An Empirical Study of the Influence of Formalized Management Control Systems on the Use of Open Innovation Practices

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ABSTRACT

Motivated by a shift in innovation thinking from closed to open innovation (Chesbrough, 2003b), this thesis aims to provide empirical insights into the influence of formalized management control systems (MCS) on an organization's use of open innovation practices. This was done by analysing the organizational rules and routines of organization members in relation to an organization's innovation practices. Using three case studies where data was collected through semi-structured interviews and document analysis, this study addresses the research question: *can formalized MCS influence the use of open innovation practices in a firm?*

Using an extended theoretical framework that builds on the institutional framework of Burns and Scapens (2000), this study found that the influence that formalized MCS have on the use of open innovation practices in a firm is dependent on two key factors:

1. The nature of the formalized MCS. That is, whether the formalized MCS are coercive in nature, forcing the project level organization members to act as prescribed by top management through the formalized MCS; or whether the formalized MCS allow the project level organization members to act according to their own understanding of the situation.

2. Whether the perspectives of project level organization members in relation to the use of open innovation practices are consistent with the perspectives of top management.

The evidence from the case studies shows that formalized MCS helped transform the routines of organization members in relation to the use of open innovation practices where the project level organization members were forced to act as prescribed by top management through the use of coercive formalized MCS. Furthermore, the evidence shows that the formalized MCS

helped support the use of open innovation practices or alternatively deterred the use of these practices, where, despite having the option to act otherwise, the project level organization members' routines encoded the formalized MCS. This was because the project level organization members' perspectives were consistent with the top management's perspectives which were enacted in the formalized MCS.

Alternatively, where the perspectives of the two groups of organization members were inconsistent, the routines of the project level organization members tended to be decoupled (or at best loosely coupled) from the formalized MCS. This was because the project level organization members acted according to how they believed was most appropriate for the situation they were in. These decoupled routines may improve performance in the firm as seen in the Fisher & Paykel Healthcare (FPH) case study. In this situation top management decided not to change the formalized MCS as changing the formalized MCS may have destabilized the routines and created inefficiencies. On the other hand, the decoupled routines may be seen to be counter-productive as shown in the evidence from Zespri. In this case, top management was forced to coerce the project level organization members to act differently. The top management at Zespri did this through changes to some of the formalized MCS, which were coercive in nature and restricted the action choices available for the project level organization members.

In addition to presenting an extended theoretical framework that builds on previous research, this thesis contributes to the MCS literature by showing how formalized MCS can help with the management of inter-firm relationships in an innovation setting. The findings in this thesis show how the formalized MCS enables the use of inter-firm relationships in a firm by creating a culture that is conducive to external collaborations. Moreover, it shows how the formalized MCS help facilitate effective communication between the organization members of the partnering firms which allows the project teams to deal with issues in a timely manner.

Finally, the evidence from this study contributes to our understanding of the processual view of change, where a change to formalized MCS does not always constitute a corresponding change in the practices of other organization members as expected by those initiating the change. For instance, in Coloplast, the top management implemented formalized MCS supporting open innovation practices with the expectation that project level organization members would change their approach to external collaborations and embrace the open innovation model. However, a change in actual innovation practices was not observed except for where the organization members were coerced to carry out activities in line with the changes implemented by top management. However, the changes led to other improvements in the firm that were not initially intended. The evidence presented in this thesis is in line with the findings from previous studies (Busco, Quattrone, & Riccaboni, 2007; Mouritsen, 2005; Quattrone & Hopper, 2001) that suggests that organizational changes are non-linear. Hence, to understand the process of change requires research to look at how the formalized MCS have changed as well as how the formalized MCS change actual organizational practices.

DEDICATION

I would like to dedicate this thesis to the following people whom I treasure most in my life:

My parents

Satish and Sushil Narayan

My best friend and husband

Sumon Biswas

My two brothers

Sanjay and Sandeep

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ABBREVIATIONS

ABC	-	Activity Based Costing
CEO	-	Chief Executive Officer
CPAP	-	Continuous Positive Airway Pressure
F&P	-	Fisher and Paykel Appliances Holding Ltd
FPH	-	Fisher and Paykel Healthcare Corporation Ltd
IAF	-	Innovation Advisory Forum
IP	-	Intellectual Property - this refers to the protection acquired for innovations, for example, patents
MCS	-	Management Control Systems
NDA	-	Non-Disclosure Agreement
NIH	-	Not Invented Here Syndrome
NIS	-	New Institutional Sociology
NPD	-	New Product Development
OIE	-	Old Institutional Economics
OSA	-	Obstructive Sleep Apnea
P&G	-	Procter & Gamble
PVR	-	Plant Variety Rights - this is the plant version of patents (IP) for the new cultivars)
R&D	-	Research and Development
ROI	-	Return on Investments
TCE	-	Transaction Cost Economics
US	-	United States of America
VP	-	Vice President

CHAPTER 1. INTRODUCTION

1.1. INTRODUCTION

The objective of this thesis is to provide empirical insights into the influence of formalized management control systems[1] (MCS) on an organization's use of open innovation practices[2]. It does this with reference to how the actions of organization members leads to a change in or continuation of the particular organization's practices following changes in the field from closed to open innovation thinking. The specific research question for this thesis as discussed below is:

Can formalized MCS influence the use of open innovation practices in a firm?

This question is examined in three different firms through the use of individual case studies during which semi-structured interviews and document analysis were used, in line with an interpretative research methodology as discussed in Chapter 3.

Focusing on the micro-processes around the innovation function, this thesis aims to contribute to our understanding of a processual view of change in an open innovation setting by extending the past MCS research which uses institutional theory to explicate the process of change as opposed to being outcome oriented (Burns & Scapens, 2000; Inês, Maria, & Robert, 2009; Modell, Jacobs, & Wiesel, 2007; Sharma, Lawrence, & Lowe, 2010). This is done through detailed discussions with organization members at different hierarchical levels about organizational practices.

[1] In this study, MCS are defined as "the procedures used by management to facilitate the attainment of their goals and those of the organisation" (Kober, Ng, & Paul, 2007, p. 426)
[2] Open innovation is when organizational members in the innovation team seek input from somebody who is not from inside the company as part of their innovation project. Refer to Chapter 2 pages 16-18 for a more detailed explanation of this concept as well as pages 26-28 for a discussion on the working definition of open innovation for this thesis.

The structure of the remainder of this chapter is as follows. The next section discusses the motivation for this study highlighting the change in current innovation thinking which shows that firms are moving from a closed innovation approach to more open collaborative innovation practices. Section 1.3 discusses the purpose and objective of this study in more detail. Section 1.4 outlines the underlying research question as well as discusses the sub-research questions used to guide the data collection process. Section 1.5 briefly explains the research design, which is followed by a discussion on the relevance of this study in Section 1.6, and the final section concludes this chapter with an outline of the structure of the thesis.

1.2. MOTIVATION FOR STUDY

In today's competitive business environment fuelled by deregulations that have led to increased globalization as well as developments in communication technology and the increased availability of venture capital funding, changes in organizational practices are inevitable to maintain sustained competitive advantage. However, as suggested by Teece (2007), the scale and scope of advantages attained in traditional areas such as quality improvements, cost control, and inventory management no longer suffice for long-run competitive success. Teece (2007, p. 1346) states,

> "*Success requires the creation of new products and processes and the implementation of new organizational forms and business models, driven by intensely entrepreneurial genre of management constantly honing the evolutionary and entrepreneurial fitness of the enterprise*".

Consequently, innovation[3] has become a critical activity for many companies (Davila, Epstein, & Shelton, 2006), and managing innovation has become a key strategic task facing organizations of all shapes, sizes and sectors (Bessant, 2003).

This study is motivated by a change in innovation thinking from a closed (internal) innovation process to a more open (external and collaborative) approach. That is, practice-based research suggests that firms should move from an innovation process where all activities are kept in-house to protect inventions from outsiders, to more open collaborative innovation practices (Chesbrough, 2003b; Chesbrough, Vanhaverbeke, & West, 2006; Enkel, Gassmann, & Chesbrough, 2009; Gassmann, Enkel, & Chesbrough, 2010; van de Vrande, de Jong, Vanhaverbeke, & de Rochemont, 2009; Vanhaverbeke, Vrande, & Chesbrough, 2008). By using open innovation practices, a firm seeks to leverage the expertise of external parties during their innovation process in order to improve the returns on their investment in innovation activities (Chesbrough, 2003b; Chesbrough & Crowther, 2006; Chesbrough et al., 2006; Chiaroni, Chiesa, & Frattini, 2011; Innovaro, 2006). Hence, these firms are effectively searching for and subsequently integrating external technologies and know-how into their innovation processes. This practice leads to the formation of inter-firm relationships that require a mutual and synergistic pooling of resources and capabilities and a substantial degree of commingling between partners in terms of people, systems, and skills to attain their objectives (Madhok & Tallman, 1998).

Early open innovation literature suggests that the use of open innovation practices is beneficial for firms as it can highlight new revenue streams, reduce costs and support the firm forming strategic partnerships (Chesbrough, 2003a, 2003b, 2006a, 2006b, 2007; R. G. Cooper & Edgett,

[3] In this thesis innovation is defined as "*the total set of activities leading to the introduction of something new* (meaning new to a particular firm), *resulting in strengthening the defendable competitive advantage of a company*". In other words, it includes all types of innovation such as new products, new markets, new technologies and new organizational forms (van der Meer, 2007, p. 192).

2007; Huston & Sakkab, 2006; Innovaro, 2006). However, more recent empirical studies found that these collaborative practices are not always welcomed by everyone in the firm. Thus, firms face challenges including internal resistance to change, external partner search issues, and the management of inter-firm relationships that hinder their efforts in adopting the continual use of these new practices (Chesbrough & Crowther, 2006; Chiaroni et al., 2011; van de Vrande et al., 2009; van der Meer, 2007). Despite these challenges being highlighted, there is little research that has examined how open innovation should be implemented in practice (Chesbrough et al., 2006; Chiaroni et al., 2011). An exception to this is Chiaroni et al. (2011) who suggest that the implementation of open innovation is a multi-phase organizational change process that requires managerial and organizational levers for innovating firms to act upon to streamline their journey to the institutionalization of these new practices. In other words, to provide guidance on how to implement open innovation, one first needs to understand the organizational change process for the institutionalization of open innovation in a firm.

The observations from Chiaroni et al.'s (2011) study are consistent with the management control systems (MCS) literature that has looked at inter-organizational relationships (Caglio & Ditillo, 2008; Meira, Kartalis, Tsamenyi, & Cullen, 2010). These studies also suggest that to deal with the challenges relating to inter-organizational relationships, firms need to make intra-organizational changes. They suggest MCS are useful tools to facilitate these (Chenhall & Euske, 2007; Dambrin, Lambert, & Sponem, 2007; Ezzamel, Lilley, & Willmott, 2004; Henri, 2006). Therefore, this overlap between the two literatures has motivated this study to draw on the MCS literature to respond to the calls from the open innovation researchers for further studies to analyse intra-organizational changes that allow the implementation of open innovation practices (Chesbrough et al., 2006; Chiaroni et al., 2011). The following section outlines the specific objective of the study that will be addressed in this thesis.

1.3. OBJECTIVE OF THE STUDY

MCS literature based on institutional theory recognises that external institutions can be important in shaping an organization's MCS (Scapens, 2006), which can influence the everyday actions of the organization members. These studies suggest there is an inter-dependent relationship between an organization's MCS (which are conceptualized as the rules and routines of the firm)[4] and the actions of organization members. That is, while the use of MCS influences the actions of organization members, the effect of the MCS is dependent on how the organization members use them (Burns & Scapens, 2000).

Hence, as suggested by Mouritsen (2005), understanding organizational transformations or the organizational change process requires research to be undertaken at the level of how organization members use MCS to drive change and how MCS influence the actions of organization members to transform organizational practices (Marginson, 2002; Quattrone & Hopper, 2001).

Therefore, the objective of this thesis is to gain a theoretical understanding and provide empirical insights into the influence of formalized MCS on a firm's use of open innovation practices. As discussed in Chapter 2, there are many definitions of MCS. This study adopts the definition of Kober et al. (2007) as described in footnote 1, who argue MCS is a mixture of formal and informal procedures. However, given the time and case site access limitations, the scope of this study is limited to understanding the impact of formal procedures[5] on the use of open innovation practices in a firm as outlined in the research question below.

[4]This thesis uses Burns and Scapens (2000, p. 6) definitions of rules and routines whereby rules are defined as "*the formally recognized way in which things should be done"* while routines are defined as "*the way in which things are actually done*".

[5]This approach is consistent with Simons' (1995, 2000, 2008) view that MCS are formal procedures that managers use to maintain or alter patterns in organizational activities. As discussed in Chapter 3, this study conceptualizes formalized MCS using Simons (1995) levers of control framework.

1.4. RESEARCH QUESTION

The above objective of this study can be restated in the following research question:

Can formalized MCS influence the use of open innovation practices in a firm?

To address this question and structure the data collection efforts, the multi-tiered sub-questions as outlined in Figure 1-1 were formulated using the extended theoretical framework, which is discussed in Chapter 3.

The first sub-question is: *have the formalized MCS changed to enable or support open innovation practices*? Based on Sawabe and Ushio's (2009) argument that formalized MCS constitute the institutions in the firm, which represent the globally shared rules that tell organization members who they are and how they should behave. In other words, this question is asking whether the rules in the firm have changed to embrace the open innovation practices. This question leads to the following sub-questions:

- *If the formalized MCS have changed, how have they changed and why have they changed?*
    - *Have these changes influenced the routines and everyday actions of the project level organization members?*
        - *If the routines have changed, how and why have they changed?*
        - *If they have not changed, why have they remained stable?*
- *If the formalized MCS have not changed, why have they not changed, that is, why have they remained stable?*
    - *Have the routines and everyday actions of the project level organization members changed, even though the formalized MCS have remained stable?*
        - *If the routines have changed, how and why have they changed?*

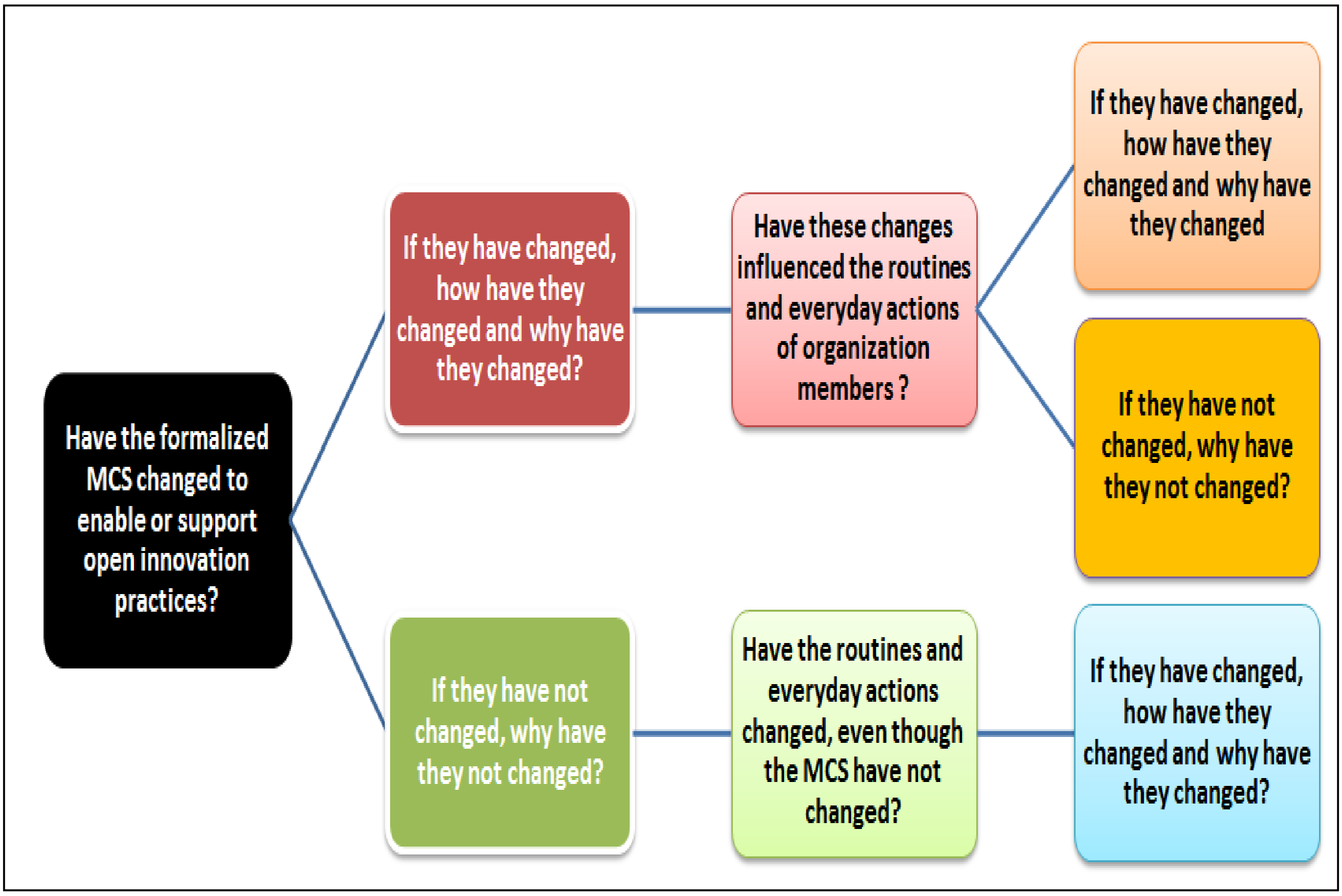

Figure 1-1: Sub-research questions

1.5. RESEARCH DESIGN

The focus of this study is on the micro-processes around the innovation function with the aim of understanding the formalized MCS that might influence the actions of organization members directly involved in innovation practices. This study draws on institutional theory, which has been used by MCS studies to explicate micro-processes within an organization (e.g. Burns, 2000; Sharma et al., 2010). Traditionally, institutional theorists have focused on the study of stability and isomorphism (DiMaggio & Powell, 1983; Scott, 2001; Scott & Meyer, 1991) and have been largely silent about specific mechanisms of choice and the circumstances under which changes are influenced. However, there is a growing body of MCS literature that takes a processual view of change (Burns & Scapens, 2000; Inês et al., 2009; Lukka, 2007; Modell et al., 2007; Sharma et al., 2010) where institutional theory is used to explicate the process of change.

This thesis aims to extend the institutional literature and thus contribute to our understanding of a processual view of change in an open innovation setting.

In line with an interpretative research methodology, a multiple case study method has been chosen with a replication logic to gain additional insights, as opposed to a sampling logic where multiple cases are simply seen as multiple respondents in a survey (Yin, 2003, 2009). In this thesis, three case studies (Fisher & Paykel Healthcare (FPH), Coloplast and Zespri) are examined. Each case study looks at a firm that is at a different stage of moving to an open innovation approach. The background information for the case studies is documented in the individual case study chapters that is, Chapters 4, 5 and 7 respectively.

Data for the study was collected using semi-structured interviews and archival document analysis, while Nvivo was used to analyse the data using a thematic approach that grouped data into themes that emerged from the interviews. The questions to guide the semi-structured interviews were constructed from the sub-research questions outlined above and example questions are included in Appendix 2. The data from each case site were first analysed individually, that is within-case analysis, and then a cross-case analysis was also performed for two of the case sites that belonged to the same industry (i.e. FPH and Coloplast) to identify the similarities and differences between them. Based on the argument that creative insights often arise from the juxtaposition of contradictory or paradoxical evidence (Eisenhardt, 1989), the use of multiple cases that are at different stages of formally implementing open innovation and varying in their use of open innovation practices is deemed to be a strength of this study. Furthermore, the following section discusses the relevance of this study for practitioners and academics.

1.6. RELEVANCE OF THIS STUDY

This research is particularly relevant as a growing number of firms are transitioning to this new way of managing their innovation process. A 2009 report in Business Week suggests that open innovation has become an important management trend over the past decade (Hagel & Brown, 2009) as several leading organizations have sought to further improve their innovation performance and returns through wider collaborations and partnerships with external parties (Innovaro, 2006). For example, in 2008 more than 50% of Procter & Gamble's new products involved an external partner (Procter & Gamble, 2008). Also, as reported by Innovaro[6] (2006), Novartis, a leading pharmaceutical firm, brings in around 50% of its new molecules from a network of university start-up alliances. Aerospace leader Rolls Royce has strategic technology development relationships with over 25 universities around the world that form part of its ecosystem. Similarly, Dell seeks to influence industry technology and product directions through sharing customer requirements with strategic partners such as Intel, Microsoft, Oracle, and EMC, which it then drives to market via its brand and delivery mechanisms. At the same time companies such as Nokia and Ericsson generate additional revenue by out-licensing their technologies (e.g. GSM and WAP protocols) to other players in the industry. Also, in the IT sector, companies like Intel, Texas Instruments, and IBM are creative licensors and leaders of cross-licensing to generate additional revenue (Innovaro, 2006).

As summarized by Innovaro (2006), the key logic behind open innovation is that today good ideas are widely distributed across many different firms; being the first to discover a concept is neither sufficient nor necessary for commercial success; better business models beat better technologies; and intellectual property (IP) is an increasingly perishable asset for which consumers and markets will not wait. Therefore, it is essential for firms to look outside their boundaries for new ideas and opportunities. However, recent literature shows that open

[6]Innovaro is a leading innovation consulting firm in the United Kingdom (UK).

innovation raises additional complexities in the management of innovation projects and hence firms require an effective infrastructure to support open innovation practices (Bruce, Leverick, & Littler, 1995; Chesbrough & Crowther, 2006; Laursen & Salter, 2006) .

In response to these complexities, firms need to manage related activities to help them institutionalize open innovation practices. As suggested by Witzeman, Slowinski, Dirkx, and Gollob (2006), managers need to create a culture conducive to external innovation. Employees need to be directed and encouraged to think beyond their internal set of resources to consider external knowledge and pathways to market. For example, managers may need to reward employees for effectively using external opportunities that add value to the firm. Firms also require mechanisms that are more suited to the open innovation setting to help them with decision making at the different stages and gates of the innovation process[7]. In a survey of companies that have adopted open innovation, Chesbrough and Crowther (2006) found that to effectively adopt and sustain open innovation practices inside the firm, it had to move from a set of ad hoc processes to clearly defined open innovation activities, systems, roles and responsibilities to ensure successful adoption across the organization. As innovation requires the involvement of many organization members across many different functions and hierarchal levels, it is important to establish clear lines of communication and control to ensure projects stay on track and avoid unwelcome surprises (Bonner, Ruekert, & Walker, 2002). However, firms also need to ensure that they do not constrain the innovation team's creativity and impede their progress as this could affect their ultimate performance (Bonner, 2005). Hence, understanding how organization members can be influenced to embrace and effectively support open innovation practices can be helpful in implementing intra-organizational changes

[7] As per the stage-gate® model (R. G. Cooper, 2006, 2009; R. G. Cooper & Edgett, 2007; R. G. Cooper & Edgett, 2008; R. G. Cooper & Kleinschmidt, 1986, 1987), an innovation process is made up of stages where project level organization members carry out different activities and gates where project teams update management on their progress.

which can streamline a firm's journey to institutionalize open innovation practices (Chiaroni et al., 2011).

Furthermore, R&D expenses are becoming an increasingly significant figure in many firm's financial statements. Hence, it is important for accountants and managers to understand the innovation processes so they can design and implement appropriate and effective control systems and performance measures. Consequently, this thesis is relevant for both academics and practitioners as it provides useful insights for the implementation and further study of open innovation practices.

In particular, it is expected that by empirically examining the influence of formalized MCS on an organization's use of open innovation practices, this study would help practitioners understand the processes of change involved in the implementation of open innovation practices. It is believed that by using the three case studies, this thesis would highlight to practitioners different approaches by top management to open innovation adoption resulting in different routine behaviours of project level organization members. It is expected this would highlight the role of MCS in the change process and circumstances where decoupling may occur requiring actions to be taken by management if they want to achieve a particular outcome. Moreover, it is expected that combining the Burns and Scapens (2000) and the Sawabe and Ushio (2009) frameworks would provide an academic contribution to knowledge as it recognizes the power difference between top management and project level organization members in respect of their capacity to change the formalized MCS and its rules. This framework is expected to provide a mechanism to academics for a focused examination of the decoupling or loose coupling of routines from rules.

1.7. STRUCTURE OF THE THESIS

This thesis is divided into eight chapters:

Chapter 1: Introduction

The first chapter provides an introduction to the thesis. It begins with a discussion of the motivation for the study. This is followed by an outline of the purpose and objective of the study, which is then formulated into the underlying research question. The research design and the relevance of the study are also briefly discussed.

Chapter 2: The Inter-firm Innovation Context

The second chapter presents the important features of the inter-firm open innovation context that is the focus of this thesis. It involves a review of the open innovation literature and the MCS literature in order to situate the study. The first part of this chapter describes the shift in innovation thinking from closed to open innovation. This is followed by a discussion of the reasons for and challenges of the shift in practice as identified by recent studies. Also, as there are many different definitions of open innovation in the literature, this chapter develops the working definition of open innovation used in this study. The second part of this chapter reviews the MCS literature that has been set in the innovation and inter-firm settings.

Chapter 3: Methodology, Theoretical Framework and Methods

The third chapter outlines the research methodology, theoretical framework, and research methods used in this study. It begins with a discussion on the interpretative research methodology adopted by this study. The next part of the chapter discusses the Burns and Scapens (2000) theoretical framework and builds an extended framework based on suggestions and findings from other academic studies, such as Sawabe and Ushio (2009), and

Lukka (2007). The last part of this chapter outlines the research methods used for data collection and analysis.

Chapter 4: Case Study 1 – Fisher & Paykel Healthcare (FPH)

The fourth chapter describes and analyses the first case study, Fisher and Paykel Healthcare (FPH). Even though the way in which the company started was a classic example of open innovation (as the firm originated from a white ware manufacturer), at the time of this research the firm had not formally adopted this concept. Instead, as explained in the firm's information memorandum, the belief was that FPH was able to reduce risks associated with new product introductions by utilizing in-house capabilities to rapidly produce prototype products for trial use and sale. However, at the project level collaborations with external partners during the innovation process were common. Project managers frequently sought ideas and technologies from external parties to solve product design and development problems. Despite the lack of a formal plan to implement open innovation, the practice of seeking and incorporating external input in the firm's innovation process had been successfully repeated time and time again by organization members at the project level. Therefore, this chapter examines how formalized MCS influenced the use of open innovation practices at FPH.

Chapter 5: Case Study 2 – Coloplast

This chapter describes and analyses the second case study, Coloplast. While innovation had been the cornerstone of this company, contributing greatly to its double digit growth for many years, the company's implementation of open innovation had not been smooth. Top management at the company rolled out the open innovation strategy following recommendations from a consulting firm that had been hired to analyse the firm's operations. However, the roll out was met with internal resistance as organization members at the project level were not comfortable collaborating with external partners. This resistance was influenced by the firm's history, which included failed collaborations and the success of the closed innovation approach. The organization members believed they could do a better job and that if they collaborated with external partners they would lose the interesting aspects of their work. To overcome this resistance top management launched a formal drive towards open innovation, which included a number of mechanisms being put in place to encourage and support open innovation practices. These management efforts resulted in a change to the formalized MCS in the firm so that it would influence the behaviour of the organization members towards open innovation. However, while the changes had some positive impacts, such as better communication inside the firm and a reduction in time to market, it did not result in an increase in external collaborations during the innovation process. Although mechanisms were in place to seek input, the input received was not being used by the project teams. Hence, this chapter discusses the disconnect between the new formalized MCS implemented by top management which aimed to change the innovation process and the actual innovation practices of Coloplast's project level organization members.

Chapter 6: Cross-Case Analysis – FPH vs. Coloplast

The sixth chapter includes a cross-case analysis of FPH and Coloplast. Both these companies operated in the medical devices industry and placed a great deal of importance on innovation. However, the two companies differed immensely in their use of open innovation practices. Hence, in addition to the identification of the similarities and differences between the two firms, this chapter also reflects on the findings from these two case studies with reference to the research question and the extended theoretical framework, and with reference to the management accounting practice variation literature to understand the reasons behind the variation.

Chapter 7: Case Study 3 – Zespri

The seventh chapter describes and analyses the third case study, Zespri. This case is different from the previous two as Zespri's innovation function had been designed to strategically seek and incorporate external knowledge into its innovation process. This had resulted in extensive use of open innovation practices by organization members across their innovation portfolios. The firm had built collaborative relationships with research partners that enabled it to innovate effectively and efficiently with a very small internal R&D team. This chapter discusses Zespri's innovation model and analyses the firm's relationship with a key research partner, Plant and Food Research (PFR), to build on the findings from the other two case studies. Moreover, this chapter discusses how the use and role of formalized MCS changes as a collaborative relationship develops over time and the project level organization members' perceived level of trust changes.

Chapter 8: Discussion and Conclusion

The final chapter summarizes the findings of the case studies and the cross-case analysis. It concludes the thesis by showing how the role played by the formalized MCS in a firm's use of open innovation practices is dependent on two key factors:

1. The nature of the formalized MCS. That is, whether the formalized MCS are coercive in nature, forcing the project level organization members to act as prescribed by top management through the formalized MCS; or whether the formalized MCS allow the project level organization members to act according to their own understanding of the situation.
2. Whether the perspectives of project level organization members in relation to the use of open innovation practices are consistent with the perspectives of top management.

This chapter also discusses the contributions of this study; it states the limitations and suggests some areas for future research.

CHAPTER 2. THE INTER-FIRM INNOVATION CONTEXT

2.1. INTRODUCTION

This chapter presents the important features of the inter-firm open innovation context, which is the focus of this thesis. A review of the relevant open innovation and MCS literatures is presented in order to situate the thesis within this context. The first part of the chapter focuses on open innovation, describing the shift in innovation thinking from closed to open innovation. A discussion of the reasons for this shift and the challenges organizations face in practice follows. As there are many definitions of open innovation in the literature, a working definition of open innovation is developed for this thesis.

The second part of this chapter focuses on the MCS literature set in innovation and inter-firm settings. The intention here is to draw parallels between the open innovation and MCS literature and to identify the rationale for this thesis by indicating its location in the management accounting literature.

2.2. OPEN INNOVATION

Chesbrough (2006b, p. 1) defines open innovation as:

> "*The use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology*".

Following Chesbrough (2003b), a number of later studies have attempted to describe open innovation practices. For instance, West and Gallagher (2006, p. 320) describe open innovation as a situation where *"internal innovation is supplemented by systematic scanning for external knowledge (facilitated by firm investments in absorptive capacity) with firms maximizing the returns that accrue from both sources".* As depicted in Figure 2-1 and explained by van de Vrande, Lemmens and Vanhanverbeke (2006), when operating under open innovation firms generate ideas using internal resources, but they also actively scan the external environment (e.g., universities, research labs, customers, and exhibitions) in search of interesting ideas. Also, innovators have the possibility of in-sourcing technology at different stages during the innovation process. This offers them a high level of flexibility as they can integrate new ideas that were not picked up in previous stages. Similarly, the firm can profit from outsourcing the technologies or projects that no longer fit their corporate strategies or competencies. In other words, open innovation provides strategic flexibility to the firm, which is a valuable asset to deal with market and technological uncertainties involved in innovation (R. G. Cooper, 2006; Davila, 2000).

