Kappa**

<table>
<thead>
<tr>
<th>Challenge for the project leader: PDD</th>
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<tbody>
<tr>
<td>The project leader is in a status of “perdition”</td>
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<table>
<thead>
<tr>
<th>Opposing interests and purposes “in-tension”:</th>
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<tbody>
<tr>
<td>e.g. Discussions/reflections on the new mechanical technology, on the new system for the closure of a mechanical element of Kappa – mediated through the accounting figures within the project report</td>
</tr>
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<table>
<thead>
<tr>
<th>Choice:</th>
</tr>
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<tbody>
<tr>
<td>Solutions for the new product Kappa (including the new mechanical technology, a different system for the closure of a mechanical element of Kappa) – sustained through the accounting figures within the project report</td>
</tr>
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</table>
Throughout the ductus, accounting sustained the mediation among the professionals “intension” (Quattrone, 2015; Busco and Quattrone, 2016), facilitating the unfolding of innovation, which also “stem[...med] from the tensions within the team” (Project Leader), quoted earlier, with multiple and heterogeneous interests. In doing so, accounting facilitated the unfolding of the work in progress/prototypes, epistemic objects, towards feasible and practical solutions that, however, did not fully resolve the incompleteness of these epistemic objects, even when Kappa was commercialized.

To conclude, the theoretical idea of ductus (Carruthers, 1998; 2010; Busco and Quattrone, 2016) integrates the interpretation of the process for innovation through the unfolding of epistemic objects (Knorr Cetina, 2001; Nicolini et al., 2012) featuring project Kappa with the role of accounting as a boundary object (Star and Griesemar, 1989; Bechky, 2003; Star, 2010; Nicolini et al., 2012). The unfolding of the ductus was driven by the outcomes from the engagement of the epistemic objects with accounting. The unfolding of epistemic objects (i.e. work in progress/prototypes) (see Section 9.2), and their incompleteness, coupled with the firmness of the cost targets, flexibly generated new pragmatic and feasible solutions for Kappa. Furthermore, the interpretation of the accounting figures as boundary objects in the project report (see Section 9.3) facilitated understanding of how accounting engages with the rationale for innovation and, in particular, with the desires, the intentions, the motivations for innovation underpinned by the multiple purposes and ends at stake, which generated tensions (Quattrone, 2015; Busco and Quattrone, 2016), also renewed by the unfolding of epistemic objects. Accounting enabled the unfolding of the ductus for innovation involving the management and the renewal of compromises for innovation within the spaces of reflections and mediations characterizing the points (punctus) that marked and drove the ductus for innovation. Accounting facilitated the collaboration among the professionals, enabling the participation of a variety of experts from different backgrounds in the NPD process. In this vein, accounting facilitated the choices for innovation, without necessarily reconciling the desires and the intentions for innovation of the project leader with the different motivations for innovation of the other staff involved throughout the ductus of project Kappa. The ductus sustained the diversity and the tensions within project Kappa, which contributed to the unfolding rationale for innovation.
9.5 Chapter Summary

Throughout project Kappa, accounting allowed the Kappa team in Beta to guide the movement of the ductus as it passed through the stages and engaged with its parts, constituting the gradual composition (Carruthers, 2010) of innovation, i.e. work in progress/prototypes. In this ductus, accounting allowed the various “figures” (Carruthers, 1998) involved to coexist, even though accounting did not lead to a complete reconciliation of the different interests at stake. Despite tensions among the professionals, accounting enabled them to direct the movement of the ductus, engaging in spaces of discussion and reflection, which made project Kappa a dynamic process (Carruthers, 2010) “punctuated” (Carruthers, 1998) “by certain spaces where specific activities […] for the] composition [of the new product Kappa] needed to be made if a vision of truth [innovation] was to emerge” (Busco and Quattrone, 2015a, p.1256; Carruthers 1990). In this way, accounting allowed the end of the ductus, i.e. innovation, be “constructed, made practical, and recursively questioned” (Quattrone, 2015b, p.26) often leading to further innovations.

In conclusion, the ductus represents a space in which unity between different actors is achieved without necessarily leading to the alignment of the views of all of the actors around a perspective (Busco and Quattrone, 2016). It follows that the empirical ductus of project Kappa was the space in which a dialogue between different perspectives generated tensions among professionals who had different purposes and ends for innovation. By drawing upon the theoretical idea of ductus, the study of the NPD setting and its process for innovation has offered a better understanding of how accounting facilitated choices for the unfolding of innovation despite the lack of consensus among the parties involved.

Using the concepts of the theoretical framework has facilitated further consideration on firmness and flexibility, mediation and hybridization which featured in project Kappa and which were analyzed in the previous chapter (Chapter 8). Specifically, the theoretical perspectives of this study have offered an in-depth understanding of how accounting engaged with the different purposes and dimensions of innovation (such as the fulfilment of accounting targets – firmness, and the adaptation to new possibilities for innovation – flexibility), facilitated the participation of multiple actors and the involvement of different interests and concerns for innovation (which were mediated)
and the different expertise involved (which was hybridized with accounting expertise). This theoretical interpretation has facilitated achievement of the research objective: an understanding of the way in which accounting engaged with the rationale for innovation in practice. Accounting as boundary object ritually sustained the process for innovation, leading the professionals to make choices and compromises from the multiple possibilities for innovation – engaged in by the unfolding of epistemic objects. At the same time accounting challenged this process, by questioning the choices and compromises achieved, and by opening up new possibilities for innovation. In doing so, accounting facilitated the process for innovation within the NPD setting, sustaining and stimulating the diversity of interests and the tensions generated within the unfolding ductus, determining and driving the course for innovation. The next chapter concludes this thesis by drawing together the main findings of this study so as to make clear the key contributions of this thesis to the academic literature. The mediating role of accounting and the novel use and application of the concept of ductus in the NPD context constitute the primary contributions of this research. The enabling role of accounting in the NPD process for a variety of participants from different backgrounds is also emphasized. The practical implications and limitations of the findings are also discussed.
Chapter Ten
Conclusions

10.1 Introduction
This PhD thesis primarily contributes to the debate regarding accounting within innovation and NPD processes by examining how accounting engages with the rationale for innovation within the practical unfolding of the NPD process of project Kappa. In doing so, understanding and knowledge of the way in which accounting facilitates and drives NPD processes and, from within these processes, new NPD objectives are additions to the literature. This is the last chapter of the thesis and the conclusions of the study and the key contributions are articulated here in detail.