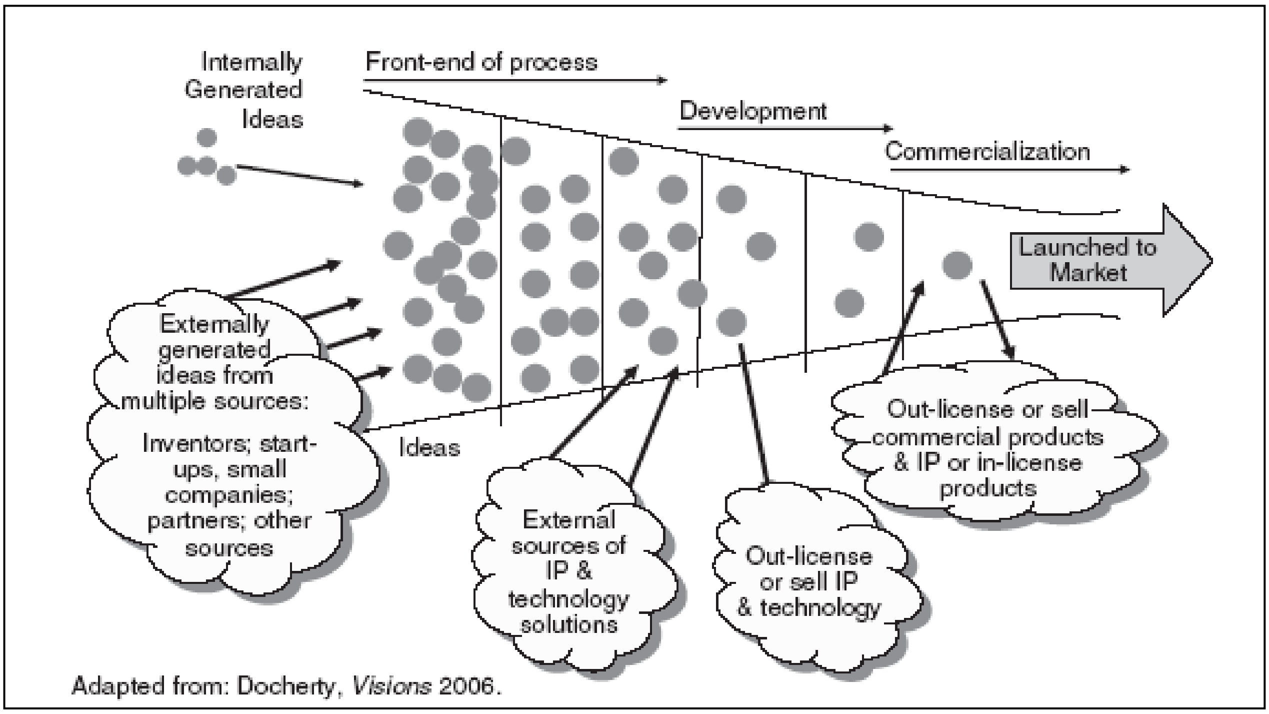

Figure 2-1: Open innovation model (sourced from R. G. Cooper & Edgett, 2007)

Gassmann and Enkel (2004) refined this definition stating that open innovation means the company transforms its solid boundaries into more semi-permeable membrane to enable innovation to move easily between the external environment and the company's internal innovation process.

Therefore, from the early definitions in the literature, the general concept of open innovation appears to be that firms open their business models[8] to purposively and actively search for and exploit knowledge and resources outside the firm's boundaries to support the firm's innovation strategy. This practice can also allow unused internal ideas and technologies to flow to the outside where other firms can unlock their latent economic potential (Chesbrough, 2007). However, open innovation is not a fixed phenomenon and is likely to be interpreted differently by different people and can vary in the way it is used by firms. Nevertheless, the open innovation concept is a shift from the traditional closed innovation model (Chesbrough, 2003b) as described in the next sub-section.

2.2.1. CLOSED INNOVATION

A closed innovation model is one in which a firm's preference is to keep all R&D activities in-house. To do this, firms require a substantial investment in the R&D function, setting up large facilities and hiring the best people in the field, as internal R&D is seen as a strategic asset and even a barrier to entry into an industry (Chesbrough, 2004). The firm views its physical and human capital as resources that are necessary to support the firm's innovation strategy and aims to commercialize the internal developments themselves. Consequently, as depicted in

[8]According to Chesbrough (2007: 22) "*A business model performs two important functions: It creates value, and it captures a portion of that value. The first function requires the defining of a series of activities (from raw materials through to the final customer) that will yield a new product or service, with value being added throughout the various activities. The second function requires the establishing of a unique resource, asset or position within that series of activities in which the firm enjoys a competitive advantage*" (Chesbrough, 2007, p. 22)

Figure 2-2, projects generally only enter in one way, at the beginning of the new product development (NPD) process, as ideas and can only exit in one way, by going to the market as a product (Chesbrough, 2006b).

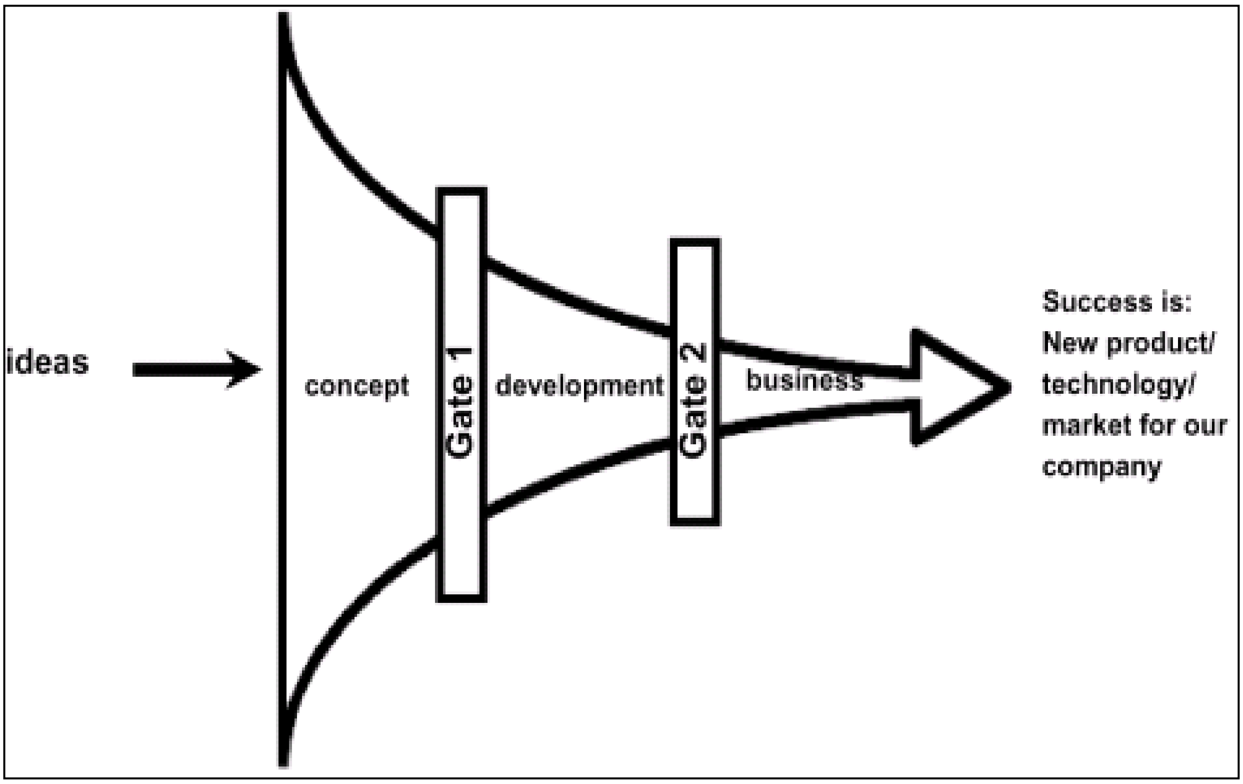

Figure 2-2: Closed innovation model (sourced from Chesbrough et al., 2006)

Chesbrough (2003b, p. 24) used the analogy of *"a series of fortified castles located in an otherwise impoverished landscape"* to explain the knowledge landscape in a closed innovation setting. Each firm's R&D function operates within the castle's four walls and generally no ideas or technologies would cross the boundaries throughout the innovation process that yields value for the firm. Because of this, a firm's focus is purely on the internal development of technologies and products for commercialization by the firm (R. G. Cooper & Edgett, 2007).

As explained by Chesbrough (2003b), this model restricts the firm from exploiting opportunities outside its boundary. In other words, by confining innovation to the four walls of their laboratories, firms limit the use of their technologies to internal projects, without considering that there may be better opportunities outside the firm to further advance the technology within a shorter time span, optimise opportunity costs, and yield higher returns. For example, breakthrough ideas initiated at Xerox's PARC laboratory that today are a critical part of the personal computer and communications revolution (such as the graphical interface, bit-mapped screen, and the ethernet networking protocol) were dropped from the Xerox research portfolio and allowed to gracefully exit Xerox with the researchers that came up with the ideas. This happened because the decision makers judged these projects to have little more to contribute to Xerox's fundamental knowledge or to its businesses. Consequently, even though the research and technology created tremendous economic value for society, it yielded little value, if any, for Xerox (Chesbrough, 2003b).

The closed model also limits ideas or external technologies from entering the firm's innovation pipeline, which may deprive the firm of potential radical inventions. As noted by an executive at Merck (a leading biotechnology firm) its internal research accounted for only 1% of biomedical research. To tap into the remaining 99% they had to actively reach out to universities, research institutes, and companies worldwide to bring the best technology and potential products into the firm (see Chesbrough, 2006b). These limitations are among many reasons for firms to shift to an open innovation model as discussed below.

2.2.2. REASONS FOR THE SHIFT TO OPEN INNOVATION

As identified by some of the earlier studies, there are a number of economic reasons why firms would want to change from a closed innovation to an open innovation model. As shown in Figure 2-3, a firm can increase its revenue streams by broadening the markets addressable by the innovation. The firm is no longer restricted to the markets it serves directly but through open innovation it can participate in other sectors through licensing revenue, joint ventures, spin offs, and other means (Chesbrough, 2007).

Secondly, by leveraging external R&D resources a firm can save time and money during the innovation process. To illustrate this, Huston and Sakkab (2006) use the Pringles Print initiative. This initiative was taken by Procter & Gamble (P&G), who wanted to develop Pringles chips with pictures and words printed on each chip but they did not have the technology for printing. Hence, they actively searched for the technology outside the firm and found a bakery in Bologna, Italy that had an ink-jet method for printing on products developed at a fraction of the cost it would take them to develop the technology internally. This also helped them take the product to the market in half the time that the project would have taken otherwise (Huston & Sakkab, 2006).

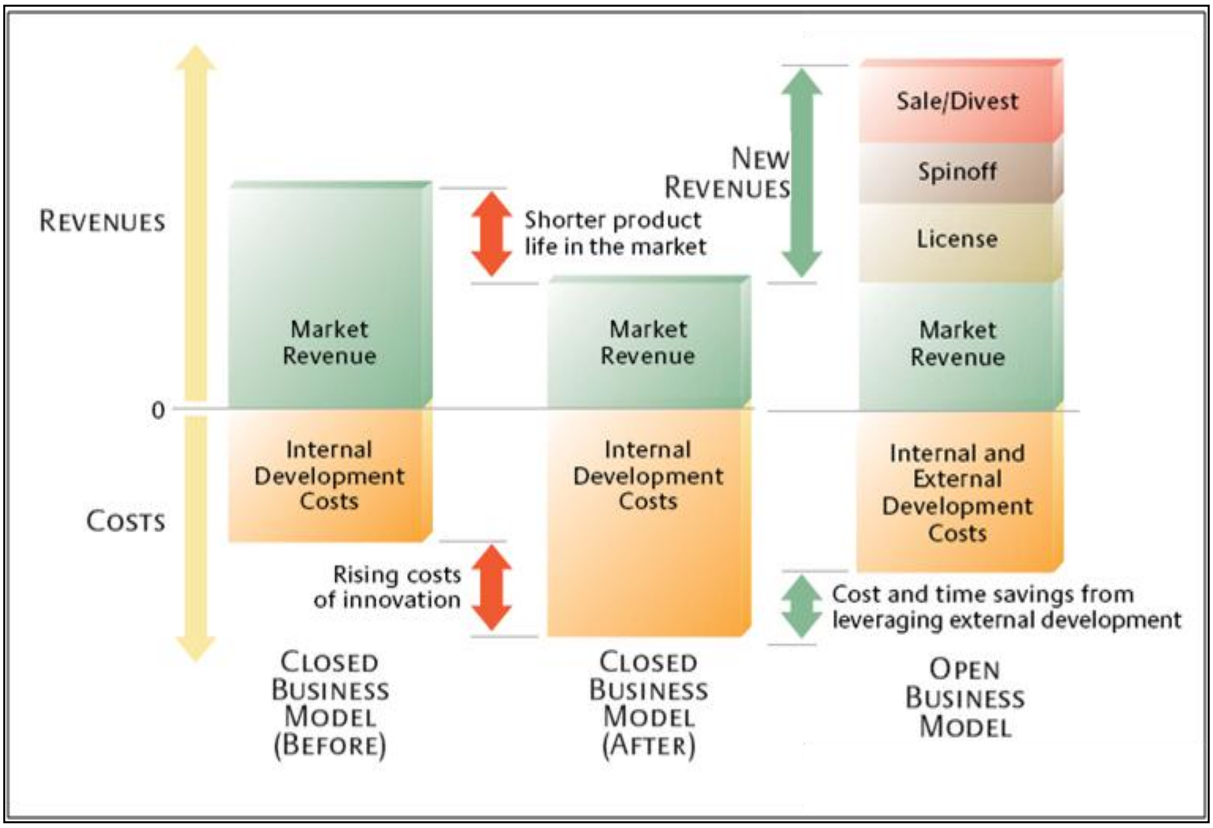

Figure 2-3: Open business model vs. closed business model (Adapted from Chesbrough, 2007)

Moreover, as firms collaborate with outside firms, useful strategic partnerships can be developed in ways that allow these organizations to leverage core strengths that otherwise would never have seen the light of day. For example, P&G licensed its technology to Clorox who successfully used it to launch "Glad Press n Seal Wrap". With this approach, P&G was able to leverage the value of the patents and enter into a successful joint venture with Clorox, whose Glad brand was already a leader in the category (Chesbrough & Schwartz, 2007).

These are all appealing reasons for adopting an open innovation model that have been backed up by real-life success stories. However, as other studies have found, not all firms enjoy these benefits. Instead they may face a number of challenges when they shift to an open innovation model, as described in the next sub-section.

2.2.3. CHALLENGES IN IMPLEMENTING OPEN INNOVATION

As suggested earlier, despite the apparent benefits of open innovation the transition to open innovation has not been easy for many firms. The extant open innovation literature has found that the increased external contacts firms need to deal with under the new approach have led to a number of organizational and cultural issues (Chesbrough & Crowther, 2006; van de Vrande et al., 2009; van der Meer, 2007). Firstly, there is resistance from within the firm to look outside its own boundaries for ideas, technologies, and pathways to market because of the strong belief that the firm has the required resources and competences to do it themselves, or organization members suffer from the not-invented-here (NIH) syndrome (Chesbrough & Crowther, 2006; Chesbrough et al., 2006; van de Vrande et al., 2009; van der Meer, 2007; West & Gallagher, 2006). Katz and Allen (1982, p. 7) define NIH syndrome as "*the tendency of a project group of stable composition to believe it possesses a monopoly of knowledge of its field, which leads it to reject new ideas from outsiders to the likely detriment of its performance*".

Similarly, the project level organization members believed that the company cannot be sure of the quality, performance and availability of technology that was not produced inside the firm. Chesbrough (2003b) suggests that while these may be valid concerns, the NIH syndrome causes the internal team's assessment to be biased. They identify all the problems and risks of an external idea or technology and they discount the ability of the idea or technology to overcome these limitations (Chesbrough, 2003b).

Secondly, open innovation requires firms to search for opportunities outside the firm. Search is a dynamic process that continues throughout the innovation process. A balance needs to be struck between rewards and controls to simultaneously produce appropriate amounts of searching, screening, and implementation (Koput, 1997). As found by Laursen and Salter (2006), firms that search widely and deeply for new ideas and applications of new technologies tend to be more innovative. However, the benefits to openness are subject to decreasing returns. In other words, after a certain point additional search becomes unproductive and increases the firm's costs without yielding more revenue. This finding is consistent with Katila and Ahuja's (2002) findings in the global robotics industry that suggests over-searching could hinder the firm's innovation performance. Koput (1997) suggests one of the reasons for the negative impact of over-searching is related to the attention allocation problem. This means that since there are so many ideas or pathways to market but limited resources, few of these pathways are taken seriously or given the required level of attention to pursue them further. Therefore, even though open innovation practices could be beneficial for firms, if not managed properly they could also be detrimental to firms' innovation as well as financial performance. Consequently, the challenge for management is to find the most appropriate methods and practices for carrying out search activities and the utilization of external knowledge resources (Bergman, Jantunen, & Saksa, 2009) as well as pathways to advance internal ideas and technologies.

Thirdly, in order to incorporate the results of the search process into a firm's innovation process, firms need to collaborate with outside firms and form inter-firm relationships. However, as argued by Bruce, Leverick and Littler (1995) in practice the benefits of collaboration may not always be achieved. Bruce et al. (1995) present two such cases where the outcomes of the collaborations were less than desirable. In their first case, the market potential of the product was altered by changes to the external environment. Hence, the result from the output of the collaboration was not up to the company's expectations, which is consistent with Das and Teng's (2001) performance risk[9]. In the second case, Bruce et al. (1995) show how a lack of commitment from senior managers resulted in cumbersome decision making in relation to resources. As a consequence the collaboration failed to exploit market opportunities, that is, relational risk[10] (Das & Teng, 2001). These two types of risks are further discussed in Chapter 7. However, Bruce and his colleagues show that it is important to pay attention to factors that may influence the outcome of using external sources. This challenge is also highlighted by the high failure rate of inter-firm relationships (Langfield-Smith, 2008).

The challenges faced by firms in implementing the open innovation model discussed above can be classified into three key categories: internal resistance to change, issues with partner search, and inter-firm relationship issues. Extant studies suggest that to deal with these challenges, firms need to use managerial levers to encourage and reward open innovation practices (Chiaroni et al., 2011; Witzeman et al., 2006). However, as discussed below, the challenges a firm will face are contingent on the dimension of open innovation they implement.

[9] Performance risk is defined as "*those factors that may jeopardize the achievement of strategic objectives, given that partners co-operate fully*" (Das & Teng, 2001, p. 6).
[10] Relational risk is defined as risks that are "*concerned with the probability and consequences that a partner firm does not commit itself to the alliance in the desired manner*" (Das & Teng, 2001, p. 6)

2.2.4. DIMENSIONS OF OPEN INNOVATION

The open innovation literature suggests that open innovation comprises two dimensions: the outside-in dimension and the inside-out dimension (Chiaroni et al., 2011; Gassmann & Enkel, 2004; Lichtenthaler, 2008; van de Vrande et al., 2009). While in practice some companies combine both these dimensions in their innovation process to complement each other, Gassmann and Enkel (2004) using their own empirical database of 124 companies, found that companies often introduce the two dimensions of open innovation separately (Chiaroni et al., 2011). That is, some companies only adopt an outside-in process while others may only adopt an inside-out process.

The outside-in or inbound process is where the firm enriches its own knowledge base and the focus is on increasing innovativeness by sourcing external knowledge through activities such as customer and supplier integration, listening posts at innovation clusters, applying innovation across industries, buying IP and investing in global knowledge creation (Gassmann & Enkel, 2004). Hence, this dimension entails opening up to and establishing relationships with external organizations to access their technical and scientific competences to improve the firm's innovation performance (Chiaroni et al., 2011).

On the other hand, the inside-out or outbound process is where the focus is on externalizing the company's knowledge and innovation in order to bring ideas to the market faster than can be done through internal development. Therefore, rather than relying entirely on internal paths to market, companies can establish relationships with external organizations that have business models better suited to commercialize a given technology (Chiaroni et al., 2011). This can be achieved through activities such as licensing IP or multiplying technology by transferring ideas to other companies (Gassmann & Enkel, 2004).

Enkel, Gassmann, and Chesbrough (2009) suggest that of the three types of open innovation processes, that is, the coupled process where both dimensions are used, the outside-in process, and the inside-out process, the outside-in process is the most dominant. In their study, they found 43% of their sample companies had an in-licensing policy in place, while only 36% used an out-licensing policy to externally commercialize their technologies. The two dimensions entail different activities and face different challenges. Therefore, as suggested by Chiaroni et al. (2011), it helps to theoretically and empirically keep them separate.

Hence, taking into consideration the scale of this research, the characteristics of the case sites involved combined with the results from previous studies indicating a larger number of firms use the outside-in process, the scope of this study is limited to just the outside-in dimension. Consequently, the research for this study was conducted based on a narrow working definition of open innovation as outlined below.

2.2.5. WORKING DEFINITION OF OPEN INNOVATION

As discussed above, open innovation is a broad concept that has the potential of being interpreted differently by different people. Therefore, this study developed a working definition of open innovation that guided the data collection, analysis, and interpretation of results. This one-dimensional definition of open innovation is based on the definition formulated by one of the case sites (Coloplast) and reads:

Open innovation is when organization members in the innovation team seek input from somebody who is not from inside the company as part of their innovation project.

This simple definition captures the essence of the outside-in process discussed in the open innovation literature and is consistent with how the organization members at the three case sites interpret open innovation.

To clarify, the open innovation concept is not part of the 'make or buy' dichotomy found in the existing literature, but rather falls under the hybrid category (Berry, Coad, Harris, Otley, & Stringer, 2009) that encompasses a wide range of inter-organizational arrangements where firms collaborate to achieve specific outcomes (Glaister & Buckley, 1996) or exploit unique resources (Das & Teng, 1998). Anderson (2009) categorises these arrangements into two categories: formal, and informal. Formal arrangements for example, franchises, licensing arrangements, joint ventures, and minority equity shares are situations in which the rules of law can be used to align the interests of partners through a shared profit opportunity and formal profit sharing rules (Anderson, 2009). However, in situations that are high in uncertainty for example, innovation, it is difficult to write full contracts and so firms use fewer mechanisms from contract law to structure interactions or allocate gains. Instead, they use arrangements such as strategic alliances, supply chains, consortia or networks (Anderson, 2009).

The above working definition is broad enough to include all these types of collaborative arrangements as well as incorporate any inflow of knowledge from an external source during the innovation process. For instance, the innovation team may just seek advice on prototype designs from medical professionals. The medical professionals do not enter into any contracts or effectively work on the prototypes physically. They just provide expert knowledge on the functionality of the prototype designs in a hospital or medical environment. This inflow of knowledge, which becomes part of the innovation process of the innovation project, is captured in this working definition of open innovation. This approach differs from previous open innovation studies that have mostly focused on inter-firm collaborations, disregarding inflow and outflow of knowledge (see Keupp & Gassmann, 2009) as well as MCS studies that have generally focused on specific inter-firm arrangements such as strategic alliances (Langfield-Smith, 2008), supply chain arrangements (Free, 2008), outsourcing (Langfield-Smith & Smith, 2003), joint-venture (Groot & Merchant, 2000; Kamminga & van der Meer-Kooistra, 2007) and networks (Mouritsen & Thrane, 2006). The following section discusses the MCS literature deemed relevant for this study.

2.3. MANAGEMENT CONTROL SYSTEMS LITERATURE

MCS has been defined in various ways over the years (refer to Malmi and Brown (2008) for a review). An early definition of MCS was developed by Anthony (1965, p. 17) who defined it as *"the process by which managers ensure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objectives"*. Later researchers suggested that MCS provide a means for gaining cooperation among collectives of individuals or organizational units who may share only partially congruent objectives, and channelling those efforts towards a specified set of organizational goals (Flamholtz & Kerr, 1983; Ouchi, 1979).

Bisbe and Otley (2004) argue that MCS refer to the processes used by organizational participants to mobilize resources and actions towards some individual or shared interest(s). A broader notion of MCS encompasses the entire strategic process: that is, it includes both strategic formulation and strategic implementation (Merchant & Otley, 2006). Ferreira and Otley (2009, p. 264) also propose a broader view of MCS which they refer to as performance management system which are:

> "*the formal and informal mechanisms, processes, systems and networks used by organizations for conveying the key objectives and goals elicited by management, for assisting the strategic process and on-going management through analysis, planning, measurement, control, rewarding and broadly managing performance, and for supporting and facilitating organizational learning and change*".

As stated in Chapter 1 of this thesis, the widely-used definition of Kober et al. (2007, p. 426) is adopted which defines MCS as "*the procedures used by management to facilitate the attainment of their goals and those of the organization*". Furthermore, in this thesis, for analytical purposes the formalized MCS are conceptualized using Simons' (1995) levers of control framework, which is discussed in Chapter 3.

2.3.1. MCS IN THE INNOVATION SETTINGS

Early studies examining the relationship between MCS and innovation have yielded inconsistent results. One stream of research examining the relationship between the use of MCS and product innovation finds that there is a negative relationship between MCS and product innovation success (Dougherty & Hardy, 1996; Gerwin & Kolodny, 1992; Leonard-Barton, 1995; Tidd, Bessant, & Pavitt, 1997; Verona, 1999). These studies tend to downplay the potential role of formalized MCS as a factor that may influence successful product innovation. Instead they argue that the use of formalized MCS is not relevant for successful product innovation. Support for this stream of research is present in both the accounting and innovation literature, which views formalized MCS as a deterrent to creativity as it cannot cope adequately with the uncertainty associated with product innovation (Abernethy & Stoelwinder, 1991; Amabile, 1998; Miles & Snow, 1978; Ouchi, 1977).

These studies are consistent with the traditional hands-off approach to innovation, which argues that successful new products result from devoting adequate resources to the process and avoiding control procedures that could restrict the freedom of engineers and others involved (Lothian, 1984; McNair & Leibfried, 1992). Hence, these studies suggest that using formalized MCS hinders innovation.

The second stream of literature sees MCS as blocking innovation excesses and helping ensure that ideas are translated into effective product innovation and enhanced performance (Bart, 1991; Chenhall & Morris, 1995; Clark & Fujimoto, 1991; Dent, 1990; Kaplan & Norton, 1996; Wheelwright & Clark, 1992). Simons (1990, 1991, 1995) research shows that formalized MCS may provide an agenda and a stimulating forum for the generation and implementation of creative ideas, including product development ideas. He suggests that most innovative firms are intensive users of formalized MCS and that the intensive use of MCS may lead to increased innovativeness. Other studies found formalized MCS were important for coordinating and controlling new product development (NPD) (R. G. Cooper & Kleinschmidt, 1987; Zirger & Maidique, 1990), which led to higher levels of product success.

Later studies investigating the reasons for the inconsistent results imply that they relate to how firms use MCS in the innovation setting. It is suggested that too much, or the wrong type of formal controls constrains the team’s creativity, impedes their progress, and injures their ultimate performance (Bonner et al., 2002). However, if the formalized MCS are used appropriately, they help ensure innovation projects are on track (Bonner, 2005; Bonner et al., 2002) and help reduce uncertainty (Chapman, 1998; Davila, 2000). They suggest MCS provide stable but adaptive frameworks and mental models that facilitate communication among team members and promote goal congruence in a setting with new information that requires quick reactions (Davila, Foster, & Oyon, 2009). Similarly, previous studies have shown how formalized MCS play a useful role in the inter-firm settings, as discussed in the following sub-section.

2.3.2. MCS IN THE INTER-FIRM RELATIONSHIP SETTING

Studies over the past decade suggest that MCS are useful tools in the management of inter-firm relationships. Through a literature review, Caglio and Ditillo (2008) identified three key control problems in inter-firm relationships. Firstly, transaction cost economics and agency theory suggest that autonomous partners may have incentives to cheat and free-ride in order to attain their own specific goals at the expense of the objectives of the collective undertaking. This leads to cooperation problems (Caglio & Ditillo, 2008). Therefore, firms need to introduce mechanisms to align their objectives. Secondly, organizational theory suggests that collaboration between firms results in coordination problems as firms become interdependent on each other (Caglio & Ditillo, 2008). Thirdly, as firms share resources in these relationships, they need to ensure that the value of the joint output is perceived by the parties to be clearly and fairly distributed and that there are no appropriation problems (Caglio & Ditillo, 2008). Extant literature suggests that effective MCS can help firms deal with these apparent cooperation, coordination, and appropriation problems by facilitating effective communication, partner search, and monitoring of activities (Caglio & Ditillo, 2008; Dekker, 2004; Ditillo, 2004; Langfield-Smith, 2008; Mouritsen & Thrane, 2006; Seal, Cullen, Dunlop, Berry, & Ahmed, 1999). Furthermore, research in this area has examined the control archetypes in inter-firm settings (Håkansson & Lind, 2004; Langfield-Smith & Smith, 2003; Speklé, 2001; van der Meer-Kooistra & Vosselman, 2000), management control mechanisms for inter-firm relationships (Dekker, 2004; Mahama, 2006; Tomkins, 2001) as well as cost and accounting controls in inter-organizational relationships (Chua & Mahama, 2007; R. Cooper & Slagmulder, 2004; Mouritsen & Thrane, 2006; Seal et al., 1999).

While both these streams of studies, that is, MCS studies in the innovation and the inter-firm settings, have separately provided helpful insights for practitioners, there is a lack of research looking at the role of formalized MCS for managing inter-firm relationships in an innovation setting. The combination of these two settings, that is, inter-firm relationships and innovation, is interesting as they both involve specific risks and have been observed to have high failure rates (Langfield-Smith, 2008). Hence, the open innovation context provides a perfect setting for this type of research, where inter-firm relationships can be studied in an innovation setting.

At the same time as mentioned in Chapter 1, insights from the MCS literature can help address some of the challenges of implementing open innovation as identified by recent studies. In particular, drawing on the MCS change literature (as discussed on page 40), it can be inferred that MCS are useful tools that can help a firm transform its practices. Therefore, in line with suggestions from this literature that to understand change, research needs to be undertaken at the level of how MCS influence the actions of organization members (Marginson, 2002; Mouritsen, 2005; Quattrone & Hopper, 2001), the aim of this study is to examine whether formalized MCS can influence the use of open innovation practices in a firm. This aim has been restated as the research questions outlined on page 6 in Chapter 1 to define the nature and scope of this study.

2.4. SUMMARY

In summary, the first part of this chapter discussed the open innovation concept to explain how it has developed. Based on this a working definition of open innovation was developed for this study. The second part of this chapter discussed the MCS literature examining innovation and inter-firm relationships. This review suggests there is a lack of studies in the MCS literature examining the micro-processes around inter-firm relationships in an innovation setting. There is also a lack of guidance in the open innovation literature on how formalized MCS can be used to guide the implementation of open innovation practices. Therefore, this study provides an opportunity to contribute to both these bodies of literature by addressing the research question outlined in Chapter 1. The next chapter outlines the research methodology, theoretical framework, and research methods used to address the research question.

CHAPTER 3. THEORETICAL FRAMEWORK, METHODOLOGY & METHODS

"The inevitable truth is that all empirical research is partial and incomplete and that theoretical and methodological choices are inevitably made whether appreciated or not."

--Laughlin (1995, p.65)--

3.1. INTRODUCTION

The purpose of this chapter is to outline the theoretical framework, the research methodology, and the research methods for this study. As suggested in the quote above from Laughlin (1995), it is not possible to cover every angle of the field and so researchers need to make choices. This chapter explains the choices that were made for this study in relation to the methodology, theory, and research methods used.

3.2. CHOICE OF METHODOLOGY

Methodological choices in accounting and organizational studies largely centre around the researchers' views on the objective-subjective debate (Hopper & Powell, 1985; Siti-Nabiha & Scapens, 2005). According to Burrell and Morgan's (1979) framework, this debate consists of four distinct but related elements: assumptions about ontology, epistemology, human nature, and methodology (Hopper & Powell, 1985; Siti-Nabiha & Scapens, 2005).

Ontology refers to the nature of reality where proponents for the objective side of the debate argue that the social world and its structures can be regarded as having an empirical, concrete existence free of human subjectivity. Opponents, however, argue that reality is subjective and exists only as a product of individual consciousness. Epistemology refers to the nature of knowledge; in particular, the form of knowledge and how it can be obtained. While proponents for the objective side of the objective-subjective debate believe that knowledge can be acquired through observation that is free of human subjectivity and is built up progressively, opponents believe that knowledge comes from empirics and this knowledge is the reason for the subjects' behaviour. Hence, researchers need to lessen the distance between themselves and the subject that is being researched so that knowledge of the subject can be acquired. Assumptions about human nature refer to the relationship between human beings and their environment. On one side of the debate is the view that people's behaviour is regarded as being completely determined and constrained by their external environment, while on the other side people are viewed as being potentially autonomous and free-willed: capable of creating their own environment (Hopper & Powell, 1985).