This chapter is structured as follows. First a summary of the entire study that was carried out for this thesis is outlined in Section 10.2. Secondly, in Section 10.3 the findings are summarized and the conclusions of the study are drawn. Then, the contributions to the literature on accounting within innovation and NPD processes are illustrated (Section 10.4). Next, in Section 10.5, how this study has used the concepts underpinning the theoretical framework in a way that is useful for studying accounting within innovation realms is highlighted. In Section 10.6, the contribution of this PhD thesis to practice, in particular for NPD stakeholders, is explained in detail. Finally, in Section 10.7, the limitations of this research are considered, as well as thoughts and ideas for future research.

10.2 Overview of the study
The research conducted for this thesis is embodied within the realm of management accounting and situated within the literature review on the role of accounting within contexts of innovation and NPD. What constitutes innovation depends on a multi-disciplinary/cross-functional discovery where the search for innovation is driven by desires, intentions and motivations of multiple actors at work. At the beginning of this study, the investigation of accounting with respect to the multiple purposes and ends regarding the unfolding of the NPD process, and resultant possible tensions among the desires, intentions, motivations sustaining the rationale for innovation (see Quattrone, 2015; Busco and Quattrone, 2016), revealed that there was the potential to offer
understandings of how accounting can drive and facilitate NPD processes and, within these NPD processes, innovation objectives.

The literature review conducted for this study has contributed to a better understanding of the role and the impacts of accounting and control within contexts of innovation (see Chapter 3, Sections 3.3 and 3.4) and NPD, in particular (see Chapter 3, Section 3.5). The accounting literature has interpreted accounting as playing a “pivotal role”, bringing together the multiple parties involved in the NPD process (Nixon, 1998; Nixon et al., 2011; Nixon and Burns, 2012). The literature has also interpreted accounting as an “integrated vernacular” (Nixon, 1998; Nixon et al., 2011), facilitating the communication among the NPD project’s participants as well as their coordination (Jørgenssen and Messner, 2010). Accounting also enables the unfolding of processes for innovation, intervening within the process and facilitating the unfolding of its trajectories (Christner and Strömsten, 2015; Revellino and Mouritsen, 2015). Further studies focussing on the balance between firmness/control/accounting and flexibility/creativity within product innovation processes (see Chapter 3, Section 3.6), on the role of accounting as mediating among different actors and domains within innovation realms (see Chapter 3, Section 3.7) and on the hybridization of the professionals’ accounting and non-accounting expertise (see Chapter 3, Section 3.8), considering hybridization as a process that may characterize innovation and NPD realms, have been reviewed. From this review, it emerged that firmness and flexibility, mediation and hybridization characterize processes of innovation and NPD. They engage different purposes and dimensions for innovation, the involvement of different domains and concerns, in which the actors have different aspirations, expertise and interests.

Moving from the motivation of this study (see Chapter 1, section 1.4 and Chapter 2, Section 2.6) and the messages that emerged from the literature reviewed (see Chapter 3, Section 3.9), the research objective of this thesis was outlined as follows: to examine and explain how accounting engages with the rationale for innovation in practice within the NPD process (see Chapter 4, Section 4.3). The research objective was planned to be achieved after having analysed firmness and flexibility, mediation and hybridization within the unfolding of the empirical NPD process and where the desires, intentions and motivations of the actors at work within the NPD setting, underpinning the rationale for
innovation, have the potential to emerge. Specifically, the three research questions were outlined as follows: 1. How does accounting engage with firmness and flexibility in processes of innovation in new product development? 2. How does accounting engage with the rationale for innovation through processes of mediation? 3. How does accounting engage with the rationale for innovation through processes of hybridization? (see Chapter 4, Section 4.4). The answers to these research questions and the interpretation of these answers through the theoretical framework of the thesis (detailed in Chapter 5) helped examine how accounting engaged, in practice, with the desires, intentions and motivations for innovation and, thus, achieve the research objective of the thesis.

With the purpose of collecting empirical material to be filtered and interpreted for examining the way in which accounting engaged with innovation in practice, an interpretivist philosophical stance was taken (see Chapter 6). Furthermore, an approach based on qualitative data and facts was adopted for this study. The thesis built on the single longitudinal case study of Beta, a facility in a company operating within the field of electronic device solutions. Beta constituted the company for the case study, where the specific project for the development of the new product Kappa was analysed with a focus on its accounting practices and their role in the unfolding of the process for innovation. For this purpose, documents, observations and interviews constituted the sources for an accurate data collection and detailed analysis.

The material collected within the empirical case of Beta described the observed practices (Schatzki, 2001a; 2001b; 2005) that unfolded during the development of the new product Kappa (see Chapter 7). Particular focus was based on how accounting practices were carried out during project Kappa. Since the beginning of project Kappa, the accounting performance of the new product in development was continuously monitored by the project manager through accounting practices, which involved frequent (monthly) updates of the project report. The accounting performance was analysed in light of the cost targets defined by the product manager within the PDD from Phase 2 of the project. The results of this analysis were periodically (monthly) reported to the senior managers at Beta during the active project global meetings. The accounting performance of the new product was also verified by the gatekeepers at the end of each phase of the NPD process. In practice, the accounting performance of the
new product Kappa was analysed through the use of the following accounting measures: labour and materials costs, which were periodically estimated and compared with their targets and updated within the project report. This occurred during the meetings that the project manager organized periodically, each month. Specifically, the project leader and the sourcing manager were involved in the estimation of the materials costs; whereas, the project leader and the manufacturing engineer were expected to participate in the meetings for the estimation and analysis of the labour cost.

Continuing to build on the material collected within the case, the empirical process for innovation featured in the new product, as observed within the context of project Kappa at Beta, was articulated as an unfolding of work in progress and prototypes that lead to the creation of a new product, i.e. Kappa, which did not fully fulfil the desires and the intentions for innovation of the project leader. The unfolding of project Kappa featured discussions and tensions between the project leader and other staff, which resulted in stimulating the creativity for innovation.

Through an analysis of the empirical material gathered to answer the three research questions, an understanding of how accounting facilitated innovation in practice during project Kappa began to emerge (see Chapter 8). More specifically, accounting enabled innovation by providing the project with firmness, which in turn engaged team in consideration of flexibility. In particular, the firmness of the accounting targets almost paradoxically constituted the source of flexibility for new opportunities of innovation. Different interests involved in the NPD process of Kappa were mediated through accounting. Accounting was in the middle of every conversation and reflection regarding the unfolding innovation. It was used to represent (Miller and O’Leary, 2007) and defend individual interests stemming from the disciplines and the functions of the staff involved, and to simultaneously challenge, or support, the intentions for innovation put forward by the project leader. In doing so, accounting intervened (Miller and O’Leary, 2007) within the process of innovation, by reinforcing, reinventing or sometimes rejecting the desires and the intentions for innovation of the project leader. In many instances outlined in this thesis this resulted in facilitating the unfolding of the process for innovation. Finally, the project leader hybridized his expertise with accounting in order to further affirm his ideal of innovation. The motivations of the other professionals involved in the project team led them to hybridize their expertise
with accounting to reinforce or question others’ interests for the unfolding innovation. As a result, accounting enabled innovation through involving a variety of participants from different backgrounds in the NPD process.

The answers to the research questions elaborated in Chapter 8 constituted the material for the achievement of the broad research objective of the thesis (i.e. to examine the way in which accounting engages with the rationale for innovation). Specifically, their interpretation, using the theoretical constructs presented in Chapter 5, framed the analysis for this purpose. The interpretation of the unfolding work in progress and prototypes of Kappa as epistemic objects (Knorr Cetina, 2001; Nicolini et al., 2012), engaging in relationships with the individuals involved in the NPD practices (Schatzki, 2001a; 2001b; 2005), allowed a deeper understanding of the unfolding process for innovation, and the underpinning desires, intentions, and motivations at stake, as well as the effects of firmness and flexibility on innovation, that stemmed from accounting. The theoretical concept of boundary object (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012), and its use in analyzing in detail how accounting engaged with the multidisciplinary context of the NPD process (Nicolini et al., 2012), helped to further understand how accounting engaged with the unfolding of innovation within the NPD process. Accounting mediated, in practice, among the heterogeneous interests of individuals (regarding the unfolding of the new product), who hybridized their expertise with accounting, having different ends and purposes for innovation. These interpretations and discussions were brought together through the theoretical idea of ductus (Carruthers, 1998; 2010), which was used to examine in detail how accounting engaged with innovation throughout the unfolding of the NPD process in practice.

To summarize, the theoretical interpretation of the empirical material collected for this study and the analysis of firmness and flexibility, mediation and hybridization featured within project Kappa facilitated an understanding of the way in which accounting engaged with the rationale for innovation in practice. Accounting, as a boundary object, sustained the process for innovation, leading the professionals to make choices and compromises among the multiple possibilities for innovation – engaged in through the iterative unfolding of epistemic objects. At the same time accounting challenged this process, questioning the choices and compromises achieved and opening up new possibilities for innovation. In doing so, accounting facilitated the process for
innovation within the NPD setting, sustaining and stimulating the diversity of interests at stake, as well as the tensions generated within the unfolding ductus of project Kappa, and determined and drove the course of innovation through the NPD.

10.3 Summary of the findings and conclusions of the study

Broadly, this study contributes to the literature by examining how accounting can drive and facilitate innovation in the course of the NPD process. This occurred in practice through accounting, which engaged with and drove the ductus (Carruthers, 1998; 2010; Busco and Quattrone, 2016) towards innovation for project Kappa, passing through the condition of perdition of the project leader, where many possibilities for innovation were generated with the unfolding of incomplete work in progress and prototypes – as epistemic objects (Knorr Cetina, 2001; Nicolini et al., 2012); and through accounting as a boundary object (Star, 2010; Nicolini et al., 2012). These elements allowed the professionals at work to manage opposing views, in which the different interests and purposes for innovation were often “in-tension” (Quattrone, 2015; Busco and Quattrone, 2016) but coexisted through accounting, which facilitated the choice of solutions for the new product Kappa to ultimately be commercialized. Over the course of this ductus, accounting, by mediating among professionals with different interests and purposes, did not only constitute the rational (from ratio: account, calculation – see Quattrone, 2015) aspect for innovation, since it attempted to rationalize innovation also through numbers, which were accounted for to the senior managers at Beta at the predetermined monthly reviews throughout the NPD process. Accounting and the firmness of its cost targets attracted the attention of the professionals with interests and purposes that were not reconciled in practice during project Kappa and, furthermore, it sustained the mediation within discussions and reflections among these professionals. Consequently, accounting facilitated the professionals in driving and making operational the unfolding of the work in progress and the prototypes, materialized throughout the ductus towards the realization of product innovation, which were adapted flexibly to the compromises achieved.

To conclude, the discussions of this study have made visible the central role of accounting throughout the ductus of project Kappa. The failure of accounting, as boundary object, in leading professionals to reconcile all the purposes and interests in practice underpinning their desires, intentions and motivations for innovation, “in-
tension” (Quattrone, 2015; Busco and Quattrone, 2016), generated temporary compromises among these professionals. The achievement of compromises enabled the unfolding of work in progress and prototypes – epistemic objects whose incompleteness, in turn, motivated further unfolding of innovation and the achievement of new compromises. This process would have developed indefinitely because of the incompleteness of the epistemic objects, which motivated this process and also because of the multiple interests and purposes that were not reconciled. The diversity of purposes was maintained within the ductus (Busco and Quattrone, 2016) and sustained through accounting, which played a mediating role. The ductus of project Kappa concluded through the project report, used by the senior managers at the final gate review of the NPD stage-gate process, despite the persistence of the desires and intentions for innovation of the project leader. At Beta during project Kappa, the mediating role of accounting allowed professionals to mark and drive the direction of the ductus, sustaining and maintaining the diversity of their interests and purposes, challenging their compromises and facilitating the unfolding process for innovation.