Researcher's positions regarding the three elements described above have direct implications for the choice of methodology. Researchers with views leaning towards the objective side of the continuum tend to use methods from the natural sciences, viewing research as a process of constructing precise and economic theories validated by well-designed tests using large unbiased samples. This type of research is referred to as positivist research (Ryan, Scapens, & Theobald, 2002) and in accounting commonly called mainstream research (Chua, 1986). On the other hand, researchers with views leaning towards the subjective end of the continuum use methods that allow insight into an individual's inner world for example, ethnographic work, in-depth interviews, and participant observations (Hopper & Powell, 1985; Ryan et al., 2002). This type of research is referred to as interpretative research (Chua, 1986; Hopper & Powell, 1985; Parker, 2008; Ryan et al., 2002).

This thesis reflects the views of the interpretative researchers who believe that one cannot totally separate the empirical world from the subjectivity of the researcher. In other words, it is not practically possible to observe and analyse the empirical world without understanding the subjects being investigated. Therefore, an interpretative research methodology using in-depth case studies[11] was adopted for this thesis, one in which the researcher interacts with the subjects being researched to understand their subjective reality and interprets the actions of the individuals. The next sub-section discusses this methodology in more detail.

3.2.1. INTERPRETATIVE RESEARCH METHODOLOGY

The starting point for interpretative research work is the belief that social systems, because of their inherent complexity and recursiveness, cannot be treated in the same way as natural phenomena. They are socially constructed and can be changed by the activities of the individuals located within a specific social context (Ryan et al., 2002). Therefore, for interpretative researchers, the emphasis is on a social rather than an economic view of organizational activities (Deetz, 2009). They aspire to gather insights about a particular issue and contribute to theory by directly engaging with the subjects being studied at the scene of action. Their aim is "*to enrich people's understanding of the meanings of their actions, thus increasing the possibility of mutual communication and influence*" (Chua, 1986, p. 615). Similarly, Hopper and Powell (1985, p. 446) say that, "*people constantly create their social reality in interaction with others. It is the aim of an interpretive approach to analyse such social realities and the ways in which they are socially constructed and negotiated*". Willmott (2008) argues that it is the focus of interpretative research on the practicalities of doing which distinguishes this type of research from the mainstream positivist research.

As suggested by Parker (2008), this type of research offers the potential to address an array of issues and problems about which little or nothing is known. Despite the criticisms regarding the generalizability of the findings of interpretative research work (Armstrong, 2008; Vaivio &

[11] As defined by Yin (2003, p. 13), "*a case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.*"

Sirén, 2010), this approach offers "*a rich tapestry of multiple perspectives and insights that mirror the complexity of the world we seek to unpack, understand and change*" (Parker, 2008, p. 911). The dominant assumptions for interpretative research as outlined by Chua[12] (1986, p. 615), which will be adhered to in this thesis, are summarized in Table 3-1.

A. Beliefs About Knowledge
Theory is used to provide explanation of human intentions which are identified by studying actors in their everyday world using methods such as ethnography, case studies and participant observations. The adequacy of the explanations is assessed via logical consistency, subjective interpretation, and agreement with actor's common-sense interpretations.
B. Beliefs About Physical and Social Reality
Social reality is emergent, subjectively created and objectified through human interaction. All human action is intentional and has meaning grounded in the social and historical context. Social order is assumed and conflict is mediated through common schemes of social meanings.
C. Relationship Between Theory and Practice
Theory seeks to explain action and to understand how social order is produced and reproduced.

Table 3-1: Dominant assumptions of the interpretative perspective (Adapted from Chua, 1986, p. 615)

As suggested by Chua (1986), the role of theory in interpretative research is to explain the actions of human subjects to understand how social order is produced and reproduced by individuals in their everyday activities. A theory can be a powerful tool for researchers to impose cohesion and stability to help them confront ambiguities (Llewelyn, 2003). The next sub-section discusses the theory and theoretical approach used in this study.

3.3. THEORETICAL APPROACH

[12] Chua (1986) has been identified by management accounting researchers as an authoritative methodology text in regards to interpretative research (Ahrens, 2008).

Over the years, management accounting and interpretative researchers have used various theories to explain and make sense of their data. This thesis is based on the view that no theory is superior to another (Scapens, 1994). Instead, they all have unique viewpoints that add to our knowledge and understanding. Therefore, the choice of theory is based on what is being investigated. The following sub-section looks at the different theoretical perspectives that have been used to examine inter-firm relationships, in order to identify an appropriate theoretical framework to guide this study.

3.3.1. THEORETICAL PERSPECTIVES IN THE MCS LITERATURE

While researchers have used various theoretical perspectives over the years to study MCS, Transaction Cost Economics (TCE) has been a common perspective applied by several studies examining inter-organizational relationships (Kamminga & van der Meer-Kooistra, 2007; Tomkins, 2001; van der Meer-Kooistra & Vosselman, 2000). This perspective has been particularly helpful in addressing questions relating to factors that determine what the firm sources from outside (Gietzmann, 1996) and highlighting the importance of trust[13] in inter-firm relationships, as it is impossible to contract for every contingency (Gietzmann, 1996). However, as acknowledged by some of the later studies (Coad & Cullen, 2006; R. Cooper & Slagmulder, 2004; Dekker, 2004), the theoretical power of TCE to clarify how MCS are used in an inter-organizational context is insufficient (Meira et al., 2010). It is argued that TCE does not take into account the rich interplay between the firm and the external partner to take advantage of their capabilities (R. Cooper & Slagmulder, 2004). Also, it does not account for other factors influencing the type of control in the inter-organizational relationships, such as the institutional environment or the power to negotiate cultural and historical conditions (van der Meer-Kooistra & Vosselman, 2000). Moreover, Dekker (2004) suggests that TCE focuses on

[13]The theory of trust also emerged from the empirical data in this study highlighting the importance of trust in an inter-firm relationship. This theory is discussed in more detail on page 217.

the potential opportunistic behaviour of the external partners to determine the type of formalized control, but there are other factors that should be taken into account such as the selection of a good partner, the social context of the alliance, and the intention to guarantee stability and continuity of the alliance. In summary, these studies argue that although the economic viewpoint was helpful for the development of early research, it is unable to explain the more complex aspects of inter-organizational arrangements such as the institutional and cultural influences. Hence, researchers are urged to explore the use of perspectives derived from sociology, which may be able to explain these more complex aspects (Coad & Cullen, 2006; Meira et al., 2010).

In light of this, researchers have used perspectives such as structuration theory (Free, 2008; Jack, 2007; Seal, Berry, & Cullen, 2004), evolutionary theory (Coad & Cullen, 2006) and actor-network theory (Chua & Mahama, 2007; Mouritsen & Thrane, 2006). While all these perspectives have made positive contributions to the literature, there have also been some criticisms. For instance, Mouritsen and Thrane (2006) suggest structuration theory is strongly based on structural principles and governance structures. Therefore, it does not allow understanding of how non-human actors, such as accounting, constitute and shape boundaries of inter-organizational relations. On the other hand, Latour (2005) suggests actor-network theory is not compatible with structuralist approaches as actor-network theory is used in an unrestricted way to describe and understand how actors relate to each other instead of trying to explain the forces that shape the actors' behaviour (Meira et al., 2010). Therefore, based on Ansari's (1977) argument that study of MCS needs to include both structural and social elements, actor-network theory may only explain part of the phenomenon.

Another body of literature relevant for this study is the MCS change literature based on institutional theory. Over the past decade MCS change literature has proliferated in response to changing management accounting techniques and the type of accounting systems being used in practice (Burns & Vaivio, 2001). These studies have found that MCS are useful tools to support organizational transformations (Chenhall & Euske, 2007; Dambrin et al., 2007; Ezzamel et al., 2004) as the use of MCS can help change organizational culture (Dent, 1991; Ezzamel & Bourn, 1990; Henri, 2006; Kurunmäki, 1999); integrate change between top management and operational sub-units (Collier, 2001; Roberts, 1990; Seal, 2001); provide a unified language to integrate change across the organization (Briers & Chua, 2001; Dechow & Mouritsen, 2005; Quattrone & Hopper, 2005); create the climate and tensions to trigger strategic behaviour towards change (Henri, 2006; Marginson, 2002); and help gain employee commitment to change (Bougen, 1989; Ezzamel et al., 2004; Miller & O'Leary, 1994).

However, this body of literature also suggests that the process of change is non-linear as it involves irregular and sporadic responses from organization members to change initiatives (Chenhall & Euske, 2007; Dambrin et al., 2007; Thrane, 2007) and it has drawn on institutional theory to study the process of change (Burns, 2000; Burns & Scapens, 2000; Lukka, 2007; Sharma et al., 2010). This literature also has similarities with some of the observations from open innovation studies which have found firms face internal resistance to change from organization members resulting in changes being implemented that were not initially intended while intended changes do not take place. Hence, the current study builds on this literature, as discussed in the next sub-section.

3.3.2. INSTITUTIONAL THEORY[14]

With the focus of this study being on firms' micro-processes around their innovation function, it draws on institutional theory, which has been used by previous MCS studies to explicate

[14] There is a large body of literature on institutional theory which has been summarized by other researchers (Dacin, Goodstein, & Scott, 2002; Moll, Burns, & Major, 2006; Scott, 2001, 2008).

micro-processes within organizations (Burns, 2000; Sharma et al., 2010). Institutional theory has also been prominent in extending past MCS studies that used in-depth case studies to collect holistic data on the processes of change, including the social and institutional dimensions of the organizations and their environments (Ribeiro & Scapens, 2006). Institutional theory has also been instrumental in studies examining inter-firm relationships (refer to Scapens & Varoutsa, 2010 for a review).

Institutional theory relates to the idea that organizations are essentially embedded in wider institutional environments. As described by Dillard, Rigsby and Goodman (2004, p. 508), "*institutional theory is a way of thinking about formal organization structures and the nature of the historically grounded social processes through which these structures develop*". Over the years, this theory has been one of the most dominant perspectives in organizational analysis (Davis & Marquis, 2005; Lounsbury, 2008). It has been shown that institutional theory can be used to analyse all types of organizations because all organizations are institutionalized, albeit to varying degrees (Scott, 1995). Institutional theory differs from alternative approaches to studying organizations in a number of ways, as identified by Scott (2008, pp. 211-214). Its distinctive features are outlined in Table 3-2.

- Institutionalists eschew a totalistic or monolithic view of organizational and societal structures and processes. They emphasize the importance of the social context within which the organizations operate.
- Institutionalists insist on the importance of non-local (as well as local) forces shaping organizations.
- Institutionalists have rediscovered the important role played by ideas, specifically, and symbolic elements, generally, in the functioning of organizations.
- Institutionalists accord more attention to types of effects occurring over longer time periods.
- Institutionalists also accord more attention to an examination of social mechanisms.
- Institutionalists embrace research designs that support attention to examining the interdependence of factors operating at multiple levels to affect the outcomes of interest.

Table 3-2: Distinctive features of institutional theory (Adapted from Scott, 2008, pp. 211-214)

In management accounting and MCS literature, institutional theory has been used to examine social and institutional dimensions of the organizations and their environments (Ribeiro & Scapens, 2006) as well as to study processes of change (Burns & Scapens, 2000; Ribeiro & Scapens, 2006; Scapens, 2006). Although different strands of institutional theory are in use today (Pacheco, York, Dean, & Sarasvathy, 2010), they share a common recognition that organizations and decision making within organizations cannot be understood without considering the institutional context (Scapens & Varoutsa, 2010). In other words, the researchers agree that institutions matter; however, their definitions of institution differ, resulting in the existence of different strands of institutional theory (Scapens & Varoutsa, 2010).

Two strands of institutional theory that have largely been used in the MCS literature are "old institutional economics" and "new institutional sociology" (Ribeiro & Scapens, 2006). Both these perspectives reject assumptions of rational-optimizing individuals on the grounds that in order to capture the cumulative paths of economic life, individuals' tastes and preferences (and also by implication their choice- and decision-making) cannot be taken as given. Hence, analysis must account for the multiplicity of influences that shape and/or reshape tastes and preferences (Pacheco et al., 2010). Institutional entrepreneurship is a third strand of institutional theory introduced into management accounting research to understand the origins of changes in the firm (Lounsbury, 2008; Lounsbury & Crumley, 2007). New institutional economics is another strand which is rooted in neo-classic economics theory. Hence, as per the earlier discussions on TCE, this strand has difficulty in analyzing processes of change (Burns & Scapens, 2000; Scapens, 1994).

The new institutional sociology (NIS) theory assumes that intra-organizational structures and procedures are largely shaped by external factors. For instance, a firm's internal structures and procedures will reflect the rules, procedures, myths, and norms that are prevalent and generally perceived to be acceptable within society (Pacheco et al., 2010). In other words, NIS is concerned with institutions at a macro level (Ribeiro & Scapens, 2006). Therefore, changes in a firm can be explained in terms of a need to conform to external pressures as opposed to an overriding (rational-optimizing) drive for internal efficiency or a cost-minimizing objective (Pacheco et al., 2010). However, this strand of institutional theory has been criticized of having a static character (Ribeiro & Scapens, 2006) that requires greater integration with micro explanations. It is also accused of not acknowledging the interactive nature of institutional processes incorporating the intra-organizational processes and the influence of organizational members in shaping the change (Pacheco et al., 2010). These criticisms are in line with earlier claims that institutional theory emphasised organization stability rather than change and tended to ignore human agency (Lounsbury, 2008; Lounsbury & Crumley, 2007; Sharma & Lawrence, 2008). Therefore, later researchers moved away from the study of isomorphism and theory of legitimacy (Ahrens et al., 2008; DiMaggio & Powell, 1983) towards the study of organization heterogeneity (Lounsbury, 2008) and recognize the role of actors in developing the model of institutionalization (Ahrens, 2008; Burns & Scapens, 2000; Scapens, 2008; Seo & Creed, 2002; Sharma & Lawrence, 2008)

Burns and Scapens (2000) claim the old institutional economics (OIE) takes into consideration internal factors and is deemed to be capable of shedding light on the processes of intra-organizational changes (Ribeiro & Scapens, 2006) as it conceptualizes economic processes that encompass both stability and change. Moll et al. (2006) explain that this theory looks at why and how particular behaviours or structures emerge, sustain and/or change over time rather than merely what structures exist at any given point in time. It considers issues of internal conflict, the importance of power and politics, learning, and changes for shaping cumulative processes over time. The key methodological features of OIE as outlined by (Wilber & Harrison, 1978, p. 71) are *holism, systemic approach and evolutionism, combined with theoretical sensitivity for power, conflict and significance of irrational behaviour*. These features substantially separate OIE from the mainstream economics which is directed to methodological individualism, the concepts of optimization and equilibrium (Petrovic & Stefanovic, 2009). Therefore, with the methodological position of the researcher aligning with the methodological features of OIE, this study builds on the theoretical framework of Burns and Scapens (2000) which is based on this strand of institutional theory.

Burns and Scapens (2000) suggest that OIE is particularly useful in studying intra-organizational changes as it provides a focus on organizational routines and their institutionalization. Using this strand of institutional theory along with multiple theoretical insights such as evolutionary theory (Noordewier, John, & Nevin, 1990), structuration theory (Giddens, 1979, 1984), and certain strands of NIS (Ribeiro & Scapens, 2006), Burns and Scapens (2000) developed an institutional framework as shown in Figure 3-1. This framework, later referred to as the neo-old institutional economics (neo-OIE) framework (Ribeiro & Scapens, 2006) was developed mainly for studying the intra-organizational processes of MCS change (Burns & Scapens, 2000; Ribeiro & Scapens, 2006; Scapens, 2006), where MCS is viewed as a set of rules and routines that together with other organizational rules and routines allow for the reproduction and cohesion of organizational life (Burns & Scapens, 2000; Covaleski & Dirsmith, 1988; Ribeiro & Scapens, 2006; Scapens, 1994, 2006). One of the strong points of this framework is that it recognizes that "*stability and change are mutually exclusive processes that occur simultaneously*" (Burns & Scapens, 2000, p. 22). In other words, while formalized MCS tend to constitute relatively stable rules and routines, they recognize that there is always a possibility of change (Lukka, 2007).

The Burns and Scapens (2000) institutional framework provides a useful basis for studying stability and change in an organization's practices (Scapens, 2006) and has been a popular framework used by many researchers over the past decade (Busco, Riccaboni, & Scapens, 2006; Lukka, 2007; Nor-Aziah & Scapens, 2007; Siti-Nabiha & Scapens, 2005; van der Steen, 2009). However, as Burns and Scapens (2000) suggest in their paper, this framework is just a starting point for understanding MCS change and they call for further studies within individual organizations to extend this understanding and thus build on the institutional framework. The following sections in this chapter explain how this study uses suggestions from other researchers. It also refines the Burns and Scapens (2000) framework that is used to analyse the case studies and explain the actions of organization members in relation to the apparent shift in the thinking of practitioners in the innovation field. However, before that the following sub-section explains the different components of the Burns and Scapens (2000) framework.

3.3.3. BURNS AND SCAPENS' (2000) INSTITUTIONAL FRAMEWORK[15]

The starting point for the Burns and Scapens' (2000) institutional framework is the recognition that management accounting practices that are part of organizational rules and routines can both shape and be shaped by the institutions that govern organizational activity. In line with the agency-structure relationship in Gidden's (1979, 1984) structuration theory, this framework recognizes the duality between action (human activity) and the institutions that structure that activity, arguing that organizational rules and routines play an important role in the relationship between actions and institutions (as depicted in Figure 3-1).

Burns and Scapens (2000, p. 8) define an institution as the "*shared taken-for-granted assumptions which identify categories of human actors and their appropriate activities and relationships*". These taken-for-granted assumptions, which are socially constructed, inform and shape the actions of individual actors. Burns and Scapens (2000) suggest that the institutions are encoded into the firm's rules and routines (arrow a), which are enacted by the actors (arrow b), which may involve conscious choice or be a result of reflexive monitoring and the application of tacit knowledge about how things are done. Their framework also shows that the repeated behaviour would lead to a reproduction of the routines, which may involve either conscious or unconscious changes leading to new rules and routines (arrow c). These changes may result in the new rules and routines being institutionalized (arrow d), which in turn are encoded into rules and routines (arrow a), depicting the cumulative process of change.

[15]It is recognized that there are other extended frameworks based on institutional theory such as Dillard et al (2004)and Hopper and Major (2007). However, as the aim of this research is organizational level analysis, it is believed using Burns and Scapens (2000) framework as a starting point is more appropriate as it focuses explicitly on the organizational level and intra-organizational changes.

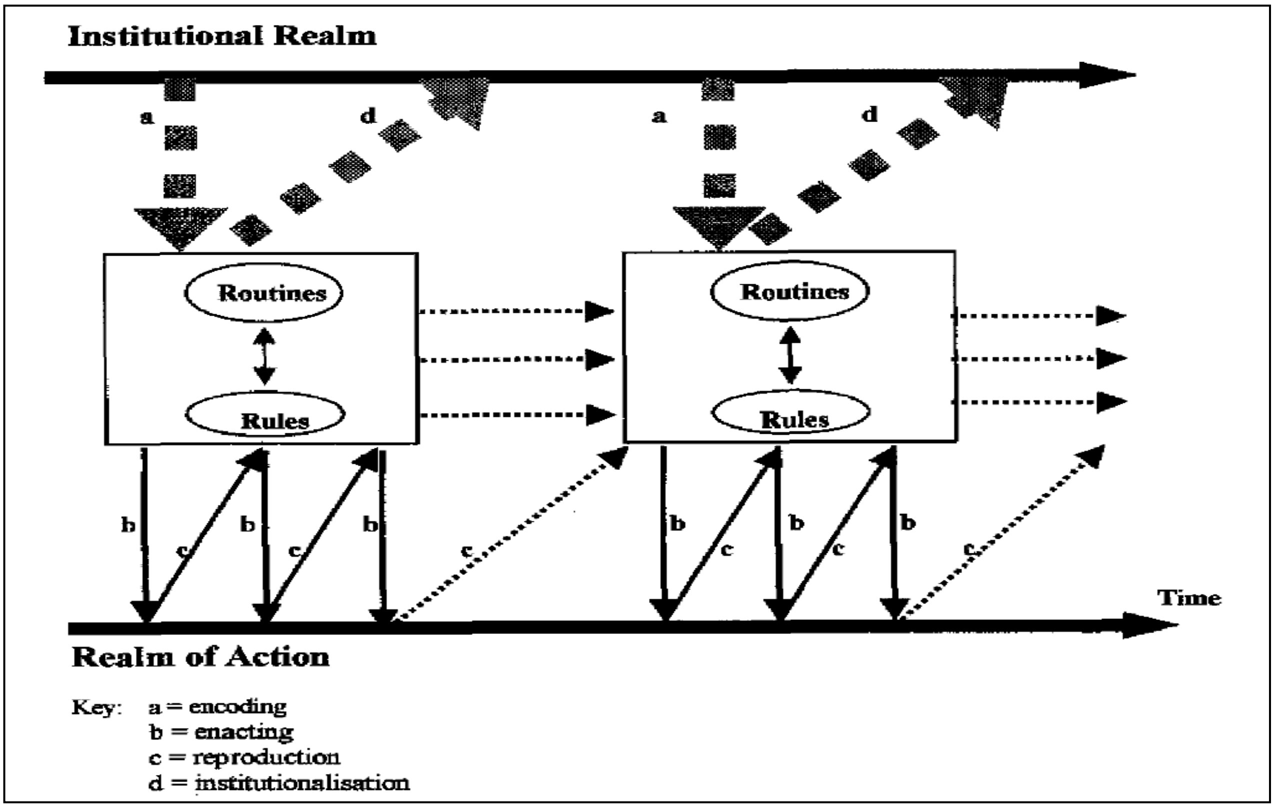

Figure 3-1: The process of institutionalization adopted from Burns and Scapens (2000, p. 9)

3.3.4. DISTINGUISHING BETWEEN RULES AND ROUTINES

Burns and Scapens (2000, p. 6) define rules as "*the formally recognized way in which things should be done",* which are distinguished from routines that are defined as "*the way in which things are actually done*". They use Scapens' (1994) argument that rules are necessary for coordination and for giving coherence to actions of groups of individuals whereby rule-based behaviour may result from an explicit assessment of the available alternatives. These alternatives are formalized into rules to avoid the difficulties and costs of undertaking such assessments over and over again. The repeated use of these rules in a programmatic fashion can be described as the routine in the organization. However, Burns and Scapens (2000) suggest that in the process of routinization, previously formulated rules may change as the group deliberately or unconsciously finds other ways of implementing them. Regardless, new routines may emerge as a consequence of the implementation of new rules which are reproduced over time and passed on to new organization members.

Burns and Scapens (2000, p. 7) acknowledge that "*rules are normally changed only at discrete intervals; but routines have the potential to be in a cumulative process of change as they continue to be reproduced*". Therefore, the time lapse between changes to the routines and the point at which rules are formulated means at any one point in time reasons for individuals' actions might not relate to formalized rules (Burns & Scapens, 2000; Scapens, 1994). Instead, they could be explained by the existence of routines that are being reproduced in the organization that have not yet been formulated into a rule. This is consistent with Gidden's (1984, p. 19) argument that "*rules certainly impinge upon numerous aspects of routine practice, but a routine practice is not as such a rule*".

While Burns and Scapens (2000) highlight this distinction between rules and routines, they place the two elements in the same location in their framework (i.e., in the same box) as shown in Figure 3-1. Sawabe and Ushio (2009) argue that this depiction of rules and routines may hinder the framework's potential to be fully deployed in the management accounting research. They argue that:

> "*the separation of rules and routines allows management accounting researchers to apply the model of institutionalization as it clearly captures a peculiar feature of a management accounting phenomenon: the prominence of formalized management accounting procedures and the management accounting practices that are related to, but quite often autonomous from, the formalization*" (Sawabe & Ushio, 2009, p. 135).

This has also been highlighted by Lukka (2007) who suggests the relations between the rules and routines can be more profoundly examined by separating the two. Lukka (2007) mobilized the notion of loose coupling[16] to open further the relation between the rules and routines of management accounting from the synchronic viewpoint, to increase understanding of how management accounting change and stability can occur simultaneously. He found that organizational routines and knowledgeable everyday actions can be flexible enough to smooth the problems of the formal rule systems resulting in satisfactory outcomes, which diminishes the need to change problematic formal rule systems. In a more striking form, Lukka (2007, p. 78) argues "*flexible and sufficiently well-functioning management accounting routines offer intra-firm legitimation for problematic formal rule systems relieving pressure to change it*". So, in other words while routines may change to solve the problems and get the desired outcomes, formalized rules remain stable despite having problems.

Similarly, Nor-Aziah and Scapens (2007) used the notion of loose coupling to study accounting change and stability in a Malaysian public utility. They found that loose coupling acts as both a process and an outcome, and by examining how loose coupling unfolded as an organizational process at their case site, they enriched their understanding of the practice and the role of accounting at the case site. They found that while the MCS changed, there was prevailing stability in the organizational members' way of thinking and acting. In other words, while the accounting rule changed in response to corporatization, the routines of the operational managers remained stable due to the loose coupling which was related to the intertwining concepts of trust, power and resistance as depicted in Figure 3-2 below:

[16]The notion of loose coupling as per the organizational decision making literature implies that "*the variety of elements of an organization need not be tightly linked to each other and the organization can still function*" (Lukka, 2007, p. 78). The notion is used in NIS literature to indicate a separation between the MCS used to secure external legitimacy and those used to manage the activities of the organization (Nor-Aziah & Scapens, 2007).

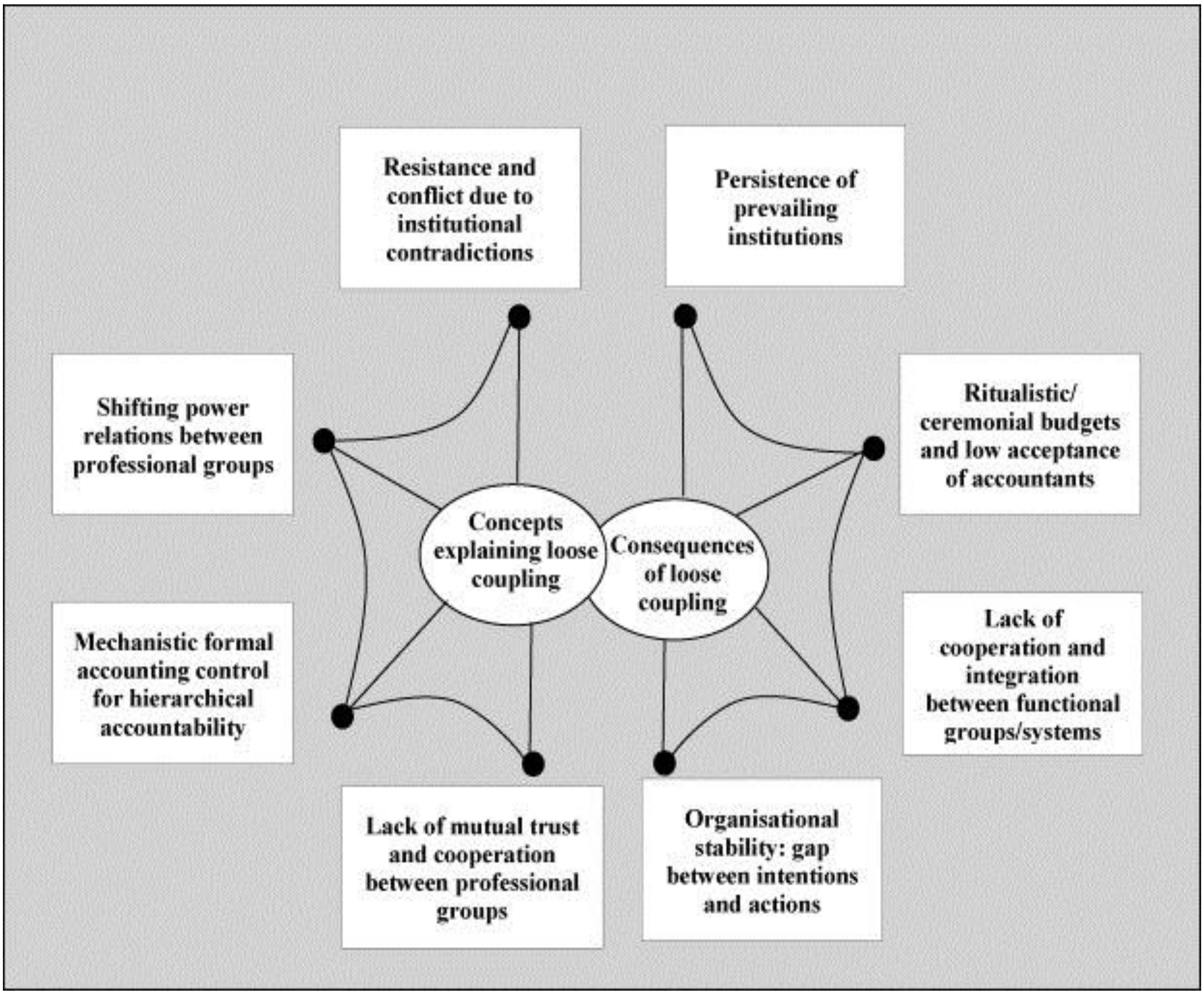

Figure 3-2: Framework for understanding loose coupling (Adopted from Nor-Aziah & Scapens, 2007)

In addition, van der Steen (2009) found that ambiguity and contradictions between rules and routines play an important role in the presence of inertia in firms, resulting in organizational change being slow to respond to changes outside the firm and taking longer to obtain, process, and evaluate information from the environment. In summary, despite having different explanations, these studies support Sawabe and Ushio's (2009) call to separate rules and routines for analytical purposes to reflect the common management accounting phenomenon of formalized MCS being different from the actual practice carried out by organization members. Hence, as discussed in the following section, this thesis refines the Burns and Scapens (2000) framework in line with the calls to separate rules and routines.

3.4. REFINED THEORETICAL FRAMEWORK

Sawabe and Ushio (2009) adapted Burns and Scapens (2000) framework based on the ontological assumption that once they are formalized, management accounting procedures exist independently from human agency. They suggested that once the formalized rules are shared globally in terms of both time and space, they become part of institutions. They defined institution following the new institutional perspective where "*institutions are shared taken-for-granted assumptions that tell an actor who you are in this situation, and what an appropriate behaviour in this situation is*" (Sawabe & Ushio, 2009, p. 137). Therefore, they argue that institutions are globally shared rules that constitute the formalized MCS. These institutions are embedded in routines which are enacted through actions, where routines are successfully enacted by actions and actions replicate routines.

This thesis aligns with Sawabe and Ushio's (2009) interpretation of institutions as globally shared rules, which include formalized rules that are independent of human agents at the project level. However, given the argument that formalized rules can be changed at any time through managerial action (Burns & Scapens, 2000; Lukka, 2007; Scapens, 1994) combined with the findings of studies that suggest change agents can be put in place by top management to implement new MCS (e.g. Sharma et al., 2010), this thesis argues that the relationship between actions of the top management and formalized rules cannot be disregarded.

Another theoretical framework that has refined Burns and Scapens (2000) is that of Sharma and Lawrence (2008). This framework is based on the work of Seo and Creed (2002) who question institutional embeddedness. They put forward the idea of institutional contradiction/ inconsistency as an impetus for organizational change. This framework recognizes that such contradictions can be exploited by entrepreneurs in their day-to-day interactions to challenge and destruct existing institutions in the firm, which then leads to production and reproductions of new practices through new rules and routines. This framework provides a means of understanding organizational change by helping explain how and the extent to which environmental constituencies shape the behaviour of individuals. It also helps analyse how the individuals themselves modify and transform the routines and organizations. However, this framework also groups rules and routines together and does not explicitly recognize the power difference between top management and organization members in respect of their capacity to change the formal MCS and its rules.