10.4 Contribution to the literature
This thesis commenced from an interest in enriching the literature by examining in detail how accounting engages with the desires, intentions and motivations of the actors involved in processes of innovation. The interpretation of the findings from this study, building upon the theoretical concept of ductus, contributes to the literature through adding a better understanding of the way in which accounting, by mediating among the tensions of the professionals at work, drives and facilitates the unfolding of the process for innovation and the achievement of the NPD objectives (see Section 10.3).

In this thesis, the accounting practices, the professionals involved (engineers, senior managers, operational staff), their interactions, and the (accounting) reports compiled and used during project Kappa were investigated and studied. By analysing the material gathered during interviews and on-site visits and interpreting it through the theoretical constructs (which were illustrated in Chapter 5), the contributions became clear. Specifically, the significant role of accounting in sustaining, challenging and facilitating the unfolding rationale for innovation emerged from the study of the interactions between the project leader and the other professionals involved from the early phases of the empirical NPD process, with particular focus on the tensions between the project
leader’s desires and intentions and other team members’ motivations. Accounting was revealed to be not only a ratio (Latin word which means account, calculation – see Quattrone, 2015) but also a facilitator of innovation, triggering and sustaining the continuous tensions at stake, and underpinning the unfolding rationale for innovation during the NPD process. In doing so, accounting clearly played a role in enabling and driving the realization and materialization of innovation. Although the NPD process reaches its end after the closure of Phase 5 and the commercialization of Kappa, the desires and the intentions for innovation have not been completely fulfilled.

The primary contributions of this study focus on the mediating role of accounting and the novel use and application of the concept of ductus in the NPD realm, which have facilitated understanding of the enabling role of accounting in the NPD process for a variety of participants from different backgrounds. Building upon the broad contribution to the literature in accounting and innovation and NPD as illustrated here, the contribution to specific strands of this literature are also clarified in detail below.

10.4.1 The contribution to the literature on management accounting, control systems and innovation

This study contributes to the specific strand of literature studying accounting and control within contexts of innovation and NPD (reviewed in Chapter 3). This literature has portrayed accounting and control as favouring innovation in “low innovating-firms” (Bisbe and Otley, 2004; Mouritsen et al., 2009). Control has been depicted in this literature as inspiring creativity in people by activating “intrinsic motivation, freedom, and autonomy to create” (Davila and Ditillo, 2013, p. 22; see also Chiang and Hung, 2014). Additionally, accounting and control have been considered to “reduce” innovation in “high-innovating firms” (Bisbe and Otley, 2004; Mouritsen et al., 2009; Bisbe and Malagueño, 2009). MCS have been portrayed as providing innovation activities and creative spaces with coordination and configuration (Davila and Ditillo, 2013; Chiang and Hung, 2014; Adler and Chen, 2011) that shape creativity into value (Tushman and O’Reilly, 1996; Brown and Eisenhardt, 1997).

The thesis complements this literature by examining the way in which accounting can, simultaneously, facilitate the professionals in making a choice by shaping innovation through evaluation of accounting performance of the potential possibilities for
innovation and, in doing so, trigger (inspire/extend) new possibilities for innovation in practice, within the same boundary of product innovation. The study of the relationship between accounting and the empirical unfolding of epistemic objects (work in progress/prototypes materializing innovation) and the empirical firmness and flexibility of the NPD process, which stem from accounting and as features in the process of innovation, help in the explanation of this contribution.

At Beta, the accounting figures in the project report facilitated professionals in making a choice among the multiple possibilities for innovation generated by the incompleteness of the developed work in progress/prototypes (epistemic object – Knorr Cetina, 2001; Nicolini et al., 2012) of Kappa. This choice stemmed from the achievement of a compromise among professionals during discussions and reflections mediated by accounting. The compromise was discovered to be temporary and promptly broken with the materialization of a new work in progress/prototype – still as a epistemic object (Knorr Cetina, 2001; Nicolini et al. 2012), whose incompleteness inspired the project leader to conceive of further possibilities for innovation, thus stimulating new desires, intentions, and motivations for innovation and renewing the rationale for innovation.

This finding, contrary to previous literature, demonstrates how accounting did not reduce innovation. On the contrary, the firmness of the accounting constraints, by shaping activities of the innovation process, opened up new possibilities for innovation. Even when a choice was made that was based on accounting data, this did not automatically either stimulate or close off the innovation process. The choice that was made and recommended to the team was challenged and questioned, leading to either reinforcing or changing the direction of the innovation process. To conclude, this thesis demonstrates how accounting is a means which triggers, challenges and sustains the process for innovation by continuously engaging with unfolding work in progress and prototypes, by alternatively stimulating and shaping/channelling choices towards feasible and pragmatic solutions. The contribution to the previous literature consists of identification in this thesis of the way in which accounting can shape the process for innovation without “reducing” innovation. Rather, accounting stimulates new opportunities for innovation by shaping pragmatic and feasible solutions within the process for innovation.
10.4.2 The contribution to the literature which portrays accounting as bringing together multiple parties within new product development

This study also contributes to the literature which recognises accounting as playing a “pivotal role” in bringing together and reconciling the multiple parties involved in the NPD process (Nixon, 1998; Nixon et al., 2011; Nixon and Burns, 2012). This literature also interprets accounting as an “integrated vernacular” (Nixon, 1998; Nixon et al., 2011), facilitating the communication among the participants in NPD projects.

The thesis complements these studies by providing insights in this case study in which accounting facilitates the materialization of innovation during the NPD process and inspires the team members to consider further possibilities for innovation, even though it does not lead to fully reconciling and build consensus among the interests of the multiple parties involved in the NPD process. This contribution builds on the answer to the second research question: how does accounting engage with the rationale for innovation through processes of mediation?, and on the interpretation of the mediating role of accounting within the ductus (Carruthers, 1998; 2010) for innovation through the theoretical concept of boundary object (Star and Griesemar, 1989; Bechky, 2003; Star, 2010; Nicolini et al., 2012).