Therefore, a theoretical framework needs to be developed which separates formalized rules and routines as well as recognizes that top managers have explicit power that can be used to introduce new formalized MCS (Burns & Scapens, 2000). Ontologically, this thesis assumes that the power to change formal MCS is embedded in the actions of top managers. However, organization members at the project level do not share this power. They have the power to shape and alter routines (Burns & Scapens, 2000; Ribeiro & Scapens, 2006; Scapens, 2006) which may then be institutionalized into formalized rules through the actions of top managers. However, on their own they do not have the power to introduce or remove formalized MCS.

Consequently, this thesis aims to extend the two frameworks of Burns and Scapens (2000) and Sawabe and Ushio (2009) by separating the actions of top management and actions of project level organization members, as depicted in Figure 3-3, to reflect the level of ability[17] they have to change the formalized rules and everyday routines of the project level organization members. The framework shows that the actions of top management can result in changes to existing formalized MCS, or even the introduction of new formalized MCS.

[17] Ability to change MCS and routines in a firm relates to the concept of power. Burns and Scapens (2000, p. 23) regard power as an integral part of the OIE framework. However, it is not included in their framework. Scapens (2006, p. 25) suggests this is an important limitation of the framework, as highlighted by Ribeiro and Scapens (2006), which does not mean the framework cannot be used but it does indicate that it is necessary for management accounting researchers to be aware of the circuits of power.

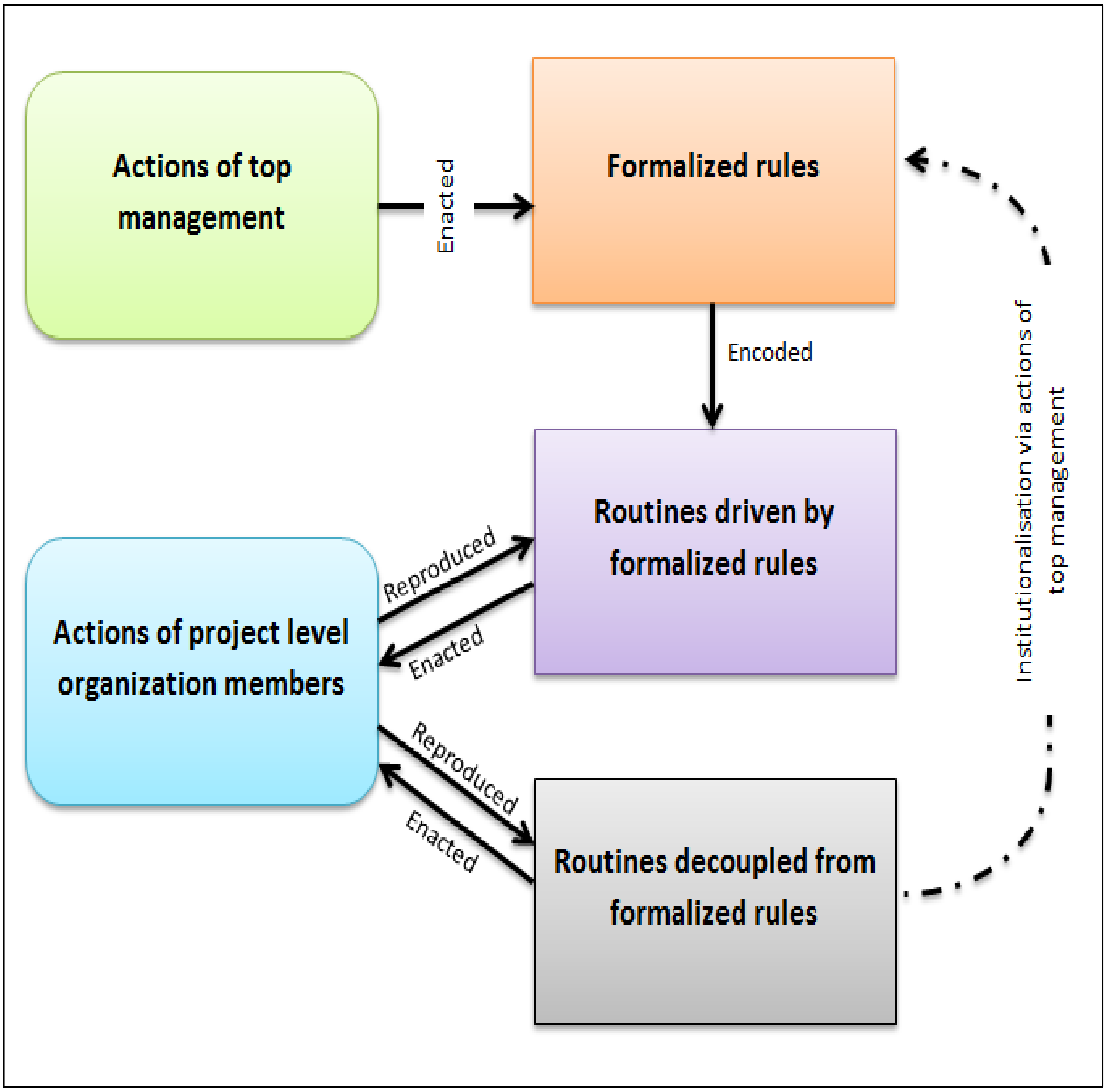

Figure 3-3: Refined theoretical framework for study of stability and change[18]

The assumption behind this framework is that the actions of top management reflect their views, beliefs, and their logic about what is efficient and effective management. In other words, their actions reflect their technical understanding but at the same time could also be influenced by legitimacy pressures. For instance, the actions of authoritative bodies outside the firm may have an impact on the actions of top management. For example, a legal requirement might be

[18]This framework has been developed in this study which builds on the work of Burns and Scapens (2000); Sawabe and Ushio (2009)

imposed, resulting in the top managers implementing new formal rules in an attempt to ensure the firm complies with the legal requirements.

In addition, top management may also take action to introduce formalized MCS that may have emerged from the repeated actions of organization members over time, in the belief that they may improve performance. However, this framework also implies that top managers' insistence not to change and their failure to take actions to introduce or alter formalized MCS following changes in routines or changes outside the firm, would result in the formalized MCS remaining stable.

Also, as shown in Figure 3-3, this framework draws a distinction between routines that are driven by formalized rules and routines that are decoupled[19] from the rules. The first type of routine is simply encoding the formalized rules, which are enacted by the project level organization members and reproduced over time. In other words, the reasons for the actions of organization members forming these routines are explained with reference to the existence of formalized rules or MCS. However, the actions of organization members relating to the second type of routines are explained by reasons other than the existence of formalized MCS. They could be a result of the intentional or unconscious actions of project level organization members: for example, in the absence of formal rules covering particular situations, ambiguities, or contradictions (van der Steen, 2009). These routines are enacted by project level organization members and reproduced over time. In this study, it is assumed that the decoupled routines reflect the perspectives and logics of the project level organization members, which are different from the perspectives and logics of the top management who designed and mobilized the formalized rules or MCS.

[19]Decoupling refers to the situation in which the formal practice is separate and distinct from actual practice (Dillard et al., 2004, p. 509).

Moreover, these decoupled routines may be institutionalized into formalized rules over time. However, this framework assumes that this process would take place via the actions of the top management as described above. That is, any changes to the formalized rules, regardless of its origin, would at least require approval from top management.

To use this framework effectively, it is also important to acknowledge that formalized MCS can take various forms. For instance, previous studies have looked at budgets (Rockness & Shields, 1984), personnel controls (Abernethy & Brownell, 1997), structured new product development processes and performance measures (Hertenstein & Platt, 2000). Through an analysis of the case data, discussed in the case study chapters, this study found that firms tend to use a combination of different forms of formalized MCS based on the challenges they face in a particular situation. Therefore, to analyse the data this study conceptualized the formalized MCS using a pre-established MCS framework as discussed in the next sub-section. While the types of formalized MCS used by firms in this study are not important for this research, using a pre-established MCS framework provided a useful frame of reference to identify and analyse the formalized MCS.

3.4.1. CONCEPTUALIZING FORMALIZED MCS

In the management accounting literature, there are a number of frameworks to study MCS. For example, Otley's (1999) performance management framework outlines five central issues that he argues need to be considered. These issues include (1) the identification of the key organizational objectives and the processes and methods involved in assessing the level of achievement, (2) the process of formulating and implementing strategies and plans as well as the performance measurement and evaluation processes associated with their implementation, (3) the process of setting performance targets and the levels at which the targets are set, (4) rewards systems used by organizations and implications of achieving or failing to achieve performance targets, and (5) the types of information flows required to provide adequate monitoring of performance and to support learning. Ferreira and Otley (2009) extended this framework to twelve elements comprising:

- vision and mission
- key success factors
- organization structure
- strategies and plans
- key performance measures
- target setting
- performance evaluation
- reward systems
- information flows, systems and networks
- performance management systems use
- performance management systems change
- strength and coherence

Other examples of MCS frameworks include the Commission of Sponsoring Organizations (COSO) internal control framework (1992), which categories MCS into preventive controls and detection controls. Jensen and Meckling's (1992) framework derived from agency theory, which divides MCS into decision rights allocation, performance measures, rewards, and punishments. Furthermore, Merchant and Van der Stede's (2003, 2007) framework derived from Ouchi's (1977, 1979) work categorizes MCS as results controls, action controls, personnel controls, and cultural controls.

However, taking into consideration the appropriateness of the framework combined with the time and access limitations, for this study Simons' (1995) levers of control framework was deemed to be most suitable to help understand the types of control being used within the case study sites. This framework focuses on the tensions between the organizational need for innovation and the organizational need for the achievement of pre-established objectives. It points out the consequent tensions among components of MCS that need to be managed to successfully deal with organizational needs (Simons, 1990, 1991, 1995). This framework also describes well the management controls used to manage risks in inter-firm relationships (Anderson, Christ, Dekker, & Sedatole, 2009).

Moreover, this framework offers a broad perspective of control systems by looking at the range of controls employed and how they are used by firms (Ferreira & Otley, 2009). An important strength of this framework is that it provides a typology for alternative uses of the MCS that is widely viewed in the literature as meaningful and helpful (Bisbe, Batista-Foguet, & Chenhall, 2007; Bisbe & Otley, 2004; Henri, 2006; Widener, 2007). Ferreira and Otley (2009) suggest that this aspect is particularly important as the way controls are used, is key to establishing whether all four levers of controls are used and to assess the balance (or otherwise) between positive and negative controls (i.e. the yang and yin) (Simons, 1995). This is because getting the balance wrong could hinder the firm's innovation (Akroyd, Narayan, & Sridharan, 2009; Bisbe & Otley, 2004).

The levers of control framework is also an established framework that has been used in many recent studies published in reputable scholarly journals. For instance, Widener (2007) used it to explore various facets of strategy that drive the use of controls, and to explore the relations among control systems as well as the costs and benefits of control systems. Similarly, Collier (2005) used this framework to study the interaction between belief and boundary systems and between diagnostic and interactive control systems in an entrepreneurial organization. He found that Simons' (1995) levers of control framework was helpful as it reflected the importance of belief systems in the social controls exercised at his case site. He also found that Simons' (1995) framework emphasized the importance of boundary systems in the use of the mechanism that changed over time in recognition of the altered dynamics between the case site in his study and its environment. Collier (2005) suggests that to understand the use of MCS in terms of a control package that is internally consistent, we require a framework that in addition to the diagnostic and interactive control systems also recognizes the importance of beliefs and boundary systems.

Furthermore, in an innovation setting Bisbe and Otley (2004) examined the relationships among variables embedded in Simons' (1995) framework of levers of control, explicitly distinguishing the different types of effects involved and testing their significance. Their results did not support the hypothesis that an interactive use of MCS favours innovation. They found that for high-innovation companies, interactive use of MCS was negatively associated with innovation, while in low-innovation companies their analysis suggested the opposite. Tuomela (2005) used the levers of control framework as a theoretical frame of reference to investigate different notions of control in a longitudinal study dealing with the introduction and use of a new performance measurement system. It was found that the new system was used for both diagnostic and interactive control purposes at the case company, plus it had specific implications for both belief systems and boundary systems.

Hence, the levers of control framework has been used in various ways over the years and these studies support Simons (1995, 2000) argument that successful implementation of strategy requires firms to use all four levers of control in an appropriate combination to increase its effectiveness and thus translate it into organizational performance (Widener, 2007). The following sub-section examines the different components of this framework.

3.4.2. SIMONS' (1995) LEVERS OF CONTROL FRAMEWORK

As depicted in Figure 3-4, Simons' (1995) levers of control are attached to four key constructs that Simons suggests must be analysed and understood for the successful implementation of a strategy: core values, risks to be avoided, critical performance variables, and strategic uncertainties. He suggests each of these constructs is controlled by a different lever: that is, belief systems, boundary systems, diagnostic control systems, and interactive control systems respectively.

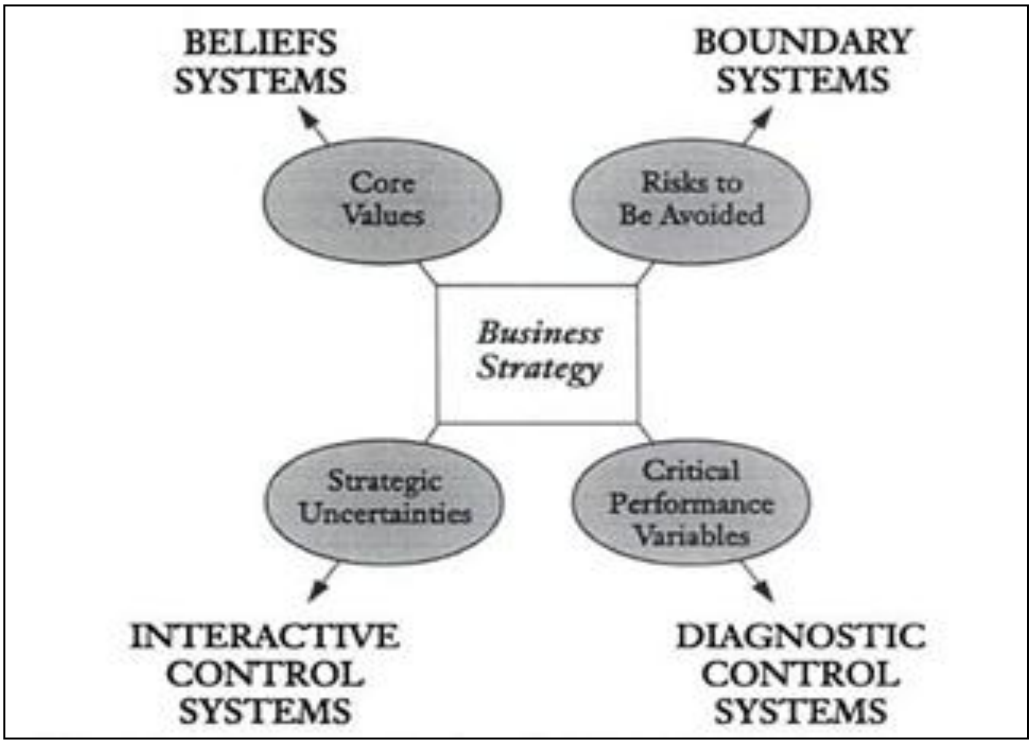

Figure 3-4: Levers of control framework (Sourced from Simons, 1995)

The use of each of these levers has different implications. For instance, the belief systems are used to inspire and direct the search for new opportunities, while the boundary systems are used to set limits on opportunity-seeking behaviour. The combination of these two levers can be used to frame the strategic domain of activity for organizational members in terms of positive ideals and proscriptive limits. Similarly, the diagnostic control systems are used to motivate, monitor, and reward achievement of specified goals, while interactive control systems are used to stimulate organizational learning and the emergence of new ideas and strategies (Simons, 1995, 2008). The belief systems and the interactive control systems are the yang that creates positive and inspirational forces. Contrarily, the boundary systems and diagnostic control systems are the yin that create constraints and ensure compliance with orders (Simons, 1995).

Simons (1995) also added internal control systems as an element to the framework. While these are not used by managers to control strategy, they are important for ensuring the integrity of data used in all the other control systems. These systems safeguard assets from theft or accidental loss and ensure reliable accounting records and financial systems. Hence, managers need to ensure that internal controls are adequate to prevent flawed decisions being made based on inaccurate data as well as avoid any misappropriation.

This study implies that the elements of this framework provide a useful frame of reference to conceptualize formalized MCS in a firm. Hence, this framework is used to identify the formalized MCS relating to the innovation function present in the case studies as well as to identify innovation routines that encode these formalized MCS. This would also help identify any routines that are not explained by the existence of the identified formalized MCS. Moreover, using the levers of control to categorize the formalized MCS makes it easier to compare formalized MCS across the case studies. The next sub-section explains the research methods used to gather the data analysed in this study.

3.5. RESEARCH METHOD

Following the assumptions of the interpretative research perspective, data is collected through the study of people in their everyday world. One methodology that allows for this is case studies. A case study involves an in-depth investigation of a phenomenon (Adams, Hoque, & McNicholas, 2006; Yin, 2009) offering the opportunity to analyse suggestive themes and counterpoints, interpretations and counter-interpretations as well as the analysis of different views around practices in an organization (Ahrens & Dent, 1998). The following section introduces the case studies used for this thesis.

3.5.1. CASE STUDIES

A case study implies a single unit of analysis (Ryan et al., 2002), which in this thesis is individual firms. However, instead of adopting a single case study design, this study has adopted a multiple-case study design where every case study serves a specific purpose within the overall scope of the inquiry (Yin, 2003). This study thus uses multiple case studies with a replication logic to gain additional insights, as opposed to a sampling logic where multiple cases are simply seen as multiple respondents in a survey (Yin, 2003, 2009).

More specifically, three case studies are included in this thesis. Each case study looks at a firm that is at a different stage of moving to an open innovation approach. The first case study, Fisher & Paykel Healthcare, collaborated with a number of external firms as part of their innovation process at the operational level; however, there had been no formal strategic drive towards open innovation by top management. In contrast to this, the second case study, Coloplast[20], had undertaken a strategic drive towards implementing open innovation since 2007 (which is formally stated in their Annual Report). However, they had been slow to

[20]This company was selected for this study due to its similarities with the first case study, FPH and the formal shift of this company's innovation practices from closed to open innovation. While this company is based in Denmark, data was collected through face-to-face interviews as for the two local companies.

incorporate the practice of leveraging external expertise into their innovation processes at the operational level. The third case study, Zespri, had both strategically implemented open innovation and extensively used open innovation practices at the operational level.

The purpose of using these firms is to help identify both how and why the innovation practices being institutionalized and used by each firm vary and whether the findings in relation to the role of formalized MCS are replicated in the different situations. Furthermore, by using multiple case studies, this thesis aims to add new insights into the behaviour and actions of organization members in relation to a move towards open innovation.

The next sub-section describes the process of selecting the firms used in this study, followed by a description of the data collection and analysis methods.

3.5.2. PROCESS OF CASE-SITE SELECTION

This study used a four stage process to select the case sites as shown in Figure 3-5:

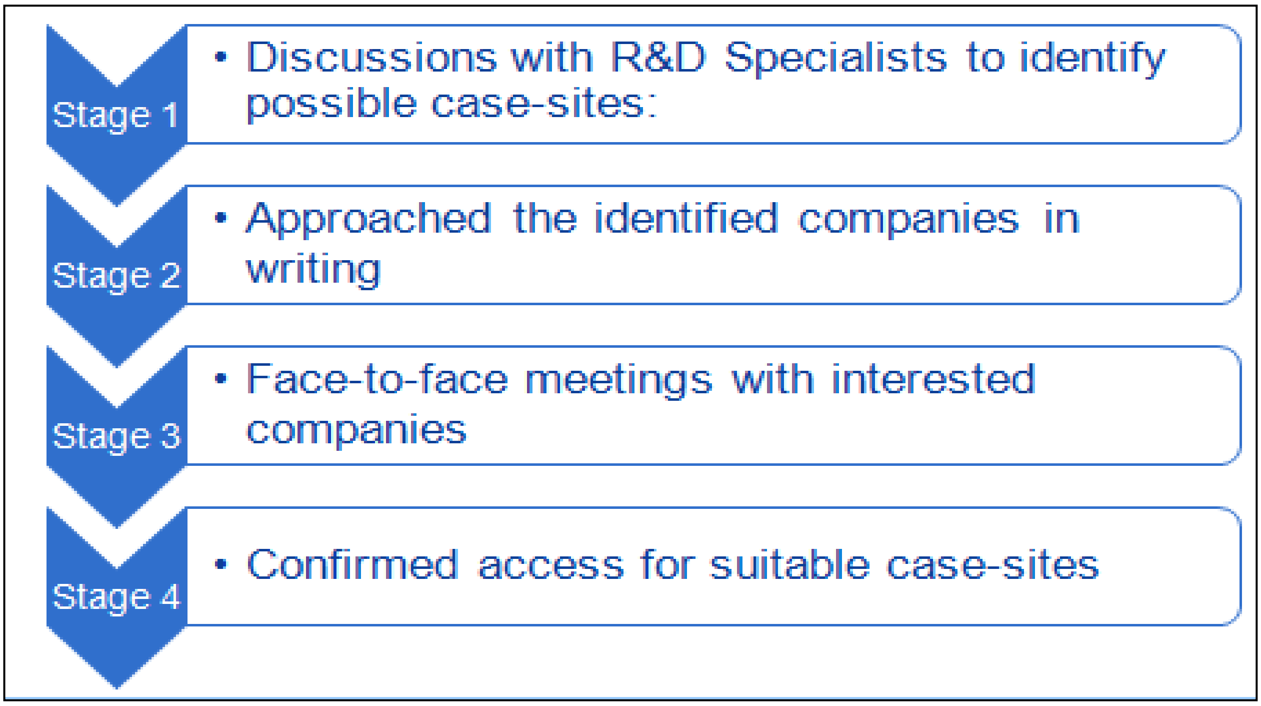

Figure 3-5: Process of selecting case sites.

The first stage of this process involved discussions with R&D experts who deal with a number of organizations in relation to their innovation activities. These experts, listed in Table 3-3, were identified through personal networks and at innovation seminars and conferences.

R&D Experts	Institution
Tony Price	Procam Associates
David Stokes	PDMA
Marion Tasker	KPMG – R&D
Martin Knoche	NZTE
Barry Cowen	NZTE
Dieter Adam	NZTE
Bruce Johnstone	Parnell Group
Jeff Tobias	Caltex – AUS
John Nielsen	Coloplast

Table 3-3: List of R&D experts spoken to for first stage of case site selection

Following these discussions, a list of companies that were of interest was compiled. The next stage of the process involved approaching the companies in writing. The correspondence sent to the companies included a summary of the study and the ethics documents as per the requirements of the University of Auckland. For companies that showed interest, a face-to-face introductory meeting was held to determine the suitability of the case site for the study. The final stage involved confirming access for the suitable case sites. As stated above, three case sites: Fisher & Paykel Healthcare, Coloplast, and Zespri were selected for this study because of the apparent variations in their open innovation practices. The background information for each of the case studies is included in the individual case study chapters, that is, Chapters 4, 5 and 7 respectively.

3.5.3. DATA COLLECTION

Empirical evidence for this thesis was collected using semi-structured interviews as well as documents and presentations. The interviews included organization members who were considered to be most involved and have inside knowledge of the innovation practices of the firms. Interviewees included organization members of different hierarchical levels. They were chosen in order to understand their actions and get the viewpoints of people with different levels of power and ability to change rules and routines in the firm. Interviews included a mixture of in-depth one-to-one interviews as well as some group discussions, which were conducted over 18 months from October 2009 to March 2011. These interviews are summarized in Table 3-4, with more details included in Appendix 1. While a number of other organization members were approached for each of the case sites, they either did not respond or declined to be interviewed, the main stated reason being that they were too busy. Despite this limitation, a good cross section of organization members ranging from top executives to people directly involved in the everyday activities of innovation projects were interviewed at each of the case sites.

Case Site	Number of People interviewed	Total Hours of Interview Data
Fisher & Paykel Healthcare	17	15
Coloplast	4	6
Zespri	8	12 ½
Totals	**29**	**33 ½**

Table 3-4: Summary of interview hours and number of people interviewed

In line with the interpretative research methodology, the intent of the interviews was to get an understanding of the organization members' account of the impact on their intra-organizational practices of the changing innovation field outside the firm. Hence, priority was given to interviewees' own interpretations and perceptions of the changes or stability they experienced or believed existed. Therefore, the researcher used semi-structured interviews with mainly open-ended questions derived from the research questions outlined in Chapter 1 to guide the interviews. Other than the introductory meetings, all the interviews were recorded and transcribed. However, the introductory meetings as well as all phone conversations[21] were documented and analysed in the same way as the transcribed interviews. A list of example questions used to generate discussions during the semi-structured interviews is included in Appendix 2. Questions were tailored based on who was interviewed and their responses to initial questions.

The interview data was also corroborated with analysis of documented sources. A large range of documents and presentation slides were reviewed and analysed along with information provided on company websites. Firstly, these were used to develop an understanding of the companies and their activities. Secondly, they were used to corroborate the interview data and identify formalized MCS and routines encoding these formalized MCS. A summary of the number of documented sources referred to is included in Table 3-5 and a detailed list of the documents is outlined in Appendix 1.

Case Site	Number of Documented Sources Reviewed
Fisher & Paykel Healthcare	36
Coloplast	38
Zespri	40
Totals	**114**

Table 3-5: Summary of number of documents reviewed at each case site

[21] 4 phone conversations with FPH's product development manager and product leader plus Zespri's innovation manager and innovation coordinator were documented. These were short conversations to clarify issues that appeared during the analysis of the interview data.

3.5.4. DATA ANALYSIS

Data from the case studies were analysed using a thematic approach with the help of QSR NVivo 9. This software, developed by researchers with extensive researcher feedback, was designed to support researchers with qualitative analysis. The intention of this software is to increase effectiveness and efficiency of the analysis process (Bazeley, 2007; Bryman, 2008; Gibbs, 2007). The first step of data analysis involved coding the data. As explained by Gibbs (2007), coding is how you define what the data you are analysing is about. So, "*coding is a way of indexing or categorizing the text in order to establish a framework of thematic ideas about it*" (Gibbs, 2007, p. 38).

Where themes emerged from the interview data, a data-driven coding approach was adopted. Some of the common themes that emerged included decoupled routines, difference in perspectives of top management and project level organization members relating to formalized MCS as well as the firm's ability to collaborate, perceptions relating to relational risk and trust. These are discussed in more detail in the following chapters.

While every attempt was made to start with no preconceptions, it is acknowledged that it is not possible to eliminate all subjectivity. All interviews as well as extracts from documented information were coded using the themes that emerged from the empirical data. In light of the purpose of this study, initially, institutional theory and Burns and Scapens (2000) institutional framework were used to make sense of the coded data from the earlier interviews. However, the empirical evidence called for refinement of the institutional framework in line with studies such as Sawabe and Ushio (2009) and Lukka (2007). Consequently, the refined theoretical framework depicted in Figure 3-3 above transpired, and the coded data from both earlier and later interviews were analysed using the refined theoretical framework as documented in the following chapters.

The data analysis process for this study involved two parts: that is, within-case analysis and cross-case analysis as described in the following sub-sections.

3.5.4.1. WITHIN-CASE ANALYSIS

This part of the analysis involved detailed case study write-ups for each case site. These were generally just narrative descriptions supported with some graphical illustrations based on the interviews and the archival documents coded in NVivo. The purpose of this analysis approach was for the researcher to become familiar with each case as a stand-alone entity and to allow the unique patterns of each case to emerge (Eisenhardt, 1989). This within-case analysis is the basis of Chapters 4, 5 and part of chapter 7.

3.5.4.2. CROSS-CASE ANALYSIS

This second part of the analysis involved looking for patterns in organization members' perspectives and use of open innovation practices that were either similar or different across the two firms, FPH and Coloplast. These two firms were selected for this analysis as they are from the same industry developing similar products, but they vary greatly in their approach towards the use of open innovation practices. As suggested by Eisenhardt (1989) and Patton (2002), the idea behind cross-case analysis is to force the researchers to go beyond initial impressions. It also enhances the probability that the researcher will capture the novel findings that may exist in the data. This cross-case analysis is documented in Chapter 6 and Chapter 7 builds on these findings in a different setting.

3.6. SUMMARY

This chapter discussed the methodology, theoretical framework, and research methods chosen for this thesis. It is argued that an interpretative approach (which takes a social view of the world as opposed to an economic view) combined with the use of institutional theory (to explain the actions and understand how social order is produced and reproduced) is an appropriate research methodology for this study. This thesis builds on the work of Burns and Scapens (2000), Lukka (2007) and Sawabe and Ushio (2009) to extend the institutional framework.

The extended framework draws a distinction between the actions of top management and the actions of project level organization members on the basis that top management has the power and ability to change formalized rules. However, the project level organization members can, at most, resist the formalized rules and develop routines that are decoupled from the formalized rules. However, they cannot change the formalized rules without action from top management. These routines may be institutionalized into formal rules; however, only with the approval of top management. The extended framework also draws a distinction between routines that simply encode the formalized rules and decoupled routines, as changes to formalized rules could result in changes to the routines as per the intention behind the implementation of the new rules. Also, routines that are decoupled may remain stable for reasons such as resistance or institutional contradictions (Nor-Aziah & Scapens, 2007). On the other hand, where formalized rules remain stable, routines encoding these rules would also remain stable while de-coupled routines may change in response to issues or problems that project level organization members may face (Lukka, 2007). Therefore, this extended framework is deemed to be a helpful analytical tool for studying stability and change in an organization's practices while simultaneously using an institutional perspective.

This chapter also discussed the appropriateness of a case study for an interpretative methodology. It described the process for selecting the case sites and explained the data collection and analysis methods used in this study. The subsequent chapters describe and analyse the case study data using the extended theoretical framework.

CHAPTER 4. CASE STUDY 1

4.1. INTRODUCTION

"Getting an innovation process right once is possible through luck – the skill comes in being able to repeat the trick"

Bessant (2003, p. 761)

The purpose of this chapter is to describe and analyse the use of open innovation practices at Fisher & Paykel Healthcare (FPH). Even though the way in which this company started was a classic example of open innovation, this concept had not been formally adopted in the firm at the time of this research. Consequently, in contrast to the second case study documented in Chapter 5, the term open innovation was neither part of the top management's everyday vocabulary, nor was it mentioned in management and strategic documents, annual reports, shareholder announcements, or even on the company website. Instead, as explained in the firm's information memorandum, the belief was that FPH was able to reduce risks associated with new product introductions by using in-house capabilities to rapidly produce prototype products suitable for trial use and sale (FPH, 2001). However, seeking input and collaborating with external parties during the innovation process were common practices used by project level organization members. That is, they frequently sought ideas and technologies from external parties to solve product designs and development problems. Despite the lack of a formal drive to implement open innovation, the practice of seeking external input in the firm's innovation process had been successfully repeated time and time again at the project level.

As stated by Bessant (2003) in the above quote, a successful collaboration can be achieved through luck but to be able to repeat the process and repeatedly obtain the desired results requires skills. The fact that FPH had engaged in many successful external collaborations over the last decade suggested its innovation process comprised factors that had helped the firm overcome the challenges (as identified in Chapter 2) of seeking external input and enabling open innovation-type activities. Hence, this chapter, using the insights from old institutional economics (OIE) principles shows how the innovation process in FPH was managed in order to identify factors that had enabled the continued use of this practice in the firm. As explained by Scapens and Varoutsa (2010) OIE was developed in opposition to the assumptions of neo-classical economics, and *"recognizes that individuals operate in specific social setting in which institutionalized rules and values, rather than some generalized principle of economic rationality, shape behaviour*" (Scapens & Varoutsa, 2010, p. 320). In line with this perspective and drawing on the extended theoretical framework as discussed in Chapter 3 where MCS is conceptualized as the formalized rules in the firm, this study examined the influence of formalized MCS on the use of open innovation practices in FPH.

This chapter is structured as follows. The first sub-section describes the company, including its history. Next, the company's innovation activities are examined in detail, followed by a discussion of the influence of MCS on the use of open innovation practices at FPH. Finally, a summary of the findings is provided to conclude the chapter.

4.2. COMPANY DESCRIPTION[22]

FPH is a leading designer, manufacturer, and marketer of a range of innovative healthcare devices. At the time of the research, it had two major product groups: respiratory and acute care, and obstructive sleep apnea. The first group included respiratory humidifiers, single-use and reusable chambers, breathing circuits, and accessories. These were designed to humidify

[22] Information for this section was obtained from the company website, annual reports and the book on F&P History titled Defying Gravity (Davies, 2004).

and deliver the gases that a patient receives during mechanical ventilation, non-invasive ventilation, oxygen therapy, and laparoscopic surgery. This product group also included neonatal care products such as infant warmers to help maintain normal body temperature, infant resuscitators, and CPAP (continuous positive airway pressure) systems designed to improve infant respiratory function. The second product group, obstructive sleep apnea (OSA) offered CPAP therapy products that are used in the treatment of obstructive sleep apnea to prevent temporary airway closure during sleep. The products included integrated flow generator-humidifiers, which were designed to deliver humidified airflow to patients during CPAP therapy.

At the time of this research, FPH's products were sold in over 120 countries worldwide through direct sales operations in most major markets along with a network of distributors that sell to hospitals, home healthcare providers, distributors, and other manufacturers of medical devices. While FPH was largely based in New Zealand with its headquarters, R&D, as well as manufacturing facilities being located in Auckland, it also had sales and marketing operations located in 30 countries around the world to support its customers. The firm had also recently set up a manufacturing facility in Mexico where it had started producing some of its products.

4.2.1. HISTORY OF FPH

FPH began as a part of Fisher & Paykel's (F&P) main operations, which specialized in the manufacture of whiteware products under license to several major international appliance companies and later moved to manufacturing products using in-house technology. In the late 1960s, F&P sought involvement in businesses where they could utilize their growing manufacturing and electronic expertise and were approached by the Department of Scientific and Industrial Research (DSIR) to take a product design to the production stage. The product design was for a respiratory humidifier for patients being ventilated in hospital intensive care situations, which was initially developed by Dr. Matt Spence from Auckland Hospital.

Dr. Spence had seen too many people die from having their endotracheal tubes blocked with dry mucus so he came up with the idea of a humidifier. He used an old preserving jar, put an electric jug element inside it with some water, and blew the air the patients breathed over the hot water. This extra humidity prevented the thick mucus that previously clogged the patients' air tube. As word of his product's success spread among the medical community, the demand for his product grew throughout New Zealand. Consequently, Dr Spence presented his prototype to DSIR who improved the design and approached F&P to commercialize the product (Paykel, 2010).

F&P's innovation team further improved this design and using a dishwasher motor from their existing product line, developed the first model of respiratory humidifiers: the MR328. Over the years, this design was improved and more healthcare devices were developed. In November 2001, the operations of F&P were split into two companies: F&P Appliances Holding Ltd and Fisher & Paykel Healthcare (Davies, 2004).

At the time of this research, FPH was a limited liability company with shares listed on both the New Zealand (NZX) and Australian (ASX) stock exchanges. It employed over 1,900 people, of whom about 295 were directly engaged in clinical research and product/process development (FPH, 2010b). For the 2010 financial year, FPH reported total operating revenue of $NZ503 million and net profit before tax of $NZ107million (FPH, 2010a). As shown below in Figure 4-1, over the previous 10 years FPH had achieved continuous revenue growth and had also enjoyed a steady increase in the number of patents held.

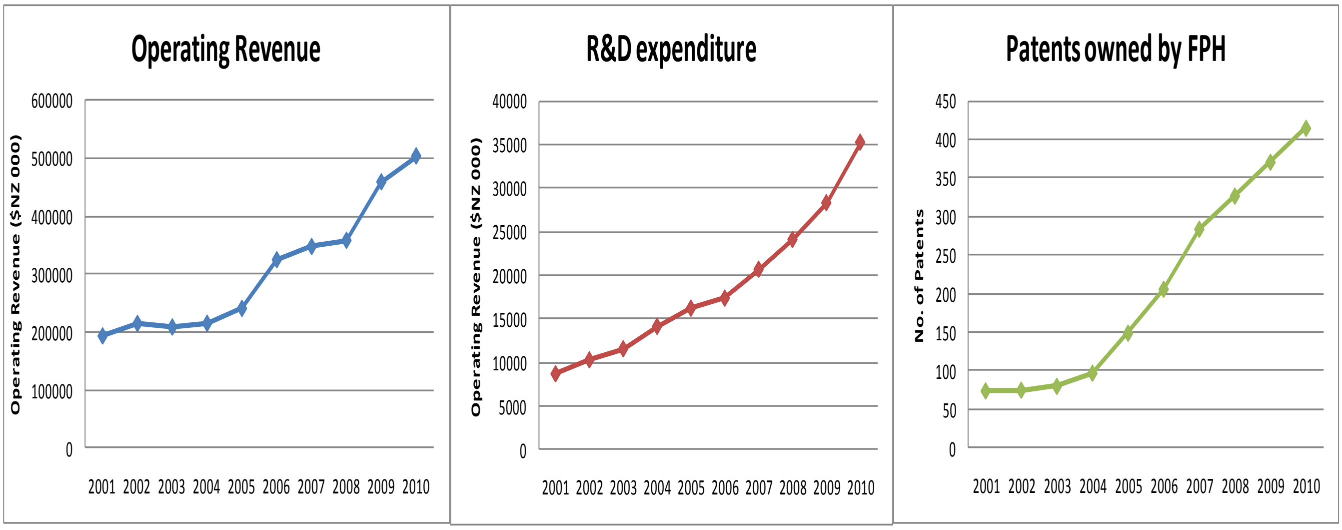

Figure 4-1: FPH's revenue, R&D expenditure and patent counts from 2001 to 2010[23].

The vision statement of FPH read, "*Our purpose is to increase shareholder value by profitably designing, developing, manufacturing, marketing and selling healthcare devices worldwide which improve patient care and outcomes*" (FPH, 2010a, p. 2). To achieve this vision, the company placed a great deal of emphasis on R&D, which was evident in the continuous growth in the firm's R&D expenditure. As stated by the CEO, "*Investment in R&D is fundamental to developing devices which can improve patient care and outcomes and to increasing our opportunities for growth in the respiratory care, acute care and OSA markets.*" This message was also echoed in the Chairman's report which read, "*New and improved products and processes, along with the development of new medical applications for our technologies, are critical drivers of our annual revenue and earnings growth. We remain committed to expanding our R&D activities*" (Paykel, 2010). This also came out in the firm's strategy as discussed below.

4.2.2. FPH'S STRATEGY AND ORGANIZATIONAL STRUCTURE

FPH's objective was to use its expertise and innovative technology to grow its market position in the respiratory care, OSA, neonatal care, and related markets. The key elements of its growth strategy as outlined in the investor factsheet (FPH, 2010b) were:

[23]Data obtained from the annual reports.

- Maintaining its focus on research and development
- Continuing to improve existing product lines
- Developing innovative, complementary product offerings
- Targeting new medical applications for its technologies
- Increasing its international presence

According to the CEO, "*The company's consistent growth strategy is to provide an expanding range of innovative medical devices which can help to improve care and outcomes for patients in an increasing range of applications.*"[24] This strategy was supported by the firm's R&D function. As shown in the organizational chart below (Figure 4-2), this function was headed by a Senior Vice President (VP) for Products and Technology who reported directly to the CEO. The VP was supported by two product group managers who headed the product groups. Below them was the lower management who handled the day-to-day operations of the firm. This included team leaders and product development team managers who managed the individual projects.

As explained by one of the group managers, the structure in FPH was such that each product group was run as its own business. Within each group there were marketing and clinical research teams, product development teams, operations and production personnel, as well as scaled-down versions of group services such as human resources (HR), information, communication and technology (ICT), and finance. Because of access and time limitations, this research had mainly been conducted in the respiratory and acute care division of FPH, which made up close to 50% of the FPH business. The following section discusses FPH's R&D function in more detail.

[24]The dates of the interviews with each case site contact can be obtained from the Appendix 1.

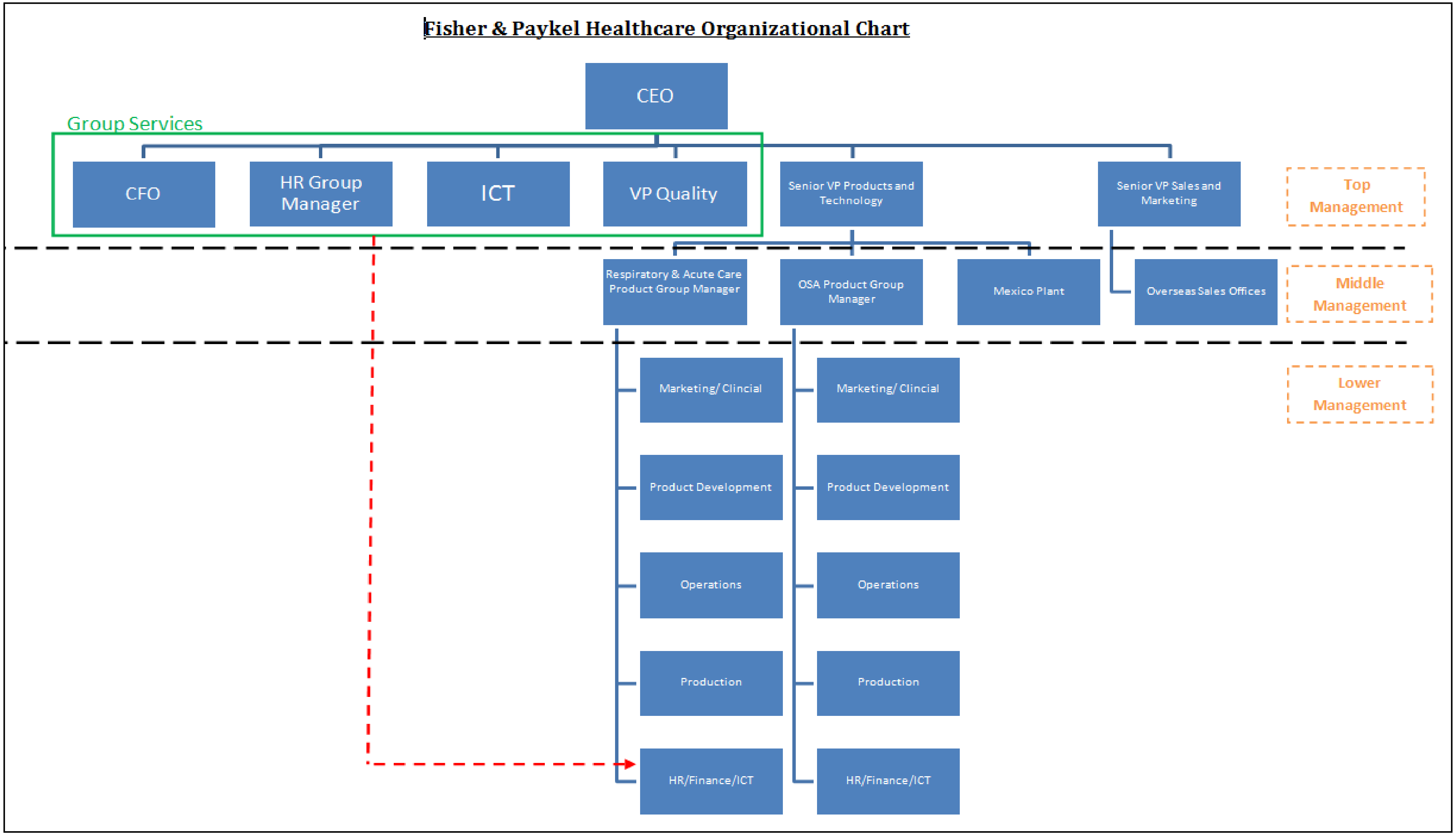

Figure 4-2: FPH's organizational chart as provided by the Group Manager

4.3. RESEARCH AND DEVELOPMENT FUNCTION

As suggested above, R&D was an important function for FPH and one of the key pillars in its growth strategy. Several times during the interviews, it was mentioned that FPH was dominated by engineers, from the CEO who had an electronic engineering background, to the new graduates joining the innovation teams. Hence, the culture in the firm and the mind-set of the people in the firm were complementary to the firm's innovative approach. The general attitude in the firm was that they could improve and do things better. As explained by one of the product development managers:

> *"At FPH innovation is about doing something better, designing it better, and being more efficient about how you design it as much as improving the product itself. We are trying to improve the design process that we use and try and design the procedures that we have to follow to meet compliance with regulatory bodies and we are trying to improve the actual products"*.

However, processes and procedures were in place that determined which projects the firm would undertake, as discussed below.

4.3.1. BUSINESS PLANNING PROCESS

As explained by the group manager, "*the business planning process starts with a strategic plan.*" For example, the respiratory and acute care group had four business units. Each unit had its own strategic plan. Each strategic plan was based on the results of macro-level analysis using tools such as SWOT[25] and PESTEL[26]. At the time of this research, the process of formulating the

[25]A SWOT analysis summarizes the key issues from the business environment and the strategic capability of an organization that are most likely to impact on strategy development (Johnson & Scholes, 2002, p. 134).

strategic plan involved looking at the competition, the firm's strengths, and break-down of sales by regions and by segments. It also drilled down into the strategy with the managers looking at the current strategy, the past strategy and what the future strategy could be.

Out of that strategic plan came a list of recommended projects as shown in Figure 4-3. For each of these projects, a business case was prepared. The business case looked at a wide range of factors including the capital expenditure required, expenses, projected sales, timeframes, resources, travel required, and environmental impact, as well as the risks and benefits of the projects. FPH had a template that team members used to prepare these business cases to ensure that all relevant information had been compiled. Then all the business cases were rated from a quality, financial, and strategic perspective.

Because of the nature of the business, some projects were undertaken purely for a quality reason. If management thought that in the worst case scenario there might be some risk to a patient, then that issue needed to be addressed. Hence, that project was ranked very high on the list. Next, the financial aspect was considered where the managers decided on projects they thought would increase sales. A return on investment (ROI) calculation was performed for each business case to help with the financial rating. Finally, they considered the strategic objective where, for example, FPH would be filling in a gap in its product line to make it possible for a customer to buy the entire range from FPH. For instance, the hospital might say that it would not buy FPH's cannulas unless the firm offers the full range. It might not be financially viable to offer the full range but FPH needed to do so if it wanted to compete with other companies supplying similar products.

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[26] A PESTEL framework categories environmental influences into six main types: political, economic, social, technological, environmental and legal (Johnson & Scholes, 2002, p. 102)

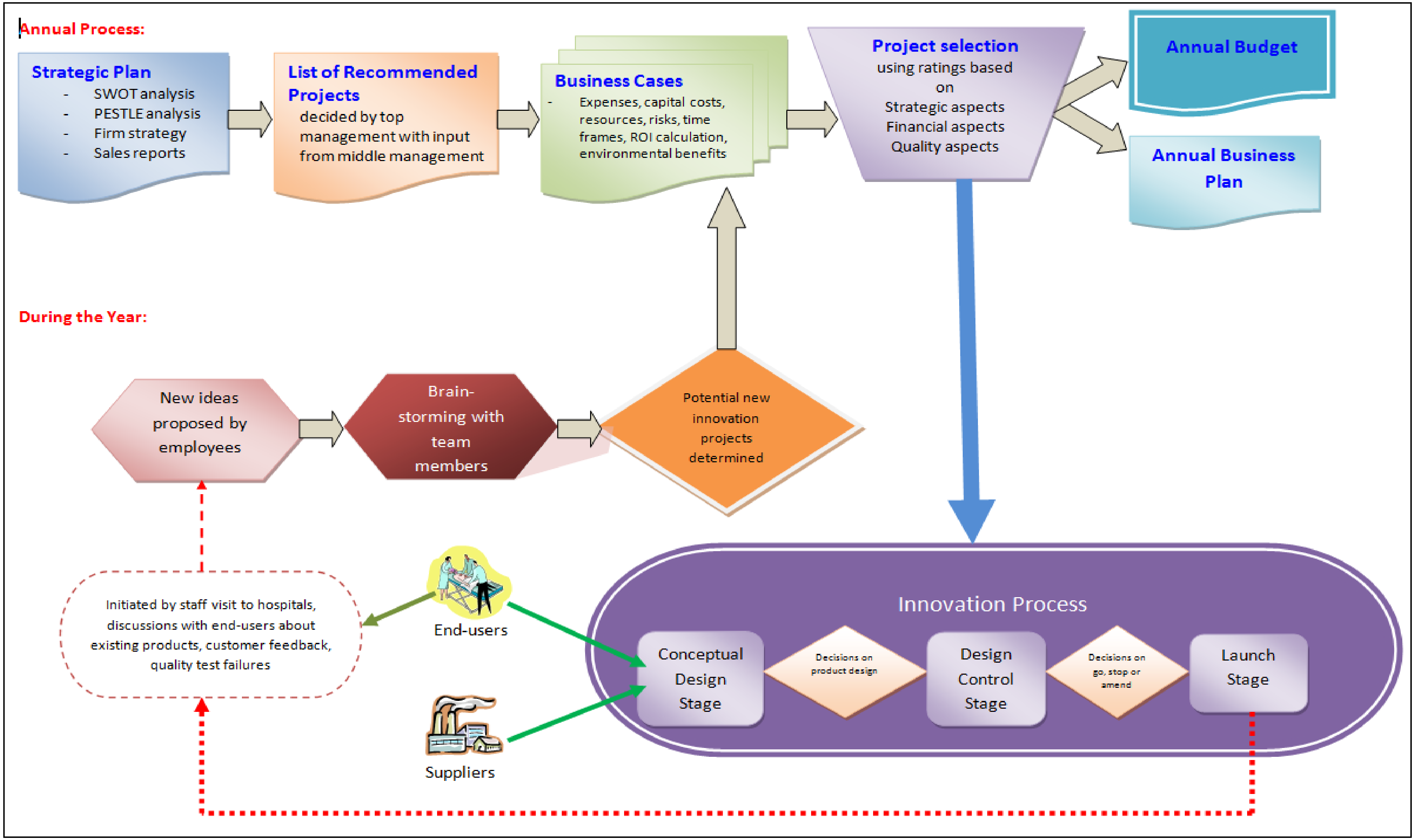

Figure 4-3: FPH business planning and innovation process

The ratings of these business cases were then used to select projects that the managers thought could be done in the coming year. These selections then drilled down into FPH's annual budget and also their annual business plan, where the budget was the quantitative side of it and the business plan was the qualitative side.

In addition to the annual business planning process, new projects were also considered during the year. The ideas for these projects were generally initiated by organization members' visits to hospitals, discussions with end-users about existing products, customer feedback or quality test failures. These ideas were discussed with fellow project level organization members at brain-storming sessions, during which new innovation projects were determined. With the help of the lower management business cases for these projects were prepared. The preparation of business cases involved several employees spending a few months understanding the issues around the project, what the customers wanted, the performance of the existing products and the potential of returns for the business. This was done by employees travelling to different hospitals in various countries. That means these employees collaborated extensively with the end-users and personnel with technical expertise in the medical fields relating to FPH's areas of focus to identify opportunities for FPH to innovate as well as perform the tasks at the front end of the innovation process. Hence, seeking external input during the preparation of business cases was an integral part of FPH's organization members' activities. This is discussed in more detail in the next section.

The business cases were prepared following research by the employees at the project level. They were then fed into the business planning process as shown in Figure 4-3. Here they were assessed, rated and put on a list. This list was divided into two parts, which they called "*above the line*" and "*below the line*". Above the line were the projects that managers were thinking of doing in the current year, while below the line were the projects that FPH might do in the future. Hence, the proposed projects were put either above or below the line depending on the rating given.

As suggested by the group manager, FPH had hundreds of business cases stored up from over the years and every year the managers reviewed them just in case some aspect changed. The selected projects then entered into FPH's innovation process as described in the next sub-section.

4.3.2. INNOVATION PROCESS

The start of the innovation process for a project was marked by the allocation of a project team. As explained by the CEO, "*We look to establish project teams that are focused on one particular fairly narrow area so that they cannot be easily distracted into doing easier things. So, they have a particular problem if you like that they need to deal with.*" These project teams carried out the conceptual design stage. This stage was followed by the design control stage before the product/process was launched or implemented.

4.3.2.1. CONCEPTUAL DESIGN STAGE[27]

This stage was more detailed than the initial feasibility work undertaken to compile the business cases. The team selected one or two hospitals that the employees visited regularly to discuss different conceptual designs and get detailed feedback as the project progressed. FPH's final products were a combination of various different components; for instance, tubes, clips, masks, and pumps. The design of each individual component as well as how they all fit in

[27]This stage is where the project teams take the business cases and define the product in more depth spelling out desired product features, attributes, requirements and specifications. These are translated into designs for the product, which are then executed into prototypes. These initial prototypes are then evaluated usually with the help of potential users such as medical professionals.

together needed to be determined at this stage. These designs were evaluated in great detail as the manufacturing process would have been affected by the decisions made at this stage because most of the cost of producing the final products would be locked in at this point.

Moreover, it was at this stage of the innovation process that project team members approached an external firm to assist them with different conceptual designs where they did not have the expertise in house. For example, the team might have required extrusion expertise to design a component with certain features; or they might have required tubes with certain unique characteristics. As these were not FPH's core business, they were unlikely to have this expertise in house. Hence, as discussed in the next section, they sought advice from external parties including suppliers that specialized in those areas.

The project stayed in the conceptual design stage until the team reached a point where they more or less knew what the products were going to look like. As explained by one of the project managers, "*We do a lot of conceptual design before we get into the next stage. So we have a good idea of what the product looks like before we enter design control. That is sort of a big milestone in the actual design of the product.*" However, at this stage the teams did not set everything out in detail. This was done in the next stage which was referred to as the design control stage.

4.3.2.2. DESIGN CONTROL STAGE

In this stage the teams followed detailed procedures for analysing risks and requirements. They documented everything as they detailed out the design and started performing formal testing. The production processes were also designed here. The end of this stage involved putting everything together and testing the processes, as well as the products that came off the processes. This was referred to as *"validating the processes at the product lines".* The products were also verified to ensure they were meeting the specified requirements.

Design controls at FPH were formal procedures that needed to be carried out. While each product was different, the same standardized sets of procedures needed to be followed even though, depending on the risks identified for the individual projects, the particular tests were different. The teams needed to identify all the risks for each project or product. These risks drove specific requirements that drove the testing that the product/process needed to go through. Because FPH deals with medical devices, these design controls were related to governmental regulations FPH needed to comply with. As one of the project managers commented:

> *"We have our sets of procedures that we rely on. I presume that if I meet the procedure that it meets every regulatory body's requirements anywhere in the world. So I do not have to understand all that. All I have to do is follow the procedure that has been carefully written to achieve that*".

As stated in FPH's information memorandum, it was essential that FPH complied with the applicable requirements, as failures could result in penalties that may include:

- Import detentions, fines or civil penalties;
- Injunctions or suspensions or losses of regulatory approvals;
- A forced recall or seizure of products;
- Operating restrictions; and
- Criminal prosecutions.

The control procedures were performed by the project teams and reviewed by the Quality department, which was a team of quality engineers. These engineers specialized in R&D but they reported through a completely separate reporting structure right up through to the CEO. This structure ensured they remained independent as required by US law[28]. However, they needed to be involved enough to understand what they were reviewing. Consequently, each project team worked closely with one of the quality engineers. This person developed an understanding of the project through constant communication with the team throughout the duration of the project.

Furthermore, there were design reviews at certain milestones in the design control process. As explained by one of the project managers, the term "*design reviews*", which was adopted from the Food and Drugs Administration (FDA) regulations, was more of a document control review as opposed to a true design review. It involved bringing together an independent manager (i.e., an R&D manager from a different project), one quality engineer, a regulatory engineer, and the project team. At these meetings, they reviewed the milestone the project was at and ensured that everything prior to that milestone was complete and acceptable.

During the innovation process, the project team generated a device history file. This file consisted of documents ranging from the intended use of the product to hazardous analysis, failure modes and effects analysis, product requirements, process requirements, and various other documents that captured the design control process.

[28]As FPH sells in the United States (US), it needs to comply with the regulations put in place by the jurisdiction on medical devices. In particular, medical devices are subject to regulation by the US Food and Drug Administration (FDA), which regulates the introduction, manufacture, advertising, labelling, packaging, marketing, distribution and record keeping of medical products in order to ensure that products distributed in the US are safe and effective for intended use. In addition, the FDA is authorized to establish special controls to provide reasonable assurance of the safety and effectiveness of most devices. Other categories of governmental regulations applicable to FPH include Quality System Regulation (US), Medical Devices Directive 93/42 EEC (Europe), Good Manufacturing Practice Regulation (Japan), and Good Manufacturing Practice Regulation (Australia and New Zealand) (FPH, 2001).

It was seen that the relevant legislations outlined the critical performance variables that needed to be met by FPH. Therefore, the design control processes and tests had been put in place as diagnostic control systems (Simons, 1995, 2000) to ensure the critical performance variables were within pre-set limits. In line with the extended theoretical framework described in Chapter 3, it can be construed here that regulations and requirements imposed on FPH through the actions of authoritative bodies outside the firm, that is, the governing bodies in the medical industry such as FDA, have been legitimized in the firm by top management in the form of formalized design control procedures. These formalized procedures had in turn been encoded in the routines of the organization members at the project level, who enacted and reproduced these routines on a regular basis.

4.3.2.3. LAUNCH STAGE

Once the validation and verification processes were complete, the product was launched. The R&D team worked with manufacturing teams to get the products to the market. They also worked with the sales and marketing teams to support the new product in the field. Although there were no formal reviews after the launch of the product by the R&D teams, they did monitor sales and kept a close eye on customer complaints. As summarized by one of the project managers:

> *"I do not think we are particularly good at evaluating projects after the fact. We are sort of keen to get it finished, get the product out of the door and then we move on. Sometimes we have some level of review and identify where things could have been done better but with a new product you often do not see miraculous level of sales in the first year. It might be several years later when you start seeing the sales really picking up."*

As FPH supplied medical devices, it also had robust procedures for monitoring and dealing with customer complaints about the products, as required by regulatory bodies such as FDA. These bodies needed to be notified when an issue was raised by an end-user and there were various rules[29] around when FPH had to notify them. As per one of the product development managers, "*Even if there are minor things happening in New Zealand, that is, if someone makes a complaint in New Zealand, we might have to notify US-FDA of what is happening.*" These complaints sometimes led to new projects being initiated to correct the problem. In the worst case scenarios, the products were pulled off the market completely. However, FPH relied on its robust design control procedures to avoid this situation.

As explained above, organization members interacted with people outside the firm at a number of stages in the innovation process to seek input for the project they were working on. This practice is discussed in more detail in the next section.

4.4. SEEKING EXTERNAL INPUT

As defined in Chapter 2, open innovation is when organization members in the innovation team seek input from somebody who is from outside the company as part of their innovation project. During the interviews at FPH, the organization members both at the top management and project level explained that FPH has had some very successful innovation projects, where it had sought input from external sources such as end-users and medical professionals, Crown research institutes and universities as well as suppliers and potential suppliers.

[29] These are rules issued by the FDA and other regulatory bodies as outlined in the earlier footnote that specified things like timelines around notification of customer complaints, details that needed to be provided, specified types of complaints that needed to be notified. For example, if there is a customer complaint that the packaging damaged the tubes which could hinder the flow of air, the appropriate authorities would need to be notified within a very short time whereas if a customer complained about the colour of the packaging, the authorities would not want to know about it. So, these rules outline the guidelines for the firm around notifications of customer complaints so that appropriate action can be taken if the need arises.

Figure 4-4 shows the shape of open innovation practices at FPH. As described in Chapter 2, there are two dimensions of open innovation: inside-out and outside-in (Chiaroni et al., 2011; Gassmann & Enkel, 2004). FPH has not been engaging in inside-out activities. As explained by one of the product development managers, "*While a number of patents acquired by FPH are not used because they do not fit the current business strategy, these patents are still acquired and retained in the firm as the company strategy might change and these patents might become useful.*" However, FPH's project level organization members have frequently engaged in outside-in activities.

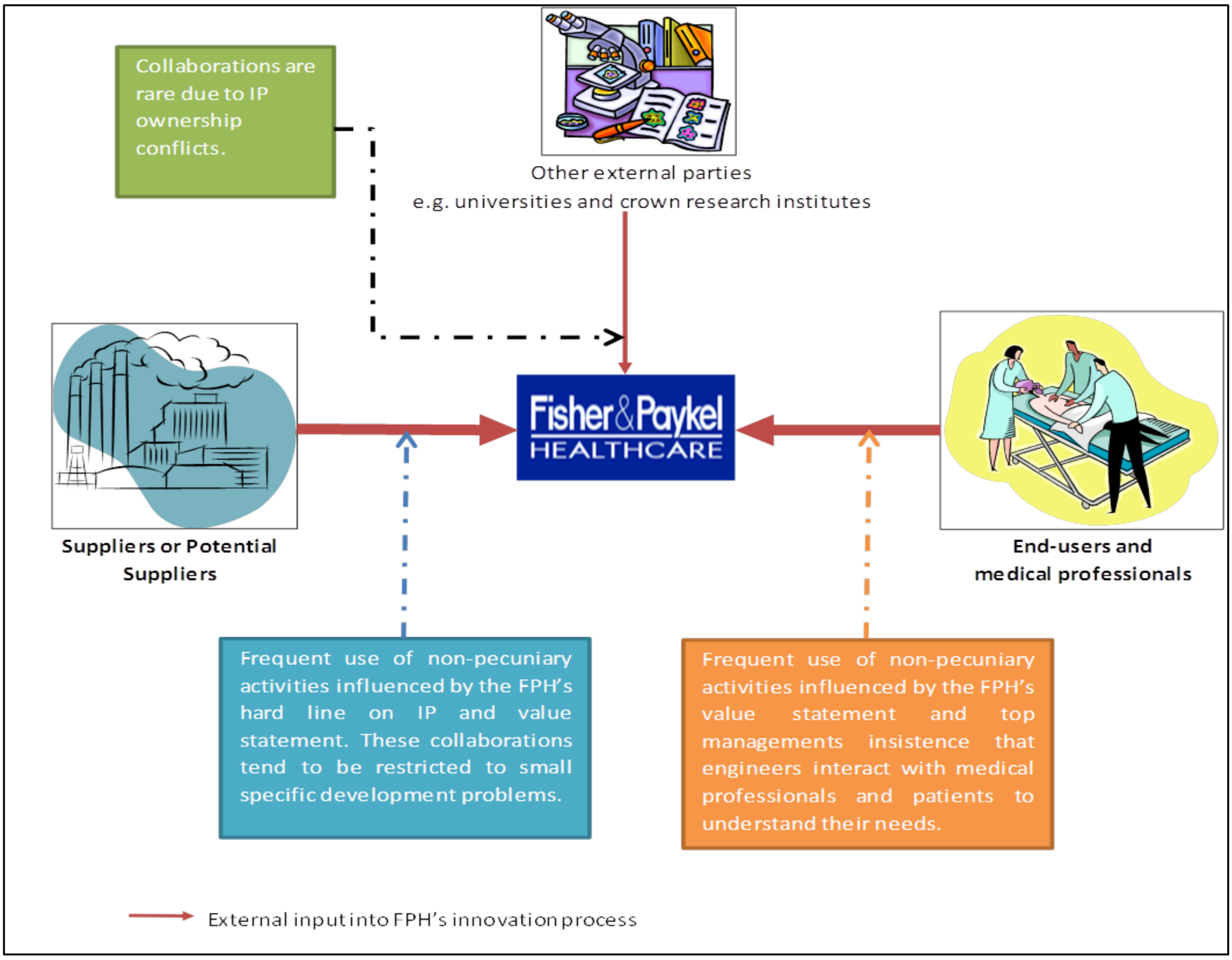

Figure 4-4: Shape of FPH's open innovation practice

This dimension of open innovation has been further divided into pecuniary and non-pecuniary activities by Dahlander and Gann (2010). Pecuniary activities refer to acquiring input into the innovation process through the market place, while non-pecuniary activities refer to firms leveraging the knowledge of an external party for the development of a new product or service without immediate financial rewards for the external party. In other words, the external party collaborates with the focal firm in anticipation of indirect benefits (Dahlander & Gann, 2010). The open innovation practices at FPH have mostly consisted of non-pecuniary activities involving end-users and medical professionals or suppliers and potential suppliers as shown in Figure 4-4 and discussed in the next sub-sections.