Specifically, the contribution to the literature stems from the following findings. During project Kappa, accounting, in addition to playing a pivotal role which brought together multiple parties (Nixon, 1998; Nixon et al., 2011; Nixon and Burns, 2012), was revealed to be a boundary object (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012), which captured the attention of the multiple participants in the project, whose objectives were often “in-tension”. Accounting was used by these professionals in tracing the direction of the ductus (Carruthers, 1998; 2010; Busco and Quattrone, 2016) towards innovation. Specifically, the direction of the process for innovation was marked by the outcomes of the multi-disciplinary discussions and reflections in which the multiple interests and purposes of the professionals, “in tension”, were translated into the common language (Beckhy, 2003; Nicolini et al., 2012) of accounting, which allowed individuals to discuss and reflect on the unfolding innovation, regardless of achieving consensus among the team members (Star, 2010). Consequently, accounting facilitated temporary compromises and maintained momentum in the unfolding of innovation for the duration of the project. It accomplished this by mediating among the
multiple professionals involved, by sustaining their discussions and using their emerging tensions as triggers for additional innovation, which ultimately resulted in sustaining the NPD process towards a commercial product at its conclusion.

10.4.3 The contribution to the literature on firmness and flexibility within product innovation

This study also contributes to the literature concerning the dimensions of firmness and flexibility (reviewed in Chapter 3, Section 3.6) studied within processes of product innovation (Tatikonda and Rosenthal, 2000; Kamoche and Cunha, 2001; van der Meer-Kooistra and Scapens, 2008; 2015). This was possible having analysed and interpreted the answer to the first research question: how does accounting engage with firmness and flexibility in processes of innovation in new product development?

The literature has discussed the balance between firmness and flexibility within innovation contexts. Specifically, firmness/control/accounting and flexibility/creativity for product innovation are balanced and managed creating a “synthesis through the concept of ‘minimal structures’ ” (Kamoche and Cunha, 2001, p.733; van der Meer-Kooistra and Scapens, 2008; van der Meer-Kooistra and Scapens, 2015), a sort of template upon which creativity can be stimulated and coordinated by the parties participating in the development of the project. Within these minimal structures, “the parties could act (and re-act) flexibly” (van der Meer-Kooistra and Scapens, 2008, p.380; van der Meer-Kooistra and Scapens, 2015).

This study enriches the literature by highlighting how accounting simultaneously sustains firmness and triggers flexibility within the NPD process, facilitating the unfolding of innovation. During project Kappa, accounting, through the project report, and its accounting figures, provided firmness to the NPD process, in a sense guiding the team to make a choice from the almost endless possible solutions for innovation which would comply with the accounting targets set for the project at the outset. In doing so, accounting also generated flexibility, through discussions that led the team to favour new solutions for innovation during the development of the new product Kappa. In Beta, firmness and flexibility both stemmed from accounting and, contrary to previous literature, it did not require that they be managed and balanced within minimal
structures, or templates where “the parties could act (and re-act) flexibly” (van der Meer-Kooistra and Scapens, 2008, p.380).

During project Kappa the clear and definite accounting targets stated in the project report acted as constraints to the NPD process and underpinned the firmness (Tatikonda and Rosenthal, 2000; Kamoche and Cunha, 2001; van der Meer-Kooistra and Scapens, 2008) on which the stage-gate system and its periodical reviews were built. The incompleteness of the unfolding work in progress and prototypes – epistemic objects (Knorr Cetina, 2001; Nicolini et al., 2012) – coupled with updates of the project report and the accounting performance as reported – boundary objects (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012) – led professionals to generate and select choices from the various possibilities for innovation in a ritualistic manner, triggering further new possibilities for innovation among the team members and allowing the NPD process move forward.

Building on these findings, the contribution to the literature consists of demonstrating how the use of accounting allows firmness and flexibility to coexist throughout the unfolding ductus of project Kappa. Within the ductus accounting mediated among the multiple experts involved in the process of innovation, during their discussions, reflections and tensions, based on accounting. In doing so, accounting facilitated innovation without, however, requiring any type of intervention to balance firmness with flexibility as previously suggested in the literature (Tatikonda and Rosenthal, 2000; Kamoche and Cunha, 2001; van der Meer-Kooistra and Scapens, 2008; 2015).

10.4.4 The contribution to the literature where accounting is portrayed as mediating within innovation contexts

This thesis contributes to the existing literature (reviewed in Chapter 3, Section 3.7), which portrays the role of accounting as going beyond simply making something visible and considers accounting an instrument that mediates “between innovation concerns and firm-wide concerns” (Mouritsen et al., 2009, p.738; see also Miller and O’Leary, 2007). This literature likens accounting and its calculative practices to “engines involved in luring actors into doing new things by their ability to inspire them to ask new questions and to see new opportunities” (Revellino and Mouritsen, 2015, p.31) for innovation. This literature has also emphasized the “performativity” of calculative practices
(Revellino and Mouritsen, 2015), which enables an innovation trajectory (see also Christner and Strömsten, 2015). Accounting calculations mediate among different processes, actors, and domains, enabling the unfolding of innovation trajectories (Christner and Strömsten, 2015).

The thesis complements this literature on the mediating role of accounting by adding some clarification to accounting as sustaining mediation, in practice, within the realm of product innovation. This was possible through the analysis of the answer to the second research question: how does accounting engage with the rationale for innovation through processes of mediation?, and its interpretation through the theoretical concept of boundary object (Star and Griesemar, 1989; Bechky, 2003; Star, 2010; Nicolini et al., 2012).

In Beta, different objectives and interests at stake characterized project Kappa. In this project, accounting, as a boundary object, was used by these professionals to translate their interests for innovation and to challenge or sustain the unfolding of innovation as desired by the project leader. In doing so, accounting, in the form of costing within the project report, was in the middle of every conversation and discussion on the materialization of innovation. The accounting measures within the project report attracted the attention, the participation and the engagement of multiple professionals and were used to create a space for discussion and reflection where accounting sustained the diversity of the interests of the professionals involved throughout the ductus (Carruthers, 2010; Busco and Quattrone, 2016) for innovation.

These findings extend understanding of the mediating role of accounting, by interpreting accounting as playing the role of boundary object (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012) by attracting the attention of different professionals whose interests were not fully achieved in practice. Accounting data facilitated mediations among professionals “in-tension”, where consensus was absent, but where, after discussion facilitated by accounting reports, additional innovation was facilitated.
10.4.5 The contribution to the literature on the hybridization of the non-accounting expertise

The literature on processes of hybridization (see, among others, Miller et al., 2008), reviewed in Chapter 3, Section 3.8, has dealt with the hybridization of the accountants’ expertise (Caglio, 2003; Burns and Baldvinsdottir, 2005; Byrne and Pierce, 2007). The phenomenon of hybridization has also been explored by considering the “opposite direction” (Caglio, 2003) where non-accountants, and in particular, experts or professionals belonging to the operational functions of the organization (such as clinicians – see Kurunmäki, 2004, military officers – see Hyvönen et al., 2009), also deal increasingly with accounting practices. The hybridization of the non-accounting professionals, allows these professionals to widen and enrich their functional activities and practices by gaining access to the professional field of accounting (Miller et al., 2008; Caglio, 2003; Kurunmäki, 2004; Hyvönen et al., 2009).

This thesis complements the literature on the hybridization of the non-accounting professionals’ expertise with accounting, by studying hybridization processes within the specific setting of the NPD context. It highlights how hybridization of expertise, involving various professionals within the same boundary of product innovation, can facilitate innovation processes. The contribution to this literature stems from the analysis of the answer to the third research question: how does accounting engage with the rationale for innovation through processes of hybridization, and the interpretation of accounting as a boundary object (Star and Griesemer, 1989; Bechky, 2003; Star, 2010; Nicolini et al., 2012).

During project Kappa many professionals expanded and combined their specific functional expertise with accounting. These professionals were attracted by accounting and the possibility to translate their functional interests through a language that other experts could understand. Consequently, accounting was not seen by these professionals, who participated in the accounting practices for project Kappa, as a threat to innovation. On the contrary, it was part of the underpinning of the innovation process, and non-accountants, e.g. engineers, carried out these accounting practices and discussions regularly with the other NPD practices.
Building upon this finding, the contribution to the literature consists in identifying the relevance of accounting, as a boundary object, underpinning and mediating between the multiple discussions and conversations among different (non-accounting) experts. As a result, accounting enabled the participation of a variety of professionals in the process for innovation. To conclude, the contribution to the literature on hybridization was supported by the study of accounting as a boundary object that constituted the means for allowing cross-functional collaboration to happen, as well as the means for translation of the multiple interests of actors at stake, who had different purposes and concerns for innovation. Additionally, since these multiple interests/purposes/concerns for innovation were not fully achieved in practice, accounting continued to attract the attention of the professionals whose diversity of expertise triggered tensions which motivated discussions for the unfolding of the NPD process.

10.5 Contribution drawing on the theoretical framework
The theoretical concepts used to frame the material collected for this study have contributed to the examination and better understanding of how accounting engages with the rationale for innovation in practice during the NPD process and thus constitute a contribution to the literature (see Section 10.4 above). The use of these theoretical constructs, in particular the novel adoption of the concept of ductus in the NPD context in framing the empirical material, has increased understanding of the ways in which accounting drove and assisted in the unfolding process of innovation for the new product Kappa. By using these theoretical concepts, this research also contributes to the accounting literature by offering theoretical ideas that can be applied to studies that investigate the relationship between accounting and innovation through the adoption of a case study.

The concepts of the theoretical framework for this study have facilitated and generated understanding, reflections and interpretations regarding the role of accounting and its interplay with the rationale for innovation, as sustained by the desires, the intentions, and the motivations of the actors at work within the NPD process. The empirical NPD process of project Kappa was studied describing and interpreting its unfolding practices (Schatzki, 2001a; 2001b; 2005), including accounting practices. The unfolding process for innovation featured in project Kappa was interpreted by introducing the concept of an epistemic object (Knorr Cetina, 2001; Nicolini et al., 2012). The role of accounting
in these contexts was analysed and discussed, adopting the concept of a boundary object (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012). The adoption of the concept of ductus (Carruthers, 1998; 2010; Busco and Quattrone, 2016) supported the analysis of the process for innovation in practice within the NPD realm and, furthermore, how accounting determined the movement, the flow and the directions of this ductus (Carruthers, 2010) for innovation.

The novel use of the theoretical concept of ductus stimulated attention towards certain points (*punctus* – Carruthers, 1998) of the NPD process in which discussions and reflections among professionals, mediated through accounting, allowed tracing of the direction of the process for innovation. Accounting facilitated professionals, who had interests and purposes “in tension”, to manage the almost infinite possibilities for innovation of Kappa, which were generated by the incompleteness of the unfolding work in progress/prototypes, i.e. epistemic objects (Knorr Cetina, 2001). Accounting, interpreted as a boundary object, also stimulated the professionals’ motivation and participation in dealing with opposite visions, interests and purposes “in tension” (Quattrone, 2015; Busco and Quattrone, 2016). Accounting also led professionals to achieve a solution at the end of the ductus (Busco and Quattrone, 2016), despite the persistence of these tensions.

The study of the points of the ductus (*punctus*, Carruthers 1998; 2010), namely the spaces for reflection and discussion, and the role of accounting within these spaces, was crucial to support interpretation of how accounting mediated, sustained, challenged and facilitated innovation as featured in the new product Kappa. Specifically, the interpretation of accounting as a boundary object (Star, 1989; Star, 2010; Nicolini et al., 2012) within the ductus contributed to a deeper understanding of how accounting engaged with the rationale for innovation among the multiple interests and purposes “in tension” (Quattrone, 2015; Busco and Quattrone, 2016), and how accounting itself underpinned and stimulated the tensions (Quattrone, 2015; Busco and Quattrone, 2016) for innovation.

The interpretation of the role of accounting as a boundary object (Star and Griesemar, 1989; Star, 2010; Nicolini et al., 2012), which facilitated and challenged the collaboration among the multiple parties within project Kappa, offered a clear idea of
the role of accounting within the multiple purposes and interests at stake, thereby creating a valuable space in which to develop and question the rationale (intentiones and in-tentiones – see Quattrone, 2015) for innovation. Moreover, the concept of an epistemic object (Knorr Cetina, 2001; Nicolini et al., 2012), relied upon here to interpret the unfolding work in progress/prototypes of the NPD process, facilitated understanding of the desires and the intentions underpinning innovation that emerged from the incompleteness of these objects, as well as of the motivations emerging from the multi-disciplinary collaboration of the experts involved, which simulated the composition of innovation throughout the ductus towards innovation.