4.4.1. SEEKING INPUT FROM END-USERS AND MEDICAL PROFESSIONALS

At the time of this research, seeking ideas for new products or improvements to existing products along with seeking advice and feedback on conceptual designs or quality of products from end-users and medical professionals was an integral part of FPH's R&D model. As explained by the group manager:

> *"Top management at FPH insist that the engineers involved in R&D be out there interacting with the users and potential users of their products. They insist that engineers go out into the hospitals, understand what is happening, try to understand the market and come up with new ideas."*

The reasoning behind this is that by being out in the field, the engineers are able to think practically, identify potential issues that may arise, get a feel for what will work and what will not. The group manager illustrated this with an experience he had speaking with an engineer from another company:

> *"I had an interesting experience with someone who had been a chief designer of a competitor's product and I asked him about his product and said, 'do you not think this*

particular thing might happen when it is in use'. And he said 'oh I do not think so'. And I said 'in ICUs this happens all the time'. And he said 'oh I do not know I have never been into intensive care'. Which to us is amazing, we would not let anyone start to design something without having ever gone to hospitals. So, it is a different philosophy."

FPH's organization culture encouraged organization members to interact with end-users and medical personnel. As stated by the CEO:

"*We work hard to encourage collaborations and access to clinicians and ultimately their patients because it is impossible to determine what the needs might be, how we can improve care and then test the ideas without access to the clinicians*".

Consequently, project level organization members routinely visited hospitals and sought input from these stakeholders in areas they were working in as they needed to understand the needs of the end-users in order to come up with products that will meet the company's vision of improving patient care and outcomes. According to the group manager, FPH had developed close working associations with a number of hospitals and clinicians, particularly in New Zealand and the U.S. These associations offered the firm valuable opportunities to test emerging technologies and have access to world-class medical expertise. In particular, the associations FPH had built with New Zealand hospitals were seen as a competitive advantage. This is because it enabled FPH to test the clinical efficacy of their prototypes in a hospital environment, investigate patient responses, and test the reliability of the product before seeking U.S. and European regulatory approvals, and committing to high volume manufacturing and commencing worldwide distribution. It also enabled FPH to make modifications to prototypes in response to these processes, and start the next cycle of testing, within a relatively short period of time (FPH, 2001).

FPH's value statement, which was frequently mentioned during formal meetings, was displayed in the company's reception area, and was on the company website as well as in every year's annual report. This value statement also emphasized the importance of understanding patient and end-users' needs as outlined in Figure 4-5. The purpose of this value statement was to communicate with the organization members top management's belief that it was beneficial and important to interact with end-users and medical professionals to understand their needs.

VALUES

Fundamental to our success are these basic values:

Patients:

We will employ our research capabilities, technical skills and clinical partnerships to design and develop innovative products and therapies which assist healthcare professionals to provide the best possible patient care and outcomes.

Customers:

Our goal is to be recognised by our customers as a high quality, innovative and efficient supplier. We will earn their respect as the best to do business with through our understanding of their current and future needs.

Figure 4-5: Extract from the FPH values statement

Consequently, from the interview data and as shown in Figure 4-6, it can be inferred that organization members both at the project level and at top management level shared the view that seeking input from end-users and medical professionals was important and beneficial for the firm, and effort should be made to develop and maintain long-term trusting relationships with these stakeholders.

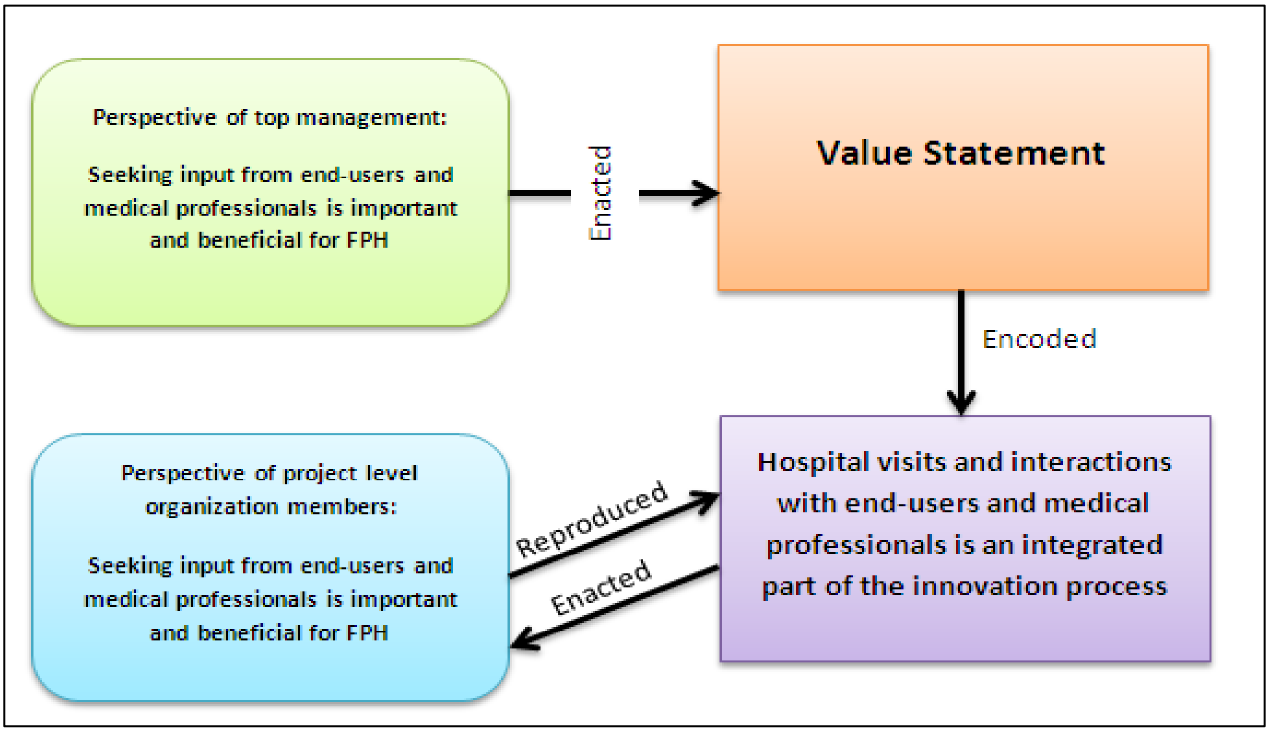

Figure 4-6: Result of consistent perspectives of top management and project level organization members

This view had been coded into the value statement by top management, while the project level organization members enacted this view through their frequent hospital visits and interactions with end-users and medical professionals. As both groups shared this perspective, the routines of project level organization members were consistent with the value statement and as a consequence of the reproductions of these routines, seeking input from these external parties was second nature and part of the innovation process.

As explained by the group manager, FPH's New Zealand location was very helpful in management's endeavours to develop long-term relationships with hospitals. FPH was the largest player in the New Zealand medical technologies sector (NZTE, 2010) with the other local firms in this field not being direct threats due to both their size and their different areas of specialization. For example, Nexus6 specialized in asthma and chronic obstructive pulmonary diseases, while Enztec focused on the design, manufacture and distribution of innovative surgical instrumentation, implants, and consumables for the reconstruction of the musculoskeletal system. Companies in the respiratory care, sleep apnea and infant warming market that were direct competitors of FPH were largely located in US or Europe. Thus, FPH did not have direct competitors locally, which meant FPH did not have to compete for exclusive arrangements with hospitals to gain access to clinicians and patients. Instead, as in one case, the hospital approached FPH's top management and offered to work with FPH organization members. As explained by the group manager:

> *"They approached us probably 20 years ago and said we would love to work with you. Is there something we can do to work together and that is how our relationship with them started and that is one of our strongest and most enduring external relationships."*

Another group of external partners that FPH had collaborated with in the past are the Crown institutes and universities as described below.

4.4.2. COLLABORATIONS WITH CROWN RESEARCH INSTITUTES AND UNIVERSITIES

FPH also had some collaboration with Crown research institutes and universities, where FPH generally funded and supported projects exploring new concepts that they might be able to incorporate in their future products or processes. These were usually pure research projects that might result in a major breakthrough, resulting in potential radical innovation[30] for FPH. These collaborations had generally been initiated by the external party who approached FPH. As stated by the group manager:

[30] Radical innovation is where prevailing knowledge is transformed and new product categories that did not exist before are created (Akroyd et al., 2009; Ettlie & Subramaniam, 2004). On the other hand, incremental innovation involves refining prevailing knowledge which results in small improvements to existing products and business processes (Akroyd et al., 2009; Ettlie & Subramaniam, 2004).

> *"We tend to be more interested in working with people who approach us. If they do not approach us first, instead, we try asking someone to work with us then their level of enthusiasm is not high enough to make it work* [sic]*. What we are really looking for is the people who come to us and say 'I would love to work with you guys, here is what I am thinking' and there are enough of those people approaching us that we tend to mostly go down that path."*

This belief was shared by top management and was evident from the interview with the CEO. Management at this level were confident that they would have a steady flow of relevant project ideas coming to them from their highly skilled employees and people interested in working with FPH. Hence, there was no need to invest large amounts of resources in searching for these opportunities. However, while FPH had been successful in attracting some good opportunities, collaborations with research institutes such as universities and Crown research institutes were rare, which the organization members at the project level attributed to the top management's views on IP ownership as epitomized by this quote from the group manager:

> "*For us there is a fairly narrow range of situations where we see the ability for open innovation and that tends to come down to an intellectual property issue. That is, whether we can ring fence the IP and make sure that we do not open ourselves to a situation where there is a dispute about who owns the IP*".

The top management's hard line on IP ownership had been a hurdle for open innovation practices around radical or semi-radical[31] innovation as it made it difficult for organization

[31] Semi radical innovation is in between the two extreme innovation types that is, incremental and radical innovation as defined in footnote 29. This type of innovation involves substantial changes to either the business model or the technology an organization has used in the past (Akroyd et al., 2009).

members to find external parties such as universities and research institutes who were willing to work with them. As explained by the CEO:

> "*Historically we have found it quite difficult to work with entities in New Zealand as our view is that we own the IP but that is not necessarily the other organization's view. So, in the end we just walk away and say sorry we are paying for it, it is ours. We own the IP. It is fine if they do it independently and take the risk and fund it themselves. Then come and sell us the IP. That is fine. But if we are paying for all the costs associated with it, we expect to own the IP and quite often it is difficult to get an agreement on that*".

The CEO reiterated that if there were opportunities where they came across somebody who was not from within the organization but had parallel interests and was working in areas applicable to FPH, management did not have a problem with the project level organization members pursuing those opportunities in collaboration with the external party. However, the primary rule for the organization members was to establish the ownership of IP upfront. The CEO believed there was no point in going on with something if they did not know where the IP was going to reside. This view was also shared by the group manager who stated:

> "*As much as possible the responsibility is pushed down to the organization members where we say to the people, if you want to engage with someone external, tie up the IP, make sure that you have this covered from a legal perspective and then whatever you do after that is up to you. So, I guess what we are heading towards is having some sort of over-arching agreement in place early on and we would like that to be very simple, very straight forward and again just covering IP*".

To support the project level organization members with this, FPH had legal and IP people in-house whom they could turn to for help in negotiations and preparation of contracts. On the IP ownership note, the group manager also stated that FPH did not license out its IP and they tried very hard not to license from other organizations as well. The reason for this was top management's belief that it was easier to own and manage the IP themselves as the interactions can become quite complex otherwise. This was explained by the group manager as follows:

> *"There are a couple of reasons for FPH's hard line on IP. Firstly, if you start putting royalties on a product, that compromises your margin and you end up in a situation where if you take a product for argument sake and it had a 10% margin on it and you used three pieces of someone else's IP. If they all asked for 2% royalty then all of a sudden your margin has gone to 4% and it is not looking viable anymore. And you cannot ever get out of that situation. You know you are stuck forever in that situation where you are paying out that royalty. So, that is one issue. The other issue is just around the management of who owns what parts of that IP. So, if you imagine for example that you are working with a research institute be it a university, etc, and you do not have an agreement that one party will own all the IP. Then you end up in a situation where there is uncertainty as to what the cost of that IP will be later on for us as a company. And there is also the issue about whether we will own it at all and whether that IP might be also licensed to one of our competitors for example. So, I can only think of a couple of very rare exceptions where we have not insisted on owning the IP. That would be our default position to insist on that before we began even preliminary discussions*".

These top management views on IP, which had been formalized into rules around confidentiality and IP ownership, had resulted in very few instances where organization members persisted in collaborating with large external parties such as universities and research institutes. However, the rules on IP ownership had not hindered collaborations at the project level with another set of external parties that is, suppliers or potential suppliers, as explained in the next sub-section.

4.4.3. COLLABORATIONS WITH SUPPLIERS OR POTENTIAL SUPPLIERS

At the time of this study, project teams frequently approached suppliers and potential suppliers and sought input into problems they identified for the projects they were working on, such as the one described below. However, this routine practice of seeking input from this group of external parties did not enact the formalized rules around IP as discussed above. Instead the project level organization members by-passed the process of holding upfront discussions about IP ownership, as they believed IP ownership was not an issue in most cases.

Interviews with project leaders and product development managers suggested that while they empathized with top management's concerns regarding confidentiality and profit margins, they also recognized the hindrance these rules presented for their ability to seek valuable knowledge from external parties. As explained by the project leaders, the IP negotiation processes were very time-consuming that resulted in lengthy unproductive debates. These processes delayed the team's development efforts and impacted on their time-to-market measures. As discussed above, FPH's interest was to own and manage the IP themselves to avoid operational complexities and loss of margins. However, most of the bigger research institutes, which could provide valuable knowledge and research prospects for FPH, tended to also want ownership of the IP. This resulted in a breakdown in communication, as exemplified by one of the project leaders:

> *"Look at our relationships with universities. It is classic because there is IP involved and they are developing stuff for us and they get really tricky. You get lawyers involved and the whole thing shuts down. It is exactly what has happened with various universities over time. The way to start up again is avoid the lawyers completely and try and avoid IP so it is not a problem."*

Consequently, the project leaders explained that when they believed they did not have the expertise in-house and required help from external parties, they first determined what they needed help with. In other words, as explained by the project leaders, during the conceptual design stage they identified specific items they needed to develop for their projects, for example, extrusion, different types of tubing, or clips. Then they went with a very specific requirement to someone they thought had the expertise to help them develop it, rather than just having a broad conversation about what the organization members were roughly thinking about doing. The project level organization members believed that one of the advantages of external collaborations was that external parties with expertise could drive the collaborations, bringing in pre-existing knowledge rather than FPH organization members trying to learn from the beginning. Therefore, things that external parties were able to figure out in a couple of days would probably have taken a lot longer if attempted in-house. Hence, the general consensus among project level organization members was that it made more sense to collaborate with external parties on things that were not the firm's core business, as this allowed them to work on aspects of projects that they had strength in.

The consequence of the organization members' approach was that the engineers needed to do a lot of the research work in-house before they approached an external party for help with development. While this approach worked for incremental and semi-radical innovation where the engineers had some knowledge in that or a related area, it restricted the company from exploring the more radical opportunities, as with these opportunities, the external researchers generally did not want to surrender their IP too easily as they wanted to keep control of the invention. However, FPH's organization members believed this was not in FPH's best interest; hence, they tended to work on radical opportunities in-house while collaborating with local suppliers or potential suppliers on small specific development problems where IP ownership was not an issue.

The project managers indicated that they preferred working with small local vendors because they could frequently meet the vendors face-to-face and resolve issues in a timely manner, as opposed to dealing with someone in another country. The project leaders explained that FPH's projects tended to require a lot of prototyping and the teams preferred to be able to physically see the prototypes before they proceeded. They believed this would be difficult or very time consuming if they were dealing with foreign companies. As stated by one of the project leaders, "*We prefer to have them locally, prefer to have them English speaking, prefer to actually go there, sit down with them and look at the problem and that is hard when they are not in New Zealand.*"

With the associations they had with local vendors, the project teams were able to visit the vendors, or the vendors came to FPH on an as-needed basis. That frequency of face-to-face interactions was the foundation of trust that they had built with these external partners. As stated by one of the project managers:

> “*We have been in situations where people have offered us to develop specific tubes but they want two hundred thousand dollars to develop it or something. We do not trust them. We do not know them from a bar of soap. We have no confidence that they could even do it. So, the discussion does not even start. You just go I will try and find something else.*”

A second project manager added to this:

> “*Part of that comes from the fact that we are in New Zealand because a lot of these companies are in States and we just have not got an appreciation for what they do over there. A lot of this is like; oh this place in Germany can give us tubes. Oh yea. And it is like, it is too far away we cannot even picture them, we cannot go and see if the company even exists.*”

Hence, the general perception among project managers and project leaders was that they could trust the local vendors and build good working relationships with them because they could interact with them face-to-face and resolve any issues as they arose.

In addition, one of the project managers suggested that they also considered the size of the vendors when seeking input as reflected in this comment:

> “*We prefer to work with vendors* that *are small enough to care about us but big enough that they can stand on their own. We do not want* [the situation that] *if we change and stop buying their things, they would go out of business. It is preferable that we are not the biggest customers and that they are prepared to work with us and not that you just get what you get*”.

Moreover, as FPH was the largest player in the sector, it had the power to leverage off local vendors whose interests were scoring a supply contract with a big manufacturer. Having a company like FPH as one of their customers would immensely benefit these vendors' operations. FPH's project level organization members strongly believed that this commercial motivation enticed the vendors to help FPH project teams with their development issues without any regard to IP ownership. As stated by one of the project leaders when describing some of the collaborative projects he had worked on, "*They had commercial motivation that we would be buying in large quantities later and that is probably the most common way we do it at the moment.*" As FPH organization members tended to approach vendors that had the expertise to deal with the specific problem they wanted external input on, the solutions provided by these vendors were usually incremental innovations of the vendors' processes, for which obtaining patents was difficult and not necessary. Obtaining such patent for these small local vendors was very costly and imposing them would have been close to impossible. So, for these vendors the cost of IP ownership outweighed the benefits. Consequently, the absence of conflict of interest over IP ownership enabled FPH project teams to develop and maintain collaborative relationships with small local vendors in New Zealand for over a decade and this was likely to continue in the future.

Despite the fact that this routine of collaborating with local vendors was decoupled from the IP rules, FPH's top management did not condemn the practice. As commented by the CEO:

> "*We would be delighted to have collaborations if they worked. We are not fundamentally opposed to it at all but our experience has not been good in finding external innovators for lack of a better word that are aligned with what our particular needs are*".

In other words, top management at FPH had identified the search for suitable partners whose interests were aligned with FPH as a challenge for external collaborations. This is consistent with the findings from previous studies looking at challenges of open innovation (van de Vrande et al., 2009; van der Meer, 2007; West & Gallagher, 2006). However, despite this challenge the project team members were able to collaborate successfully with suppliers and potential suppliers to fulfil the needs of the innovation projects. The project leaders believed that in most of these cases it came down to the fact that external parties collaborating with them got some benefit for helping them to develop.

As explained by the project leaders, they did not need to follow any formal processes or procedures to find or approach external parties. The project teams found the firms that they believed were helpful through their own sources or through searches on the internet. There was no centralized group that helped the teams with this activity. The problem with this was that there were people within FPH that held valuable information such as suppliers that had worked for them in the past that were helpful and ones not to approach. This information could have been helpful, but until recently[32] they were unable to share it with the relevant people, as it was not done systematically.

The organization members started the process of collaboration by talking to people that they believed might have the expertise they needed for their project; for example, extrusion companies with different technologies or tube suppliers. At this stage there was no arrangement to pay the external parties or enter into any formal arrangements. However, when searching for external expertise the project managers operated on the basis that FPH was a large[33] company; one of the identified companies would be the potential supplier, and so,

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[32]An upgraded database has now been installed in FPH as described later in this chapter that could help with this issue.

[33] Large in terms of size relative to other MedTech companies is New Zealand.

the external companies had commercial motivation to work with FPH to research and develop an item. Consequently, as suggested by a number of the project leaders, they had in the past persuaded external parties to enter into an arrangement by conveying to them that FPH was a big player in New Zealand, so, collaborating with them would be worth their while. For instance, in explaining one of the projects the project leader stated, "*We said to them that if it works out then the production is yours.*" While this strategy convinced some external parties to work with FPH on that project, as pointed out by another project leader, "*That is a really dodgy thing to say because that would be an engineer making the commitment who has got no control over future purchases.*" A third project leader added to this, saying:

> "*The external party can pretty much trust you [the engineers] that you are going to put the business with them because you have been through the pain and the heartache with them. The only problem is that in two years' time when you are doing something else and someone is trying to reduce the cost of the product, they do not have any of that loyalty.*"

This could destroy the trust that one group of engineers had developed.

While the advantage of the above approach to FPH was that project managers could start collaborating almost immediately as opposed to going through long discussions and paper work to put a contractual agreement in place, the problem with this approach was that it created false expectations that could result in FPH damaging its reputation and compromising future collaborations. As explained by one of the project leaders, this problem had already arisen in one of the divisions of F&P where a number of the suppliers came back and expressed their anger because they basically spent all their time developing products in collaboration with the project team and then in the first year of production, the manufacturing was outsourced to an overseas company that offered a cheaper price. As a result, the external collaborators felt cheated as they did not benefit from the collaborations at all.

One of the project leaders gave a recent example of working on a special type of board for a new product, when he approached a company but they were really reluctant to help. They told him that they were not interested in working on this project because every time F&P went to them, they helped with the development work and then they did not hear anything else from F&P. However, another project leader explained that there would be a degree of that when they are working on new ideas and trying to figure out if it is going to work. Not everything is going to work. The project leaders guessed there was a ratio of 10 if not 20: 1 of times when FPH approached an external party to help with a project that did not go anywhere, to the number of times something was developed in collaboration with an external party. As stated by one of the project managers, "*If you are looking at putting a contract for every one of those, that is all you would be doing.*"

Moreover, as pointed out by one of project leaders, FPH would have been compromising its negotiating powers if it said upfront to the external party that they would do all this development work together and FPH would guarantee to purchase the product from them. As revealed by the project leader, in one of the projects where this approach was used the external party came back with a ridiculously high cost per unit because they knew the business was theirs already. Hence, they could profit more by charging high prices. In cases like this the choices available to FPH was either pay the high price or retract its agreement and destroy the possibility of future collaboration opportunities; or even face legal consequences by breaching a contract.

One of the project leaders described his view of external collaborations as:

"It is like two companies are trying to screw each other and at the end of the day they come to an agreement that works. The problem is you actually have to get somebody who is willing to end the fight really. Like if you could work out a contract of sorts that said you work with us, joint development, we will give you a year's worth and work out the approximate price range we talking now. Then maybe you can get through all that, come out of the site and say ok let's move ahead and develop. But it is a lot of work to get through before you even know whether it will work."

Therefore, the project level organization members' view was that the ideal situation for FPH was where a project team was able to easily approach external parties who were willing to work with them without entering into a formal contract at the outset. However, they also agreed that these arrangements should be based on trust and the possibility of future collaborative projects with these external partners should not be compromised.

The following comment by the group manager adequately summed up the view of project level organization members:

"We are not looking so much for what I would describe as a transactional-based approach. We are looking for a more relationship-based approach. So for example, we would or I would prefer and I think this represents the company's view to a large extent, we would prefer to have an arrangement where we are working together with a researcher, without tying ourselves down to very specific project goals, milestones, etc. because to be innovative as a company you need to be prepared to follow things as they develop. If you think of a project, it might be three to five years

*to develop something. If you sit down at the beginning and define exactly what all the steps are going to be, exactly what the milestones are going to be, etc., then you do not have much flexibility to follow those opportunities that may arise as you go along. And if you think of the whole concept behind innovation, it is all about being able to follow those things when they come up and knowing which things to follow. So, I think that is what I am referring to when I say we prefer not to have a transactional approach. A lot of funding and contractual arrangements with institutions are based around you pay us this amount of money and we will carry out this task. That is not particularly helpful to us. I would justify that it is not particularly helpful for encouraging innovation. If you want innovation, you are better to say why do not we agree to work together as long as it is of mutual benefit with very loose terms and go from there. Our most successful arrangements have been based around those sorts of arrangements. I think it depends as well whether they have a short-term or long term view. I mean if you pick the organization that you going into that arrangement with [*external partner*] carefully, over time it becomes in both parties' interest to keep looking after the other one's interests. You know you become intrinsically linked because you know the more you can do for them, the more they will do for you. And it just snowballs. Whereas when it is transactional, in my experience it does not happen nearly to the same extent.*"

One of the project managers suggested that the key to building these trusting relationships was being upfront and saying to the external parties during initial discussions that:

"We will make it worth your time while we are doing the project and we may give the manufacturing opportunity to you for a specified period of time, however, we

cannot guarantee the results. In that way it is a bit more formal without putting everything down on paper during initial R&D work."

For instance, FPH had a project developing a special type of tube for one of its core products. FPH did not have this expertise at that time; however, it was management's intention to keep the production of this tube in-house once it was developed as it was a key component of a core product. Hence, the project team working on the tube approached a company with expertise in this type of tubes and asked them to help develop the tube. In the initial discussions, the project leader informed the external party of their intentions to bring production in-house eventually; however, if the development of this tube was successful, the external party could have the production for the first few years while FPH set up the production facility. The opportunity to supply the tubes for a couple of years was seen as good commercial motivation for the external party to collaborate with the FPH project team to develop this new type of tube. After a few prototypes, the project team had the product they wanted. Therefore, the external party was given the contract to continue developing the tubes until FPH was ready to start producing it themselves. This arrangement continued for 10 years before FPH brought the production in-house. According to the project leader, the feedback they received from the external party was that they appreciated FPH being honest and upfront about their intentions to bring the project in-house. This avoided any false expectations and it was a win-win situation as on one hand FPH benefited from the external party's expertise in the development of the tube, who then continued to supply good quality tubes at a reasonable price. On the other hand, the external party benefited by profiting from the supply of the tubes following the successful development. The two parties formed a good trusting relationship during this project and, according to the project leader, FPH was willing to work with this party again in the future.

While this experience might have been a unique one-off case, the important lesson from this example was that to avoid problems later on, it was important to hold an honest upfront discussion, which more or less was also top management's intention when implementing the formalized rules on IP ownership. However, the difference was that while the formalized rules required things to be formally documented which lengthened the process, project level organization members believed it did not need to be put on paper. It just required both parties to understand what they were getting into so that there were no false expectations that could be a problem in forming trusting relationships.

The project level organization members agreed that when selecting external partners they needed to find firms or people that were willing to work with FPH and that had certain competencies. The project level organization members added that these external parties actually had to be willing to widen their own competencies so that FPH could collaborate with them on different projects that required competencies in their field of expertise. For example, an extrusion partner should have been able to help FPH with extrusion problems relating to various materials. They also needed to be capable of dealing with different problems because, as stated by a project leader, "*The only reason we are going to someone else is because we do not have the capital equipment and the expertise behind that here. Otherwise we would jump on and try it ourselves.*"

As summarized by one of the project managers, there were some informal guidelines that they used to select partners for external collaborations. Firstly, the vendor needed to have the expertise that the engineers required help with. Secondly, anything that ended up on one of FPH's final products needed to come from a source that complied with regulatory and quality requirements. Hence, if the engineers were working with a supplier for the first time, they needed to go through their quality tests with the supplier to ensure they complied. These tests eliminated potential suppliers that did not fit the high standard of requirements set by FPH to ensure compliance with regulations.

The project leaders suggested that the trick was to form relationships and then maintain them. In the past, some teams had formed really good trusting relationships with vendors, only to find that some other team approached the same vendor at a later date and damaged the relationship by defaulting on some arrangement or not following up. As one of the project leaders suggested, "*We need to extend the trust to the greater FPH.*" Another project leader used a dating analogy as outlined in the following comment:

> "*We seem to have a number or couple of brothers all dating the same girl. I guess the thing is you do not want to commit to that great relationship because it is hard so we are going to do it informally. We might have our own little flowchart of what our first approach is and second and what we are willing to go to. But we do not want the next person to turn up and ruin the whole thing.*"

To address this problem, FPH's top management upgraded the company's supplier database so that organization members could go in and enter supplier competencies and track records. The organization members could put in comments about the suppliers and rate them. As one of the project leaders described, "*You can enter your experiences with the supplier in the past. The next engineer can come along and see the rating you have given them and your comments. Then they can decide whether to work with them or not.*" The organization members also had the option of approaching other organization members in FPH who had worked with the supplier to get their feedback and use them as a contact to approach the supplier.

This upgraded database had been installed by management to overcome the issues created by a lack of centralized processes and procedures around approaching external parties. However, use of this upgraded feature in the database by R&D organization members was optional and there were no formalized rules regarding the use of this database. It is simply a tool to connect organization members in FPH so that they could help each other build and maintain long-term, trusting relationships with the suppliers.

Overall, the discussions in this sub-section combined with the previous sub-section show that the difference in perspectives of top management and project level organization members, as shown in Figure 4-7, had resulted in the decoupled routines of project level organization members for collaborations with external parties (other than end-users or medical professionals).

In other words, Figure 4-7 shows that where the perspectives of the top management and the project level organization members differed, and the project level organization members had the ability to by-pass the formalized rules implemented by top management, decoupled routines emerged. For instance, in this case study the perspective of top management was that FPH was better off keeping R&D activities in-house as it reduces the risks involved in new product introduction. They have enacted this perspective into formalized rules around IP. However, the perspectives of the project level organization members differed as they believed FPH could benefit from collaboration with local vendors and that the risks associated with these collaborations were minimal. Therefore, they viewed the rules around IP ownership as unnecessary and rather a hindrance to their ability to collaborate with external partners. The organization members did not have the power to change the formalized rules.