10.6 Contribution to practice

As stated in chapter 7, section 7.8, accounting constraints initially appeared to limit the creativity for innovation, influencing and conditioning the choices and the creative ideas of the engineers (especially the project leader) for innovation of product Kappa. This research has shed light on those situations in which these possible limitations to innovation were converted instead into stimuli and opportunities for enhancing and extending the search for innovation. In particular, this study has explained and focussed on how the limitations stemming from the firmness of the accounting targets can be converted, in practice, into flexible opportunities for innovation during the NPD process.

It is acknowledged that the accounting reports showing adverse results, such as a product’s cost being higher than the target, present opportunities for the team to further engage with accounting to address this issue. When this occurred in Kappa, it opened up a space in which additional creative ideas about the new product were generated in order to enhance innovation. By relying on this role of accounting and by extending these implications to the realm of practitioners, this study recognises the importance of considering the effects of actions aimed at addressing difficulties in managing adverse accounting data generated in an effort to adhere to the firmness of the cost constraints. From discussion of the negative accounting results by a multidisciplinary team, new opportunities for innovation can potentially emerge.

This study also recognizes the importance of the repetitive meetings and practices used to update the accounting report, e.g. the project report as used for cost control, in
stimulating, motivating and directing the actors in practicing accounting and striving to achieve the cost targets during the process of innovation. This is demonstrated by the professionals on team Kappa in Beta, who often used accounting to manage discussions and reflections on the materialization of innovation. Therefore, it is suggested that it may be useful to ritualize accounting practices within the NPD setting to make professionals on a regular basis to generate accounting reports which may then be used to facilitate discussion among the NPD team. Such discussion may also make NPD team members more aware of the effect that their actions have on the accounting results as inscribed on accounting reports generated during the NPD process.

Within the empirical case of Beta, accounting was practiced and managed by engineers, e.g. the project manager, the project leader and the other technical and engineering staff involved within project Kappa, who hybridized their expertise (in Project Management, Engineering and Manufacturing) with accounting. At Beta, the management accountants did not participate in the NPD process. They did not practice accounting or control for any of the new products in development at Beta. Rather, the management accountant was almost totally involved in accounting, financial, and invoicing activities relating to commercialised products. The findings of this study demonstrate that when accounting is practiced and managed by people who are practically and technically involved within the execution of the NPD process, accounting itself is merged in the everyday technical discussions and collaborations aimed at developing work in progress and prototypes. Accounting is owned by the people actively involved in finding solutions to innovation dilemmas, thus contributing to the unfolding of the process of innovation. These considerations lead to an additional contribution to the realm of practitioners in NPD settings who are advised to engage and involve the professionals in charge of the technical development of a new product in accounting practices. The engagement of accounting within the practical activities for innovation may generate multi-disciplinary discussions and tensions, which, when mediated through accounting, may also contribute to the unfolding process for innovation.

During project Kappa, accounting was used to defend the interests at stake within NPD, and helped in finding solutions when tensions among different and conflicting interests arose. By mediating among the diversity of purposes within the project, accounting acted as a constraint as well as a stimulus for new, feasible solutions for innovation.
Therefore, this study suggests that practitioners who deal with NPD processes should not perceive accounting as a threat to innovation or a limit to the possibilities for innovation. If the stakeholders of the process abandon this prejudice and, instead, actually hybridize their expertise with accounting practices by combining accounting practices with their disciplinary practices and with their interests, it may be possible to make accounting data generate source and means of mediation with the other parties involved. In this way embracing accounting practices may contribute to the unfolding of innovation in practice.

10.7 Limitations
This thesis and its key contributions should be read also in light of the limitations of this study. The use of a single, interpretivist case study does not allow space for generalizations of what happened in Beta and of the role of accounting within this empirical NPD process. However, this was never the intention for this research. In fact, far from wishing to offer generalizations regarding what happened during project Kappa, this thesis was aimed at analyzing and examining in detail the way in which accounting engaged in practice with the rationale for innovation, through the multiple interests and purposes “in tension” for innovation within the practical context of an NPD process. The complexity of NPD, and the multiple relationships and interactions among the social actors within this process (Cooper, 1990; 1996; Akrich et al., 2002a; 2002b), would be overlooked if the complexity of this world were “reduced entirely to a series of law-like generalisations” (Saunders et al., 2009, p.115). Through the interpretivist philosophy, this research was conducted with the purpose of interpreting and understanding the humans, their roles as social actors and how these actors interpreted the different situations and events occurring during the NPD process (Ryan et al., 2002; Saunders et al., 2009).

Furthermore, in conducting this research, it was not expected that results would be produced, which could be replicated exactly if another researcher decides to study the same organization, or which could be generalized to all organizations. At a minimum the temporal dimension would be different, as would the bias introduced by asking the same team the same questions that they had already been asked as part of the data gathering for this thesis. Rather, the task here was “to explain what [...] was going on [...] in the] particular research setting” (Saunders et al., 2009, p.158), by analyzing and
Chapter Ten: Conclusions

explaining in detail the results and the conclusions drawn, having formed a coherent link between the problem identified in the literature, the research objective articulated, the methodology adopted and the data gathered and analysed.

A limitation of this thesis may also concern the collection of qualitative data and a possible accidental subjective interpretation by the researcher. In this regard, the best was done to avoid this, through careful work supported by different sources of evidence: interviews, documentation and direct observations.

The use of the theoretical concepts for this study may be considered relatively new in the studies of accounting related to processes of innovation and NPD. The interpretation of the process for innovation within the NPD realm and the interplay with the unfolding accounting practices through the theoretical ideas of ductus (Carruthers, 1998; 2010), epistemic object (Knorr Cetina, 2001; Nicolini et al., 2012) and boundary object (Star and Griesemar, 1989; Beckhy, 2003; Star, 2010; Nicolini et al., 2012) have offered new insights into the role of accounting within innovation and NPD realms. The limitation in using these constructs may consist of the weak familiarity of the reader with these theoretical ideas. However, every effort was made to provide a clear explanation of these concepts (in Chapter 5) and present a comprehensible link with the empirical material (in Chapter 9), with the final purpose of making clear the key contributions of this study (in this chapter).