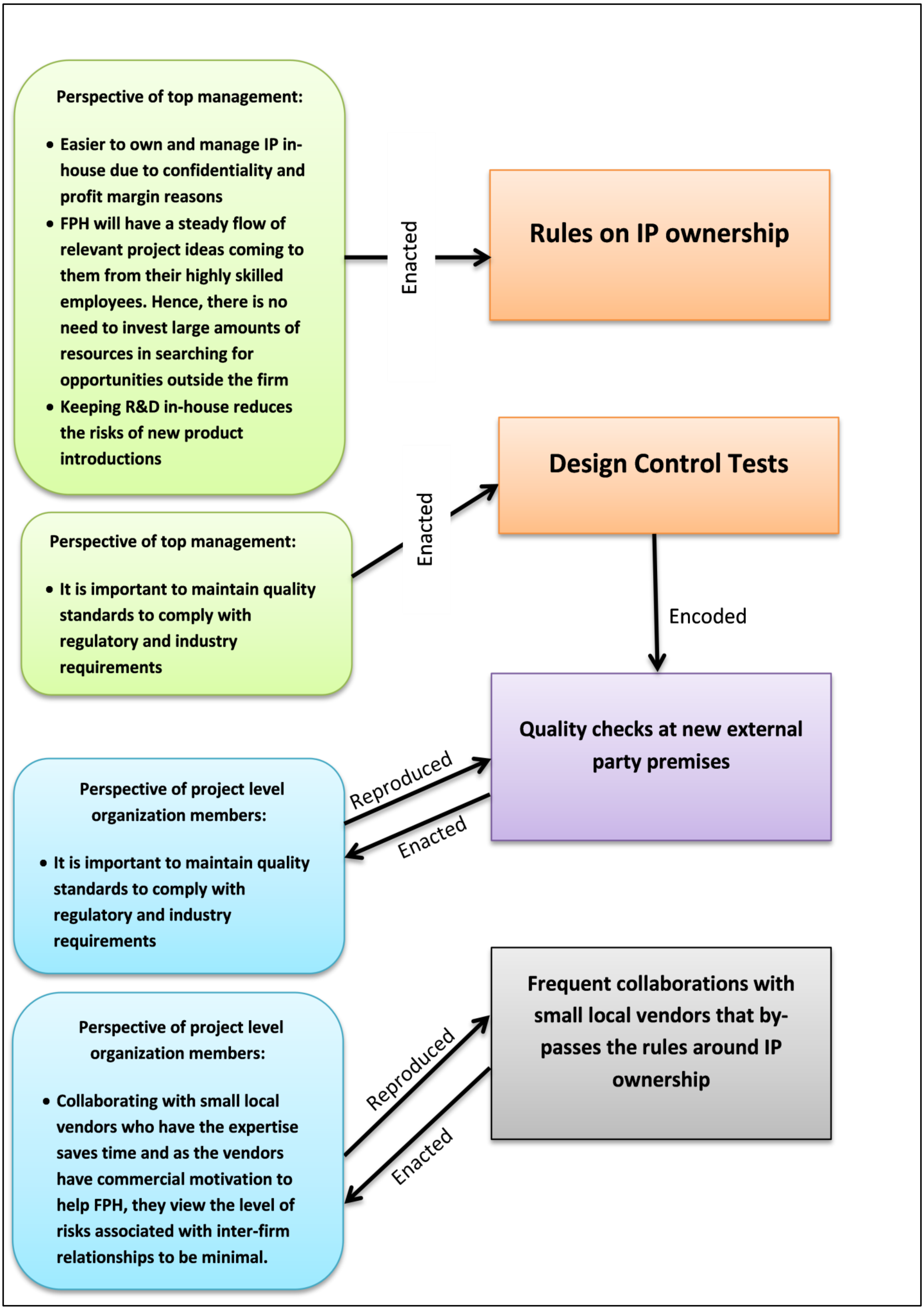

Figure 4-7: Result of different perspectives of top management and project level organization members

However, they were able to by-pass the rules and this was evident in their frequent collaborations with local vendors where they did not enter into any IP negotiations as was required by the formalized rules around IP[34].

In contrast, when the perspectives of top management and project level organization members were consistent, the routines of the organization members simply encoded the formalized rules. For example, the top management's perspective was that it was important to maintain quality standards in order to comply with regulatory and industry requirements. This perspective had been enacted into formalized design control tests that ensured the quality standards were maintained. The project level organization members shared this perspective and so, their routines encoded the formalized design tests and this was evident in their practice of inspecting and performing quality checks at new external partner sites.

The following sub-section describes an example of a project involving an external party to illustrate how project level organization members collaborate with a local vendor, by-passing the formalized rules around IP.

4.4.4. EXAMPLE PROJECT INVOLVING EXTERNAL PARTY

One of the items on FPH's product list was Optiflow™ Nasal Interfaces. This specially designed product also referred to as a cannula delivered humidified air directly into patients' nares[35] at speeds of up to 50 litres per minute. As shown in the picture below, this accessory included soft and flexible nasal prongs. These were designed to promote patient comfort and compliance. It also included an adjustable head strap, which was designed to comfortably fit over the patients'

[34] This is further illustrated with an example in sub-section 4.4.4.
[35]Nares refer to the nostrils or nasal passages.

ears. Moreover, it was fitted with a lightweight and flexible interface tube that allowed freedom of movement for patients.

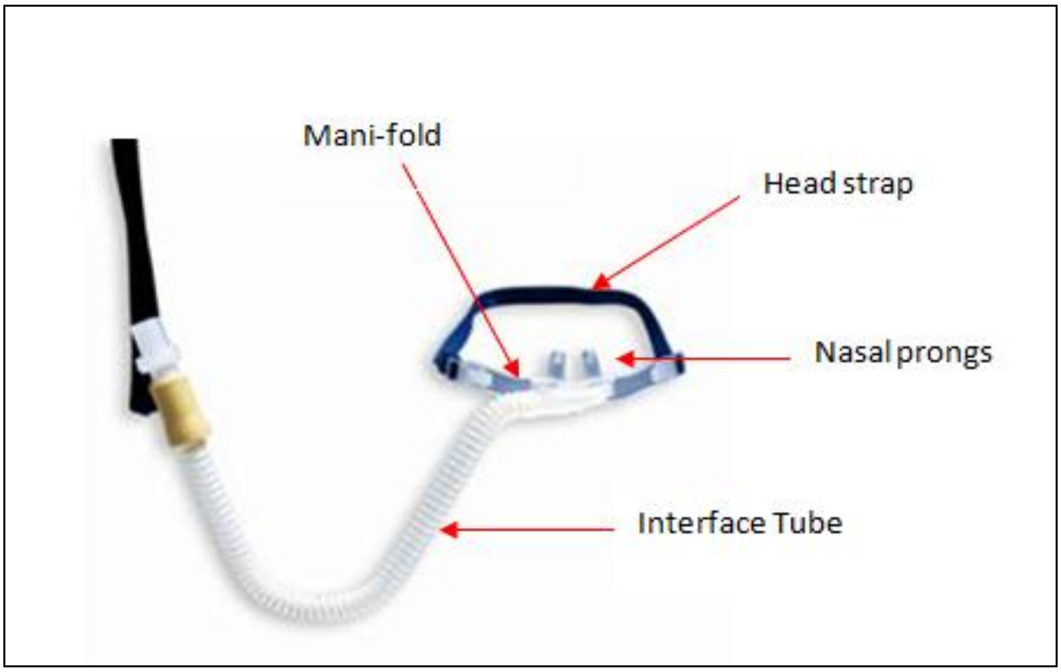

Figure 4-8: F&P Optiflow™ Nasal Interface.

This product accessory was developed more than four years ago in two different sizes, large and medium. While this product had been very successful, feedback from end-users suggested that a smaller sized cannula was desired. Hence, FPH did a feasibility study and found that there was a need for a smaller sized cannula that could fit small adults.

It was also suggested by the in-house R&D personnel that by developing a smaller cannula they would have the full set of sizes to fit the complete range of patients. They believed that as the large and medium cannula were selling really well, they were missing out by not having the smaller sized cannula as small adults were a significant portion of the population. As explained by the project manager, "*The proposed item did not involve changing much in terms of the usability in comparison to the other sizes. It was more of make it the same but fit the smaller population.*" The project team did not have to design the whole cannula because they could use all the same parts that were used in the bigger sizes. It was only the part that fitted on the patient's face that was different. Hence, as explained by the project manager, it involved developing just two new parts, that is, the nasal prongs and the part that held the cannula, which they called the manifold.

According to the business case prepared for this project, this project would have yielded a good [36]return on investment plus with a relatively small amount of money and effort it would give FPH access to a large proportion of the market that they did not already have access to. Therefore, this project looked very promising as it had high financial and strategic value, so it was given the green light to be developed.

The project team believed that they had the expertise in-house to develop the product as they had done this in the past with the two other sizes. They went to a few hospitals in Auckland but the majority of the conceptual design work was done in-house by collecting a group of small females in the building and focusing on designing the product essentially for them. They also invited children of FPH's employees who were in their early to mid-teens to participate. This group of female employees and the children from different ethnicities gave the team enough of a cross-section to perform their research work. As explained by the project manager:

> "*We looked at doing it in-house because we had our own people, fairly internal. We had a little bit to do with Star-ship hospital but most of their patients were small children whereas we were designing the product for small adults.*"

The team designed some prototypes and got the group to try them on. The team took photos of how the prototypes fit the test group, got feedback from the group, and adjusted the designs of the products to fit those people. The team believed it was easier to work with the internal

[36] Good ROI here means a number that was more than acceptable for the project managers and top management of FPH to allow the project to be carried out.

group than with patients in a hospital, as the team could get feedback on the different designs more quickly. Once the conceptual design of the product was finalized, the team moved to the design control stage where the product went through all the specified tests. Although the design of the product passed all the tests, a concern was raised about the packaging of the product during the verification tests. Part of the verification test was transport testing. This test was risk driven and tested what would happen if the delivery was superior and the products had to travel in lots of different ways where they may end up being dropped, vibrated and put through different temperature extremes to get to their destination.

The team had used the same packaging as used for the other sizes which was sealed plastic bags. However, the verification tests suggested that because of the smaller size of the new product, it could get squashed in that packaging during transportation, which could compromise the quality of the product. The project manager explained:

> "*We could do the packaging with a cardboard insert and get to perform well enough to pass the verification tests. But we just had a feeling that we could get customer complaints in the future especially once we have large volumes and we knew that it would be better to improve the packaging.*"

A cardboard insert was initially used to improve the packaging issue so that the product could be launched. However, as per the project managers comment above, this was not a permanent solution to the problem. Therefore, the team started working on alternative packaging. The team had a brainstorming session and came up with suggestions for possible packaging options. The team worked closely with the packaging arm of the production team, as their choice of packaging would have a direct impact on the production team. The aim was to improve the time it took to pack the products, which was a manual process at FPH. The team worked with the people packing the products and timed the process using different types of packaging. They timed packing the product into a plastic bag, packing it into trays and other different types of packaging. They worked with packaging staff to understand what would be faster and calculated how much faster it would be. From this the team established that it was a lot faster to pack it into a tray. Hence, the team elected to go down the path of packing in trays and developed some models of what might be suitable; for instance, a biscuit packaging kind of design where the tray is sealed inside a plastic cover, or a soap tray model. However, now the team was faced with the challenge of designing a package they did not know much about. So, as explained by the project manager, "*It was apparent that we would go with an external party as we know how to pack things in plastic bags. We are good at that but we did not and do not do a lot of other types of packing.*"

The team was aware that the sleep apnea division of FPH were using some similar packaging so they went and spoke with the engineers involved. The engineers recommended a vendor up the road from FPH that they had worked with on a vacuum form of packaging. The team approached this vendor who was more than happy to help FPH. The team started working with the vendor to design and develop prototypes of the different types of tray packaging FPH could use for their product. As the project manager stated, "*The external party was involved pretty much from the start of the design stage. We did not know much about vacuum form packaging so they tried to teach us along the way.*" After initial conceptual design work, the team decided to go with a completely vacuum formed tray and lid all in one piece. Before this decision was made the team did a lot of total variable cost calculations, looking at the product cost and changes to the product cost.

As the project manager explained, the alternative packaging was going to cost more than the plastic bag they were currently using, but they did not want the total variable cost to go so high that they would start losing a significant amount of margin. In addition to the financial impact, the team also took into consideration the social and cultural impact. As stated by the project manager:

> "*We made an effort into making it recyclable. That is part of the reason we ended up with this lid type version because then we could use PET, which is a very common easily recyclable plastic because we were worried that the bulk of the packaging could put people off especially Kiwis and Europeans. So, it is completely recyclable as opposed to the alternatives which were not.*"

The vendor worked with the team to develop an injection mould that produced a package the team liked. This involved a large amount of designing and altering aspects of the packaging until it worked better and was more reliable and presentable. However, this required a special vacuum form tool and knife to cut out the shapes, which required a capital investment. The vendor's concern was that if he invested in this tool and FPH decided to take the production of the packaging elsewhere, he would be stuck with a tool that he would probably have no use for. After discussing this with relevant personnel within FPH and getting approval for the capital expenditure, the team offered to buy the tool and let the vendor use it to make the vacuum packaging for FPH. Although the tool was owned by FPH, they were installed in the vendor's machine in its factory up the road from FPH. As suggested by the project manager, the tool probably would not run in any other machine. However, it was seen as the better option compared to others the team evaluated before making the decision to buy the tool. Some of these options involved buying and installing a machine at FPH. However, that would have cost more and it would have taken longer to validate the machine. The choice the team made was much simpler and faster, plus it achieved the team goals. Moreover, the project manager suggested that it would have been difficult to pull out at that stage and go with a different vendor as they had been working with that vendor on the project for a while. As the project manager put it:

> "*It would have been difficult to pull out and go with their competitor at that stage. So that is the advantage that they gained from working with us and helping us. We developed trust over the time of the project and they were being helpful and that is a big advantage. We could be open with them around what we were doing.*"

The team was happy with the result and the new packaging was put through the verification tests to ensure there were no quality issues; all the relevant documentation was completed before the packaging was rolled out for all three sizes of the product. While the new packaging protected the product from getting squashed, it also improved the assembly time because it was easier to pack and it gave the product more appeal. The new look was welcomed by the sales and marketing teams. Their feedback to the R&D team was that the new packaging made the product look better which made it easier to sell. According to the project manager, this form of packaging might be useful for other products in the future. The vendors were also winners in this situation, as they were now producing the packaging for FPH. As suggested by the project manager, the vendor was a small company up the road and now FPH was a huge part of their business. The project team and the vendor had built a very good relationship, which had paved the way for future possible collaborations.

This example shows how the project level organization members successfully collaborated with an external party without going through the lengthy IP and formal agreement negotiations required by the formalized rules around IP. However, this does not imply that all MCS were disregarded. The following section takes a closer look at the MCS that were used in FPH's R&D function.

4.5. MANAGEMENT CONTROL SYSTEMS

The previous section suggests FPH frequently engaged in the use of open innovation-type practices at the project level by seeking input from external parties even though this practice had not been formally implemented in the firm. Hence, in accordance with the underlying research question for this thesis, the purpose of this case study was to understand the influence of formalized MCS on the use of open innovation practices at FPH. However, the first step of this analysis requires the identification of the formalized MCS that applied to the innovation function at FPH. Therefore, drawing on Simons (1995, 2008) levers of control framework and using interview data from the CEO, the group manager, the project leaders and the product development managers, along with document analysis as listed in Appendix 1, the MCS outlined in Table 4-1 were identified. The following sub-sections discuss these formalized MCS and the related routines.

4.5.1. VALUES STATEMENT

As discussed above, the top management's view was that organization members at the project level needed to understand the current and future needs of end-users in order to fulfil the company's vision to develop devices that could improve patient care and increase FPH's growth opportunities. Therefore, top managers insisted that the organization members interact with end-users and medical professionals. This was seen as a core value for the firm and was documented in the company's value statement. This value statement was seen as a belief system put in place to guide the behaviour of organization members. It did not tell the organization members what to do but it highlighted the values that the organization members needed to exhibit in their day-to-day activities.

Key Constructs	Management concerns at FPH	Levers of Control	Formalized MCS in the Innovation Function
Core Values	Understand the current and future needs of end-users to develop devices which could improve patient care and increase FPH's growth opportunities.	**Belief Systems**	**Values Statement:** - This statement outlined the basic values believed to be fundamental to FPH's success which was frequently communicated to the employees, was displayed in the company's reception area and was on the company website as well as included in every year's annual report.
Risks to be avoided	Valuable information leaking to competitors allowing them to capitalize on it by taking away FPH's market share Committing to business arrangements that would compromise the quality of their product and reduce profit margins.	**Boundary Systems**	**Rules around confidentiality and IP ownership:** - FPH's default position was to own all the IP related to their products as this avoided operational complexities and FPH did not have to share the profit margins. Therefore, teams working on a project involving IP needed to get a written agreement on IP ownership (approved by FPH's legal team) before they engaged in any further discussions with an external party. - All external parties working with FPH needed to sign confidentiality agreements to avoid classified information leaking out to competitors.

Critical performance variables	Product quality and compliance with regulatory requirements. Dealing with technical problems with the project on a timely basis. Ensuring R&D costs were within acceptable levels that FPH could afford.	**Diagnostic control systems**	**Design control tests:** - These tests were designed to meet the critical performance variables around quality that FPH needed to comply with as outlined by the relevant regulations. **Formal project reviews:** - Frequent face-to-face meetings between project teams and other relevant parties to discuss progress of the project, issues and ways to solve the issues. **Budget** - The budget was used by top management to make decisions regarding projects they could afford to undertake and also to monitor revenue and expenses to ensure they were in line with expectations.
Strategic uncertainties	Changes in the market and competitor technological advancements that could derail the company's vision.	**Interactive control systems**	**Business Planning Process** - This process involved macro-level analysis to identify any changes in the market and determine the business plan including the selection of projects to be carried out during the year.

Table 4-1: MCS relevant to FPH's innovation function

The project managers and the leaders argued that the existence of a value statement that highlighted the importance of understanding the current and future needs of patients had resulted in the organization members at all hierarchical levels recognizing the need for project level organization members to build a strong relationship with hospitals. This recognition was depicted in the routine visits to the hospitals by project level organization members (as described in sub-section 4.4.1) where they interacted with patients and medical professionals to enhance their learning and product improvements.

Moreover, as explained by the project leaders, healthy collaborations at the consumer end of the value chain had given project level organization members the confidence to seek input from external parties at the supply end of the value chain as well. The view among the organization members was that by seeking input from external parties they were learning and increasing their knowledge. This was in contrast to the view identified by previous studies where the organization members believed they possessed all the required knowledge to develop their products and services (Chesbrough, 2003b; Chesbrough & Crowther, 2006; Katz & Allen, 1982). Unlike the findings of previous studies, there was no evidence of any internal resistance among the project level organization members at FPH that challenged the use of open innovation practices involving end-users and small local suppliers. However, there was a difference of opinion between the top management and the project level organization members in relation to the rules on IP. This is discussed in the next sub-section.

4.5.2. RULES AROUND CONFIDENTIALITY AND IP OWNERSHIP

The second set of formalized MCS identified at FPH was the rules around confidentiality and IP ownership. These MCS acted as boundary systems to set the limit on what organization members could do to protect the firm from the risks of valuable information leaking to competitors and the risk of committing to business arrangements that could compromise the quality of FPH's products and/or reduce profit margins. The purpose of these rules was to eliminate external partners that did not share FPH's interests.

However, the discussions with project leaders, product development managers, and the group manager all suggested that there was a difference between the organization members' routines[37] in relation to seeking external input from suppliers during the innovation process, and the expected action as per these formalized rules around IP. In other words, the routines were decoupled from the formalized MCS. While the rules on IP required collaborations to be based on contractual agreements determined through a negotiation process carried out prior to any project discussions with external parties, the organization members at the project level tended to bypass the process of negotiating contractual agreements and instead attempted to build long-term associations based on trust and mutual understanding.

As discussed in sub-section 4.4.3, this decoupling was not due to tensions and conflicts among organization members as found by Nor-Aziah and Scapens (2007). Instead, in line with Ines et al.'s (2009) finding, the decoupling was the consequence of multiple logics informing the consciousness of organization members. For instance, top management's logic in formulating the rule was that going through the formal negotiation process and entering into a contractual agreement would avoid operational complexities at the later stages of the innovation process. However, the project level organization members' logic was that if they were approaching small local vendors with specific development requirements where IP ownership was not an issue, there was no point in going through the lengthy formal process. This was because, firstly,

[37] Routines here refers to how project level organization members actually go around their innovation process seeking input from local vendors without going through the formal IP negotiations first. This is illustrated with an example in sub-section 4.4.4.

the formal process caused unnecessary delays in their development time and, secondly, as they were dealing with innovation there was high uncertainty around whether the project would proceed to the next stage of development. Therefore, the later stages of the innovation process that top management was concerned about might not have even eventuated. In that case, going through the lengthy negotiation process would simply have been a waste of time and resources. Consequently, the difference in logic between top management and project level organization members had resulted in the organization members circumventing the formal rules around IP and establishing relationships with external parties based on trust and mutual understanding. The reproduction of these actions over time had been recognized as a routine that was decoupled from the formalized rules, which continued to be enacted by the organization members consistent with the argument depicted in the extended theoretical framework described in Chapter 3, and as depicted in Figure 4-7.

However, it is important to note that although these decoupled routines existed in the firm, the formalized rules on confidentiality and IP ownership were not entirely redundant. As explained by the project managers, organization members enacted these rules when they perceived IP ownership was an issue or when they believed the threat of sensitive information leaking into the public domain was high. However, these actions were rare relative to the routine of seeking input from external parties by bypassing the formalized rules.

4.5.3. DESIGN CONTROL TESTS

The third set of formalized MCS was the design control tests. FPH was operating in the medical devices industry. That means, as previously discussed, FPH needed to comply with a number of regulatory and industry requirements in order to ensure the product launched in the market was of satisfactory quality. Recognizing the consequences of failing to meet these requirements, top management at FPH had integrated these regulatory and industry requirements into these design control tests. The importance of these tests was appreciated by the project level organization members and was encoded in their routines at the design control stage, as described in section 4.3.2. Some of these tests were also used by project leaders when selecting external parties they had not previously worked with to ensure the quality of their product was not compromised, as explained in section 4.4.3 and also depicted in Figure 4-7.

4.5.4. FORMAL PROJECT REVIEWS

The fourth set of formalized MCS was the formal project reviews. There were two types of formal project reviews. Firstly, the design reviews (discussed in section 4.3.2), where the project team met with an independent manager, one quality engineer, and a regulatory engineer at particular milestones to discuss the progress of the project and ensure that everything prior to that milestone was complete and acceptable. The requirements of this MCS were encoded in the routines enacted by the project level organization members at the design control stage of their innovation projects.

Secondly, FPH had project reviews that the project level organization members referred to as "*deep dives*". At these meetings, the project managers and the group manager met with the top management including the CEO (and occasionally the Chairman of FPH) where they discussed the innovation projects that were in FPH's innovation pipeline. The discussions centred around the progress of current projects, any issues that may have come to light and ways those issues could be resolved.

Similar types of project review meetings were also held with innovation partners on a regular basis. Although there were no formalized rules around these reviews, the project level organization members' logic was that by regularly meeting the representatives of the external partners face-to-face, they were able to identify and deal with any issues such as technical problems, on a timely basis. These meetings also allowed the parties to build trust and a mutual understanding.

4.5.5. ANNUAL BUDGET

Another formalized MCS identified at FPH was the annual budget. The project level organization members argued that the annual budget was not an impediment to their work. The CEO explained that, this was because top management believed that while the budget was useful for managers for decision-making as well as monitoring revenue and expenses, they also believed that being required to rigidly adhere to the budget would be a distraction for project level organization members, taking their time away from their day-to-day activities. This view was exemplified in the following comment from the group manager, "*We are keeping a close eye on R&D expenditure at a higher level but we trying not to tie up every individual manager worrying about every last dollar sort of thing and I think it is working well.*"

Therefore, while the budget process was part of the routines performed by top management, the actions of project level organization members did not directly involve the use of the annual budget. As explained by one of the project managers, the only time they were reminded of the existence of the budget was if the teams were very close to exceeding the funds allocated to the R&D divisions, which only happened on rare occasions. Therefore, the annual budget was not directly involved in the routines of project level organization members.

4.5.6. BUSINESS PLANNING PROCESS

Another formalized MCS as described in section 4.3.1 was the business planning process. This process was an interactive control system that allowed top management to identify and respond to strategic uncertainties such as changes in the market or advances in competitors' technologies and product offerings. This process was performed as per the formalized requirements once a year, when the projects to be carried out that year were selected. However, the interactions project level organization members had with external parties such as end-users and medical professionals also helped them identify issues that had strategic implications for FPH. As these issues required urgent response, an alternative path of project approvals had also been applied, as depicted in Figure 4-3, which was complementary to the formalized MCS and viewed as being an effective way of dealing with the emerging uncertainties in a timely manner.

4.6. DISCUSSION

As outlined in Chapter 1, the underlying research question for this thesis is '*can formalized MCS influence the use of open innovation practices in a firm*'. The description of FPH's innovation activities and the formalized MCS suggest that the formalized MCS had a significant influence on the shape and use of open innovation practices in FPH, as depicted in Figure 4-4. This study found that at FPH, top management used formalized MCS as enabling agents to help organization members perform their tasks better (Adler & Borys, 1996). These MCS have helped the project level organization members appreciate the benefits of seeking external input and allowed them to act according to their instincts, resulting in routines that were more effective.

For instance, FPH leveraged on the knowledge and experience of end-users and medical professionals that project level organization members used as part of their innovation process. This practice has been influenced by the belief in the firm, endorsed by the firm's value statement that it is important for the firm to understand the needs of the end-users. As a result, part of the project level organization members' role in the firm today is to visit hospitals to interact with clinicians and their patients. However, because of FPH's hard line on ownership of IP, most of its external development projects comprised non-pecuniary collaborative activities involving incremental innovation, where project team members identified the area they needed assistance with before approaching firms they believed had the required expertise and were willing to help them. By approaching the external party with small specific development problems, the project teams were avoiding having a broad conversation that required them to deal with the IP issues before they started. This was believed to be more effective as organization members were still able to leverage the expertise of external parties without needing to delay the development time as a result of unnecessary paperwork, which was required for formal contractual agreements under the formalized rules on IP. However, this practice limited FPH's collaboration to mainly small local vendors due to project level organization members' perception that it was difficult to build trusting relationships with external parties that they could not meet face-to-face on a regular basis.

Consequently, this case study showed that formalized MCS had influenced the shape and use of open innovation practices at FPH by guiding the actions of project level organization members. This helped the firm bypass or address the challenges faced by other firms of implementing open innovation (Chesbrough & Crowther, 2006; Chesbrough et al., 2006; van de Vrande et al., 2009; van der Meer, 2007; West & Gallagher, 2006) which, as discussed in the next sub-section and summarized in Table 4-2, had resulted in the creation of routines incorporating open innovation practices .

4.6.1. INFLUENCE OF FORMALIZED MCS

In the existing MCS literature focused on innovation, formalized MCS have been found to have multiple roles (Akroyd & Maguire, 2011; Akroyd et al., 2009; Davila, 2000). For instance, one of the roles is to promote goal congruence among organization members that is, a control function (Bonner et al., 2002) while another is to enhance learning and coordination (information function) to reduce uncertainty (Akroyd & Maguire, 2011; Davila, 2000). This case study examined the influence formalized MCS had in enabling open innovation practices in FPH by referring to the challenges of open innovation identified by previous open innovation studies (outlined in Chapter 2).

One of the challenges of open innovation was motivating organization members to collaborate with external parties during their innovation process. However, at FPH internal resistance to the use of open innovation was not an issue. As previously discussed, even though some routines were decoupled from formalized MCS, these actions were not condemned by organization members. They appreciated the value of successful external collaborations, viewing them as an opportunity to learn and improve their innovation process.

Formalized MCS	Routines depicting open innovation practices	Discussion
Values statement highlighting the importance of understanding customer needs **(Belief System)** Business Planning Process **(Interactive Control System)**	Regular Hospital visits – Interacted with patients and medical personnel to understand patient needs and conducted research for business cases as well as got feedback on conceptual designs.	OI Challenge: ***Internal resistance*** This was not an issue in FPH as organization members were used to seeking input from external partners and the perception among the organization members was that by collaborating with external partners they were learning and this would help them improve their products and processes as well as respond to any strategic uncertainties in a timely manner.
Rules on IP ownership **(Boundary Systems)** Quality test requirements **(Diagnostics control systems)** **Recent Change:** Supplier Database with Feedback from prior engagements	Frequent collaborations with small local vendors who had the commercial motivation to collaborate with FPH. This routine bypassed the rules on IP ownership. Rare collaborations with other external parties e.g. universities and large research institutes – research discussions began after contractual agreement was in place. This practice encoded the rules on IP ownership.	OI Challenge: ***Partner selection*** The rules around IP ownership and the quality test requirements narrowed the search for project level organization members as they eliminated external parties that had conflicting interests and did not meet the quality requirements that FPH needed to meet. Also, the upgraded supplier database could be a useful tool for organization members to help identify external partners that may be of interest.
Formal Project reviews **(Diagnostic control systems)**	Frequent face-to-face meetings where project level organization members interacted with selected partners and followed up on issues relating to the project.	OI Challenge: ***Management of Inter-firm relationships*** The project reviews allowed effective management of the relationship providing the organization members the opportunity to build trust and mutual understanding with the external partners which could result in further collaborations.

Table 4-2: Summary of the influence of formalized MCS in relation to challenges of open innovation

Organization members argued that the collaborative culture was created as a result of top management's actions to formalize their belief that understanding the needs of patients was critical for their innovation endeavours, and they encouraged organization members to routinely visit hospitals to interact with end-users and medical professionals. This practice instigated confidence in the project level organization members to collaborate with other external parties to supplement their expertise, enabling them to concentrate on their core competencies to achieve better results. This added confidence enabled the organization members to continually seek input from other external parties such as local vendors.

Another challenge of implementing open innovation identified by past studies is issues with partner selection. Partner selection is believed to be critical to management of inter-firm relationships (Anderson & Dekker, 2010; Ireland, Hitt, & Vaidyanath, 2002) because selecting a good partner contributes to controlling the threat of failures and helps protect valuable information (Dekker, 2008; Li, Eden, Hitt, & Ireland, 2008). FPH had no formal processes in place to search for external partners. However, the rules around IP ownership had restricted the project level organization members' search for partners to mainly small local vendors. While these rules limited the types of open innovation activities the firm engaged in, they helped the firm protect its core competencies being leaked to competitors. At FPH when project level organization members felt they needed to protect the information relating to their products from competing firms, external partners were required to enter into formal contractual agreements before any discussions took place. This meant the boundary systems implemented by FPH in the form of rules on IP ownership eliminated partners that did not share the same interests as FPH. Where organization members perceived the risk of information leakage to be low, for example, with small local vendors who had the incentive to help FPH, organization members used informal guidelines and design control tests to select appropriate partners and build the relationships based on trust and mutual understanding.

This finding is consistent with studies that found trust was a substitute for formalized MCS (Caglio & Ditillo, 2008; Dekker, 2003).

Moreover, another challenge of open innovation faced by firms is management of inter-firm relationships. At FPH, once the project teams got over the hurdle of selecting partners, collaborations with external partners were managed through face-to-face interactions. As described above, project level organization members frequently visited the external partners or the partners came to FPH's premises to discuss the progress of the projects and any issues they were facing. These meeting were organized on an as-needed basis and, depending on the size of the projects, they varied in frequency from several times a week to once every few weeks. These review meetings with external partners generally involved the project managers and were informal in nature. According to the group manager, the down-side of this type of open innovation activities was that a lot of management time was devoted to these review meetings. However, these face-to-face interactions allowed the teams to solve problems as they went, which sped up the innovation process. Moreover, this allowed the two parties to become familiar with each other's systems and processes as well as build trusting relationships. This is consistent with studies that have found that repeated interactions provide firms with benefits such as mutual knowledge, ease of knowledge transfer, and trust (Anderson & Dekker, 2010; Li et al., 2008).

As explained by the group manager, FPH's aim was to build long-term collaborative relationships with external partners as opposed to one-off transactional relationships. This view was supported by an upgraded supplier database, allowing organization members to share their experiences with others in the firm to help with their partner selection endeavours. Although use of this database to search for external partners was not mandatory, it was a resource available for engineers to find external partners, and identify people within the firm that had worked with the partners and discuss their experiences. This enabled the engineers to contact the external party through a colleague in FPH who already had a good working relationship with the external partner. The firm was able to capitalize on that relationship by saving on the time and costs related to conducting the quality-related tests mentioned above. This also reduced the risk of other FPH employees going in and damaging existing relationships that project teams had built. The general consensus among project level organization members was that establishing and maintaining long-term relationships with vendors the organization members trusted was the key factor that enabled FPH to continue seeking external input for their innovation process.

Therefore, it can be construed that the formalized MCS influenced the use of open innovation practices at FPH by creating a culture among organization members where they valued the importance of knowledge outside the firm and felt comfortable collaborating with external partners where they perceived low risk of misappropriation, on the basis of trust and mutual understanding. However, at the same time the formalized MCS had created a boundary regulating the selection of appropriate partners to protect the firm from operational threats and complexities. The following sub-section discusses the stability of these formalized MCS in FPH despite the changes in the innovation field and the existence of the decoupled routines.