10.8 Future research

Concerning future research, this study was based in a setting in which the accounting practices were not carried out by management accountants in the NPD process, but rather by engineers using accounting practices. It would be interesting to complement this study with a further case study in which accountants actively participate in the NPD process. This different scenario would permit an analysis of possible changes, if any, in the interplay between accounting and innovation, and the role of accounting with respect to the management of the different interests and purposes at stake within the NPD process.

Moreover, recent studies in project management have introduced alternative methodologies for the development of new products that are more flexible and, in some cases, less connected to the pre-structured stage-gate model. It would also be interesting
to see studies carried out that interpret the role of accounting into a more flexible context, devoid of the firmness represented by predetermined reviews, structures and constraints, and possibly involving the use of the same theoretical approach, in order to see how the NPD ductus would move between boundary and epistemic objects, how it would unfold and how a solution would be achieved (if at all) at the end of the process.

In this study the rationale for innovation has been conceived of as underpinned by the desires, intentions, and motivations for innovation of the multiple professionals at work, who have different interests and purposes for innovation. It would also be interesting to conduct a study investigating the interplay between accounting and the rationale for innovation to discover whether the rationale for innovation within the NPD process is underpinned by the same concepts as conceived of for this study.

Finally, this study has focussed on one of the three traditional constraints to be considered when developing projects (see Atkinson, 1999), i.e. the cost constraint, and how the NPD practices engaged with the accounting practices aimed at developing a new product that also fulfilled this constraint. Recent project management literature, e.g. Shenhar and Dvir (2007) and Turner et al. (2007), have highlighted how the success of a project depends on many other criteria, such as project efficiency, impact on the customer, on the team, business results, preparation for the future. Given the flexibility, the uncertainties, the contingencies characterizing projects of innovation and NPD, a study of the role and the impact of accounting with a focus on these aspects characterizing projects of innovation could be considered for future research.
References


Appendices

Appendix A: The summary/agenda of the presentation during the first case visit in Beta

AGENDA

- The meaning of a PhD
- An overview of my PhD course
- The ambitions of the PhD student
  - My supervisor’s career as a model
- The nature of this specific PhD thesis
- The access needed to carry out the case study
- The possible relationships between the PhD student and the case study

Comments, questions, observations?

Appendix B: An example of a completed template of the data analysis process

- Matrix 1: Data Reduction

<table>
<thead>
<tr>
<th>Data</th>
<th>Interviewee</th>
<th>Document</th>
<th>Observation</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Company Beta is provided with an R&amp;D department dedicated to the development of new products</td>
<td>Manager PMO</td>
<td>Slides presenting the business of the company Beta</td>
<td>The tour of the company</td>
<td></td>
</tr>
<tr>
<td>The NPD follows a stage-gate model</td>
<td>Project Manager</td>
<td>Document describing the formal NPD process; two documents detailing the expected inputs, tasks and outputs of each phase of the NPD process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The project manager is thinking of introducing a new methodology for project management within the case</td>
<td>Project Manager</td>
<td>Document describing the formal NPD process; two documents detailing the expected inputs, tasks and outputs of each phase of the NPD process</td>
<td>A board within the laboratory.</td>
<td></td>
</tr>
<tr>
<td>The stage-gate model is made up of five phases: Concept, Feasibility and Planning, Design, Qualification, Pre-production</td>
<td>Project Manager</td>
<td>The document describing the formal NPD process; two documents detailing the expected inputs, tasks and outputs of each phase of the NPD process</td>
<td>The same process employed for project Kappa</td>
<td></td>
</tr>
<tr>
<td>The passage from one phase to the following phase is determined through the signing of checklists by members of Top Management</td>
<td>Project Manager</td>
<td>The five Phase Checklists</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The project team is composed of people belonging to the following functions: Marketing, Engineering, Operation.

They are located in different offices/laboratories.

The management accountant is not involved in the NPD process and the accounting practices are carried out by the engineers within the team.

Indeed it was not cited when informed of the team members’ list.

The Marketing prepares the product description document where the functional requirements and the accounting targets for the new product are synthesized.

Meetings were arranged to revise the targets. These meetings involved the Marketing and Engineering staff.

... the product description document lists all the requirements to develop the product, from the technical to the accounting goals. This document also includes a recommendation to develop new technologies for Kappa, so as to fulfill the technical requirement goals of the company.

- Matrix 2: Data Display

<table>
<thead>
<tr>
<th>The Company</th>
<th>The general NPD process</th>
<th>The process for the development of Project Kappa</th>
<th>Accounting during Project Kappa</th>
<th>The staff dealing with accounting</th>
<th>Tensions generating discussions and reflections</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Company Beta is provided with an R&amp;D department dedicated to the development of new products</td>
<td>The NPD follows a stage-gate model</td>
<td>[... the marketing senior manager and the product manager] know how it works in the laboratory. However, in this case they have prepared a product description document where the cost target and the technical requirements</td>
<td>The management accountant is not involved in the NPD process and the accounting practices are carried out by the engineers within the team</td>
<td>[... the marketing senior manager and the product manager] know how it works in the laboratory. However, in this case they had prepared a product</td>
<td></td>
</tr>
<tr>
<td>The stage-gate model is made up of five phases: Concept, Feasibility and Planning, Design, Qualification, Pre-production</td>
<td>cannot be fulfilled simultaneously!</td>
<td>description document where the cost target and the technical requirements cannot be fulfilled simultaneously!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[... the product description document] lists all the requirements to develop the product, from the technical to the accounting goals. This document also includes a recommendation to develop new technologies for Kappa, so as to fulfil the technical requirement goals of the company.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The passage from one phase to the following phase is determined through the signing of checklists by members of Top Management</td>
<td></td>
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</tr>
<tr>
<td>The project team is composed of people belonging to the following functions: Marketing, Engineering, Operation</td>
<td></td>
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</tr>
<tr>
<td>The Marketing prepares the product description document where the functional requirements and the accounting targets for the new product are synthesized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- **Preliminary Conclusion and Verification**
  - The NPD process is structured around phases, with predetermined checklists to be signed before moving from one phase to the following one. This may recall the literature on the dimensions of firmness and flexibility within processes of innovation.
  - During the NPD process the management accountant does not deal with the accounting practices. These practices need to be carried out to analyze the cost of the new product in development versus the target. The engineers within the team use accounting.
  -> This may recall the literature on the processes of hybridization of non-accountants dealing with accounting.