4.6.2. STABILITY OF FORMALIZED MCS AND ROUTINES

The formalized MCS at FPH had not been changed since the company was formed in 2001. However, there had been a change in the view of organization members regarding collaboration with external parties other than end-users and medical professionals. While it had always been the view that organization members would benefit from interactions with people on the consumer end of the value chain, the view relating to the supply end of the value chain was that FPH would be better off utilizing in-house R&D capabilities as that would enable them to reduce risks associated with new product introductions as outlined in FPH's information memorandum and encoded in the rules around IP. However, project level organization members' perception of the low risk of collaborating with local vendors, depicted in their reproduction of collaborative actions with local suppliers, resulted in the decoupled routines discussed above.

As per the discussions with the CEO and the group manager, the effectiveness of these routines had been realized by organization members at all hierarchical levels. However, at the time of this research, this had not prompted top management who had the power to change the formalized MCS, to implement formal open innovation processes because they believed the current mix of formalized MCS and the decoupled routines were working effectively. Consequently, the need for formal processes was deemed to be unnecessary and may in effect have destabilized the routines that were at the time delivering better-than-desired results. The view of the management was exemplified in the following comment by the group manager:

> *"I do not think that we need a rigid way of engaging with the external people. I think there is a tendency in large companies to formalize processes but I guess I would ask the question; why are you formalizing it. Is it necessary that everyone in the company is doing it the same way? I think you can as much as possible push that responsibility down the organization and say to people, if you want to engage with someone external, tie up the IP, make sure that you have this covered from a legal perspective or whatever and then whatever you want to do after that is up to you.*

Form that relationship whatever way it works. So for me the challenge is not to formalize but to make sure that it does not become overly procedurized."

FPH management's reasoning for not changing to formalized open innovation processes was in line with Lukka (2007), who found that adjustments in decoupled routines through the actions of organization members to promote effectiveness dismissed the need to change the formalized MCS despite having apparent weaknesses.

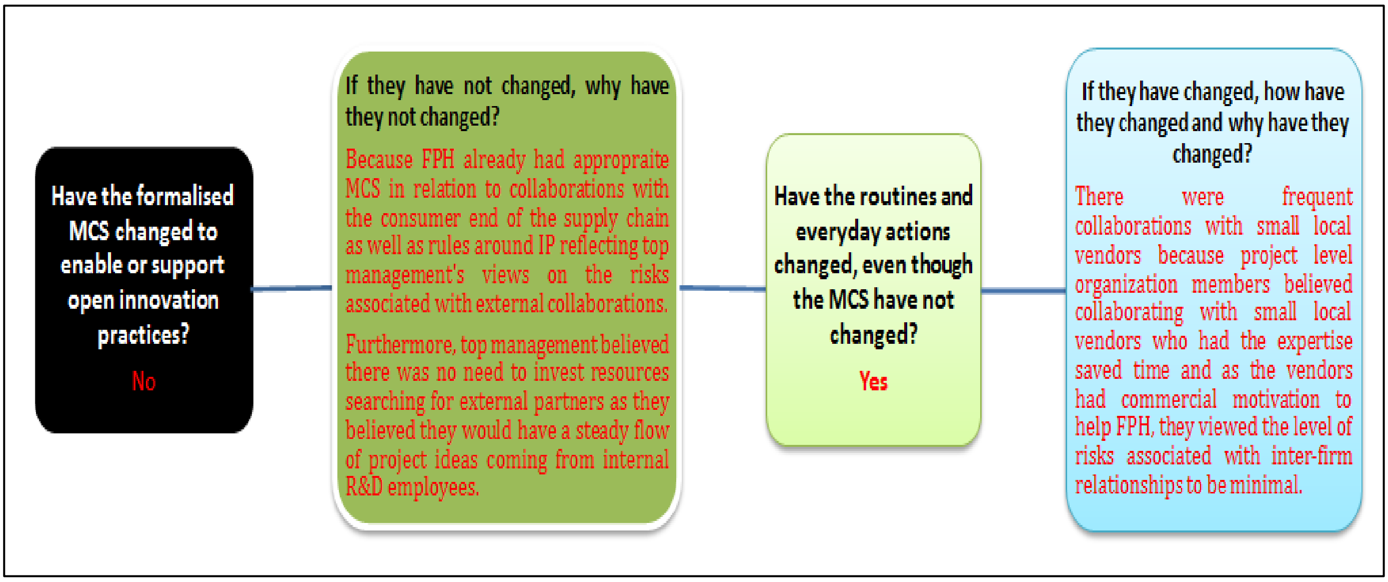

Figure 4-9: Responses for sub-research questions at FPH

Therefore, as summarized in Figure 4-9, the formalized MCS were not changed at FPH to enable or support open innovation practices. The reason for this was that top management believed they already had the appropriate MCS in place and there was no need to invest further resources or formalize the open innovation processes because the innovation practices at the time of this research were effective and generating the desired results. However, the routines of project level organization members did change compared to top management's initial expectation of mainly in-house R&D activities. Instead the project level organization members frequently collaborated with small local vendors. The reason for this change was the project level organization members' belief that collaborating with small local vendors who had the expertise saved time and that the level of risk associated with collaborating with small local vendors was minimal.

The results of this case study support the argument presented in the extended theoretical framework that the perspectives of top management that are embedded in their actions are reflected in the formalized MCS of the firm. If they believed change was necessary, a change to the formalized MCS would result. However, if they believed a change was not required, as shown in this case study, the formalized MCS would remain stable. On the other hand, the perspectives of the project level organization members, which are embedded in their actions, are reflected in the everyday routines of the firm. Where the perspectives of the project level organization members are consistent with the top management's perspectives, the routines simply encode the formalized MCS. However, where the perspectives differ and the project level organization members have the ability to by-pass the formalized rules, decoupled routines emerge through repetition of actions that the project level organization members perceive to be more appropriate as opposed to actions prescribed by the formalized MCS. This is illustrated in this case through the project level organization members' collaborations with small local vendors where the company rules around IP ownership were by-passed (refer to sub-section 4.4.3).

The following section concludes the discussions in this chapter.

4.7. CONCLUSION

This case study showed that while FPH's top management had not taken any deliberate actions to formalize and promote the use of open innovation practices in the firm, especially in relation to collaboration with suppliers or potential suppliers, routines depicting open innovation practices were evident in the firm. It found that existing formalized MCS had been influential in the development of these routines on the consumer end of the supply chain by guiding the actions of project level organization members that helped the firm bypass or address the challenges of implementing open innovation as identified by previous studies (Chesbrough & Crowther, 2006; Chesbrough et al., 2006; van de Vrande et al., 2009; van der Meer, 2007; West & Gallagher, 2006). This study supports the findings of Lukka (2007) that changes to formalized MCS are not necessary in the presence of decoupled routines that allow organization members to perform their tasks better. This study also supports Inês, et al.'s (2009) argument that decoupled routines are created as a consequence of the existence of multiple logics. In FPH, there was a difference between the logic of top management and that of project level organization members, which was reflected in the decoupling of the routine around collaborations with local suppliers from the formalized rules around IP. This study identified that the logics of the organization members are embedded in their actions.

Therefore, distinguishing between the actions of the project level organization members, which are reflected in the routines and the actions of top management in relation to the formalized MCS enabled this study to understand how formalized MCS influenced the use of open innovation practices at FPH, as well as explaining why the formalized MCS in FPH remained stable despite changes in the innovation field. Therefore, this study portrays the explanatory power of the extended theoretical framework developed in Chapter 3. The following chapter discusses the second case study, Coloplast.

CHAPTER 5. CASE STUDY 2

5.1. INTRODUCTION

"When you are doing open innovation, you have to be thinking what are you going to get out of it"
-Director for the Technology Scouting Group-

The purpose of this chapter is to describe and analyse the use of open innovation practices in Coloplast. This case study differs from the first case discussed in Chapter 4, as at the time of this research, Coloplast's top management had formally implemented an open innovation strategy, formalizing the open innovation process. However, the organization members at the project level were slow to incorporate the external knowledge into their innovation process. Top management attributed this to the project level organization members' discomfort at involving external parties in the innovation process. To progress from the unfreezing phase[38] of the open innovation implementation process (Chiaroni et al., 2011), top management tried through various internal initiatives, which are discussed in this chapter, to change the internal culture of the company to make the organization members more comfortable with working with external parties during the innovation process.

The aim of this study was to use retrospective analysis to examine how the formal drive for open innovation impacted on Coloplast's innovation activities and to understand the influence of the formalized MCS on the use of open innovation practices at Coloplast.

This chapter is structured as follows. The first sub-section describes the company including its history. The next section discusses Coloplast's shift to open innovation and top management's

[38] Unfreezing phase is the first phase of the organization change process where a sense of urgency for change is established and change agents lobby for the change to be implemented (Chiaroni et al., 2011).

efforts to formalize the open innovation process. That is followed by a discussion of the effect of the changes implemented by top management. Subsequently, the influence of formalized MCS is discussed along with the impact of the changes to formalized MCS on the routines of project level organization members.

5.2. COMPANY DESCRIPTION

Coloplast is a Danish company operating in the healthcare industry. At the time of this research, its core business activities were to develop, manufacture, and market products and services that made life easier for people with diseases of a deeply private and personal nature. Coloplast operated in three main business areas: ostomy care, urology and continence care, and dressings. Ostomy care products were for people whose intestinal outlet had been rerouted through the abdominal wall. Products in this area included ostomy bags, plugs, and accessories. Urology and continence care products were for people suffering from diseases of the kidneys, the urinary system, or the male reproductive system. Examples of products in this category included catheters, urine bags, urisheaths, bowel management products, and absorbent products. Dressings were for the treatment of chronic wounds and skin care products used for prevention and treatment. Examples of products in this area included ulcer dressings, pressure relief dressings, contour dressings, as well as various forms of adhesives.

At the time of this research Coloplast sold and marketed its products globally with Europe and the US being the key markets. They supplied the products to hospitals and institutions as well as wholesalers and retailers. They also supplied directly to end-users in selected markets. In 2010, Coloplast had sales and customer service operations in over 25 countries and they exported to more than 65 countries all over the world. However, the company's R&D function was mainly located in Humlebæk, Denmark. They had only a small group of people working in the US, who were originally employed by a company that Coloplast bought a few years earlier. This group was working on surgical urology, which was very different to the work of the rest of the company. Consequently, as explained by the Director for Technology Scouting, "*they have no interaction with us at all.*" Therefore, this study only focused on the R&D function located in Denmark which according to the interviewees handled over 90% of Coloplast's entire R&D activities.

5.2.1. HISTORY OF COLOPLAST

As explained on the company website[39], the start of this company dated back to 1954 when Nurse Elise Sorensen came up with the idea of an ostomy bag with an adhesive ring. It all began when Elise's sister, Thora had an ostomy operation. This dramatically changed her lifestyle as she stopped going out due to the fear that her stoma would leak in public. To help her sister out of isolation, Elise had the idea of making an ostomy bag with an adhesive ring that would enable it to fit tightly to the skin. She believed this simple solution would prevent leakage and help people like Thora return to their normal lives. Elise took her idea to various plastic manufacturers, but at first no one showed any interest. Eventually, she had success with Dansk Plastic Emballage when its owner Aage Louise-Hansen, upon his wife's insistence, agreed to produce the world's first disposable ostomy bag in 1955 (Tidd, Bessant, & Pavitt, 2005). Sales of this product exceeded all expectations and led to the growth of this company shown by the timeline in Figure 5-1.

[39] http://www.coloplast.com/about/ourcompany/history/pages/default.aspx

Coloplast together

The first 50 years together

1957 Coloplast founded by Aage and Johanne Louis-Hansen
1978 Coloplast opens its first sales subsidiaries in the UK and France
1979 Coloplast adds continence care products to the business portfolio
1982 Coloplast adds wound care products to the business portfolio
1983 Coloplast listed on the Copenhagen Stock Exchange
1985 Coloplast formulates its first mission statement
2002 Coloplast begins relocating production to Hungary
2006 Urology added and breast care divested
2007 Coloplast builds new factories in Hungary and China
2007 Coloplast celebrates its 50th anniversary

Figure 5-1: First 50 years of Coloplast (Source: 2007 Annual report)

At the time of this research, Coloplast had over 7,000 employees and for the 2010 financial year reported a total operating revenue of DKK 9,537 million ($NZ 2,303 million) with a net profit before tax of DKK 1,674 million ($NZ 404 million). As shown below, over the 10 year period from 2001 to 2010 Coloplast had achieved steady growth in terms of revenue and had also increased its R&D expenditure consistent with the company's strategy, as discussed in the next sub-section.

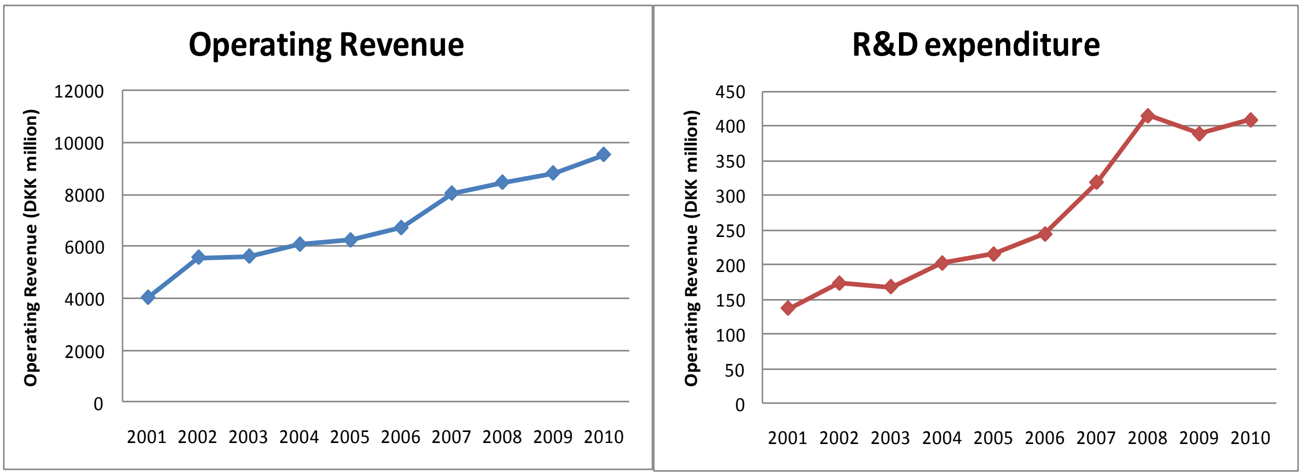

Figure 5-2: Coloplast's revenue and R&D expenditure from 2001 to 2010[40]

[40] Data obtained from annual reports. The apparent decrease in R&D expenditure from 2008 to 2009 relates to a more than usual increase in R&D expenditure in 2008 due to the additional management initiatives to implement the intended changes to support their drive to open innovation.

5.2.2. COLOPLAST'S STRATEGY AND R&D FUNCTION

According to the company's 2009 and 2010 annual reports, the objective of the firm was profitable growth. In other words, all business areas and geographical regions were required to contribute growth as well as financial profit (Coloplast, 2010). The strategy for the firm to achieve this objective was to develop and market products and services that "*make life easier for people with intimate healthcare needs*" (Company's mission statement). As per the company's website, this was made possible by listening to customers to better understand their needs and respond by finding new ways to do things better together. Therefore, the firm's R&D function played a crucial role in supporting Coloplast's strategy. As stated in Coloplast's enterprise risk management guidelines, Coloplast had set targets of how much of its total revenue must stem from new[41] products. Coloplast's emphasis on innovation was also highlighted in a letter from the CEO published on the company's website which read, "*Our competitive strength and growth opportunities rely not only on the company's profitability, but equally on our innovative skills.*"

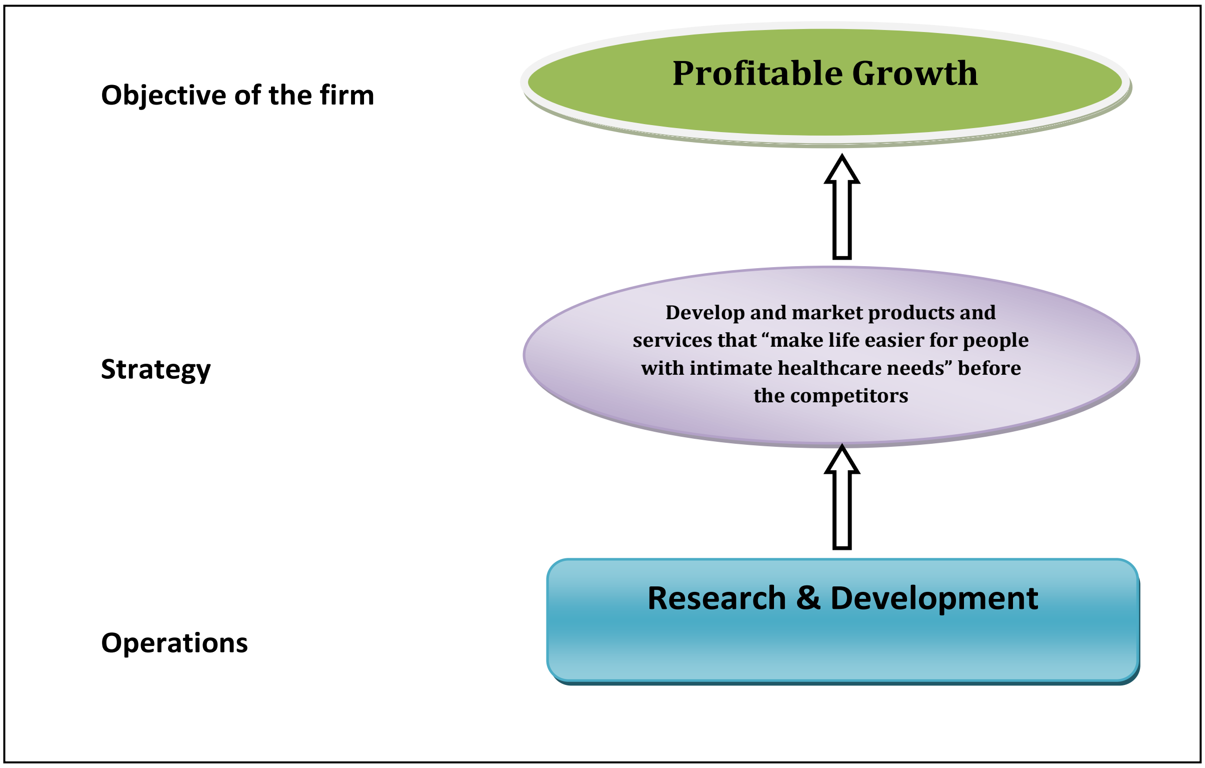

Figure 5-3: Coloplast's strategy

[41]A product was defined as new if it had been on the market for less than four years (Coloplast, 2007).

At Coloplast, the R&D function's responsibility was to manage the entire innovation process from idea generation to commercialization of new products and implementation of new technologies or processes for the manufacturing and operations departments. The aim was to be first to market with the best medical devices or service solutions. Coloplast's R&D function was divided into three departments. The first was the clinical and regulatory department that took care of all clinical studies as well as all regulatory work to ensure that the company complied with all regulations and had the license to sell its new inventions. The second was the project management group where all project managers were located. Finally, the technology department included all the specialists, lab facilities, pilot facilities, strategic technology analysis, and any other R&D-related roles that did not fall under the other two departments. Traditionally, employees operated within their silos and there was very little collaboration between employees across the boundaries of the departments, apart from the necessary formal meetings to share information relating to a project. However, with the drive to open innovation, management had in the past couple of years put in a lot of effort to bring employees from different departments together.

So at the time of this research, as summarized in the following comment from the Vice President for Technology (VP), "*Coloplast is* [was] *a project centric organization and the composition of the project teams is* [was] *cross-functional*." This means that in 2010 an innovation project team included members from each of the three departments as well as members from the marketing, operations, and manufacturing departments who were co-located to encourage collaborations and effective knowledge sharing. This is described later in this chapter. The next sub-section describes Coloplast's innovation process in more detail.

5.2.3. INNOVATION PROCESS

At Coloplast, projects were usually selected from a list of product ideas following initial work on user needs from the people in the field such as the sales and marketing employees. For instance, the marketing team might have done a survey or some kind of end-user study analysing people's behaviour. This information would be compiled into a report from which a list would be generated outlining what was needed. This list along with any information on technical discoveries would then be presented at the CEO business forum, which involved top management and highest-ranking sales managers from the different sales regions. At this forum they decided what they needed to get the targeted growth, and established multi-year themes to guide product development across businesses and functions. These leaders then reviewed the themes annually to pressure test their relevance. This review included discussions about the competitive landscape, market acceptance, theme significance, technology advancement, and sales cannibalization. Discussions on competitive landscape included questions such as *"how have our competitors' plans changed"* or "*did our competitors take unexpected actions"*. Market acceptance involved questions such as "*are we still getting a desirable market response to this theme"* and "*how have preferences changed"*. Discussions on themes significance involved questions like *"do we still believe that this theme is a big issue in the market"* and "*how much will success distance us from our competitors"*. Technology advancement discussions centred on questions such as "*have we discovered a technology that allows us to reshape the theme* and *what emerging technologies would allow us to develop a wholly new theme"*. Finally, discussions on sales cannibalizations involved questions such as "*how will our planned project launches across these themes affect our existing product portfolio* and *to what extent are our value stream partners prepared for project launches in the next 12-24 months"* (RTEC, 2010, p. 68). Information from these discussions was then translated into the firm's go-to-market and technology strategies for the different business areas.

Following this, an innovation brief was prepared that outlined items like what the firm wanted to achieve, what the end-user need was and what the target market was. Using this brief, the front-end team started the idea generation phase where they came up with ideas that would fulfil the path laid out in the innovation brief. From here the projects went through a structured stage and gate innovation process (R. G. Cooper, 2001, 2009; R. G. Cooper & Edgett, 2007) as shown in Figure 5-4 which Coloplast organization members referred to as '*Accelerate Ideas to Market*' (AIM). The purpose of AIM was to provide an overview of activities and decisions during the development of new products. Each stage spelled out the activities that needed to be undertaken before moving to the next stage, which was divided by a gate where using a set of criteria, management decided whether the project would proceed to the next stage or be withdrawn from the process.

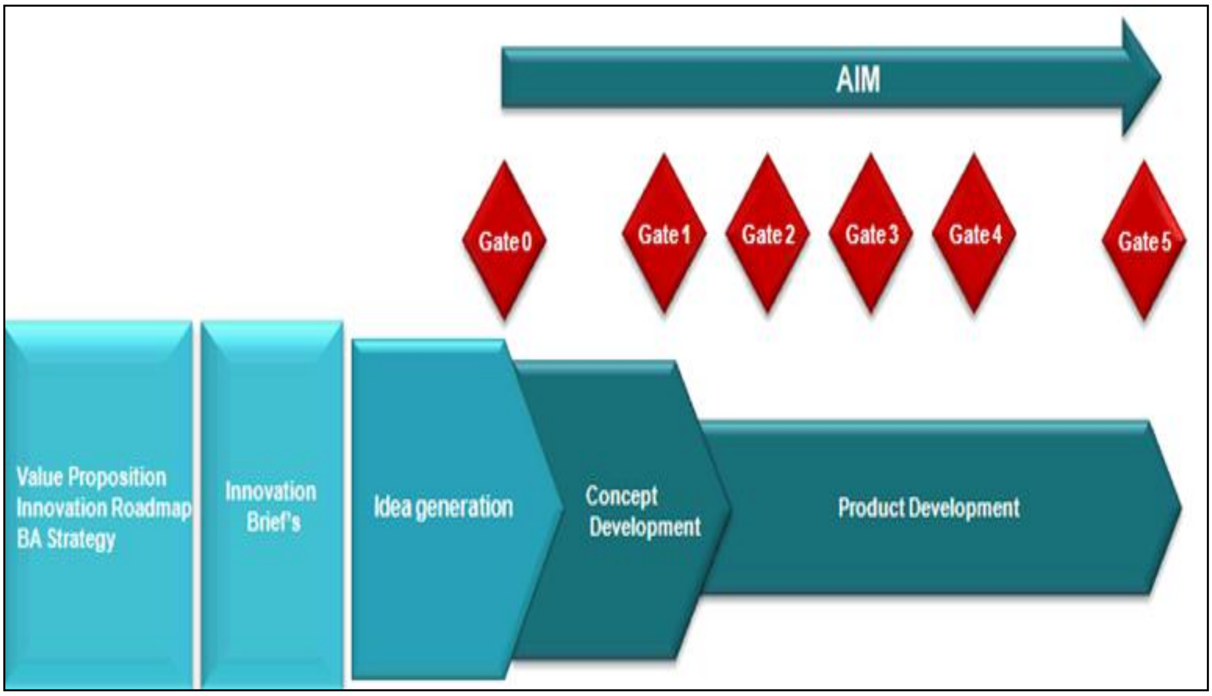

Figure 5-4: Coloplast's innovation process

While this innovation process was standard practice, what was different in Coloplast in 2010 compared to a few years back was that now there was a push for the innovation teams to include more external collaborations during their innovation process. This push was a consequence of the company's strategic drive towards open innovation discussed in the following sub-sections, which was an attempt by top management to change the closed innovation culture that had been dominant in Coloplast's innovation departments in the past.

5.2.4. DOMINANCE OF CLOSED INNOVATION CULTURE

It is important to note that Coloplast's history of R&D dates back to the 1950s when closed innovation was seen as best practice. Building internal capabilities by hiring the best people in the field and having the best laboratory facilities was seen as a strategic asset (Chesbrough, 2003b). Coloplast organization members had inherited this culture of internal development from the history of the organization which was a contributing factor in the difficulties the firm was facing in implementing the change to open innovation. Closed innovation had been a part of the firm's institution, influencing the actions of the organization members for decades.

In addition as explained by the VP and the R&D Controller, another important factor contributing to the dominance of the closed innovation culture in Coloplast was its location. As stated earlier in the chapter, at the time of this research Coloplast was located in Denmark which was known for its large, global companies manufacturing medical disposables, appliances, and instruments. According to the Danish industry report (Medicoindustrien, 2008), the Medtech industry comprised a host of small and medium-sized manufacturers (over 225 companies in total) and several of them were innovative companies. According to the statistics in this report, 5% of the 225 companies analysed have over 1000 employees who contribute 77% of the total sales for the industry. Therefore, it can be deduced that in terms of size measured by number of employees, Coloplast was amongst the top 5%.

However, MedTech companies in Denmark were located within close proximity to each other. For instance, as explained by the VP:

> "*Our two biggest competitors in the world are located within a radius of 20 km of where we are sitting right now* [Coloplast head office in Humlebæk]. *That is the reality that we are living in. So the cleaning people that are working here can easily be married to one of the engineers working at our competitors. That is a bit difficult and by the way the reason they are located here with an R&D department is because we are here*."

As a result of this close proximity, Coloplast organization members were uncomfortable working with local external parties that they did not trust. Coloplast organization members found it difficult to get assurance from local vendors that they had no associations with their competitors and so they preferred to develop the technologies internally. With so many large organizations operating in close proximity, smaller vendors did not have the incentive or commercial motivation to commit to just one organization as they could have missed out on lucrative opportunities from elsewhere. Therefore, building the level of trust desired by Coloplast organization members was difficult and had resulted in a culture of internal development. However, at the time of this research Coloplast's top management was committed to changing this culture to enable the firm to leverage from external collaborations as they strategically drove towards an open innovation strategy, as described in the next section.

5.3. SHIFT TO OPEN INNOVATION

After a period of significant mergers and acquisitions, top management recognized that Coloplast's R&D team lacked a standard approach to manage and prioritize projects across business units. The firm's growth was dropping, they were having uncoordinated product launches, launch dates were being missed and, on average, innovation projects were taking approximately four years to complete, while other firms in similar industries were taking half that amount of time. These were seen as signs of the firm facing a crisis that required immediate attention.

As a result of this situation, Coloplast executives hired a consultancy firm to analyse its operations and suggest what the company's R&D department should look like. One of the recommendations in the proposal submitted by the consultancy firm was the implementation of an open innovation strategy, which the top management rolled out in 2007.

As shown in the diagrams below, Coloplast's top management wanted to move from a traditional innovation process[42] to an open innovation process[43]. The proposed change created some agitation in the R&D department as employees did not like the idea, fearing that it would change the way they did things. As the VP said, *"it is hard to argue against the recommendation that you should listen to other people outside, however, when you ask but why? The answer is lacking".* He went on to explain that it was not that employees did not have networks and did not talk to people outside the firm before the open innovation strategy was rolled out. They did, and given the history of the firm and the nature of the firm's products employees were always encouraged to form their own networks and share knowledge, especially with end-users. However, what was new was that these external collaborations were being given a strategic view and people could not understand why. They could not understand what value it would add to the firm or how they would benefit from the change.

[42]Figure 5-5 as was presented during the Capital Market Day presentations in 2006 (Coloplast, 2006).
[43] Figure 5-6 as presented during the Capital Market Day presentations in 2008 (Coloplast, 2008b).

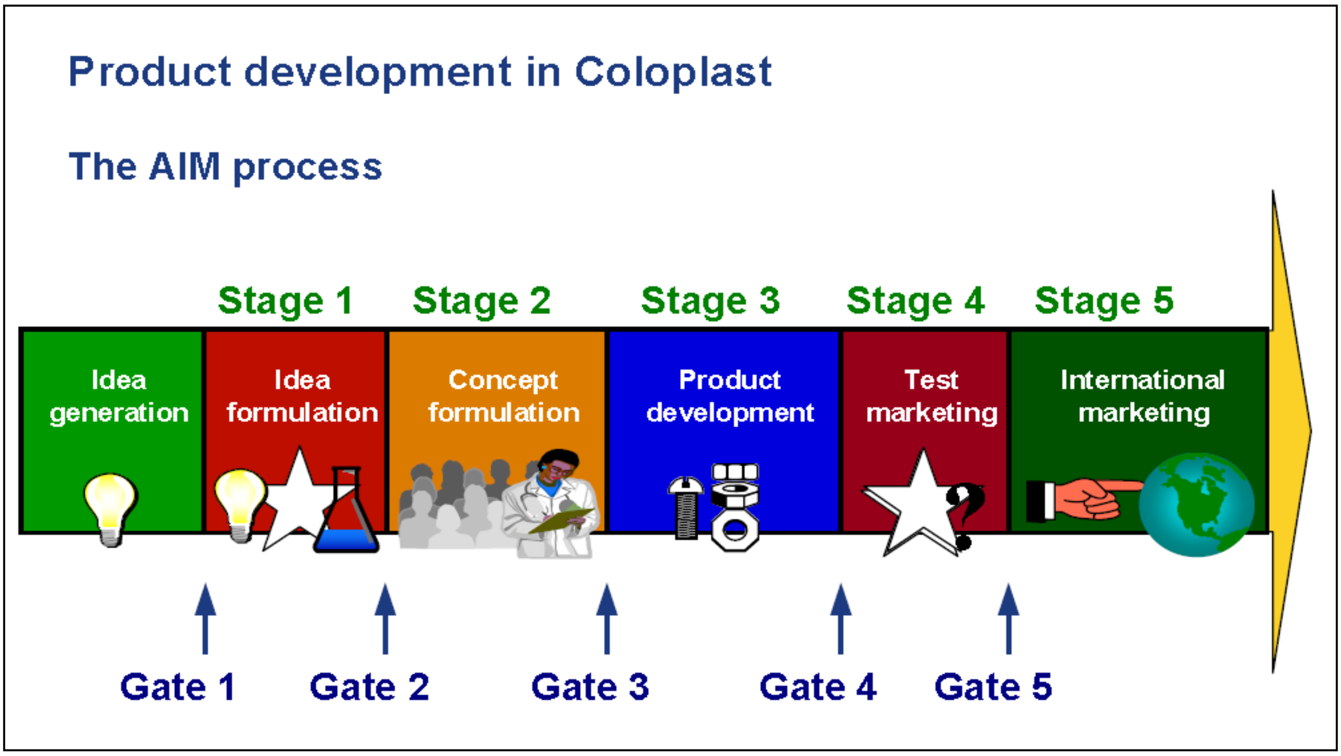

Figure 5-5: Innovation Process included in the Capital Market Day Presentation in 2006

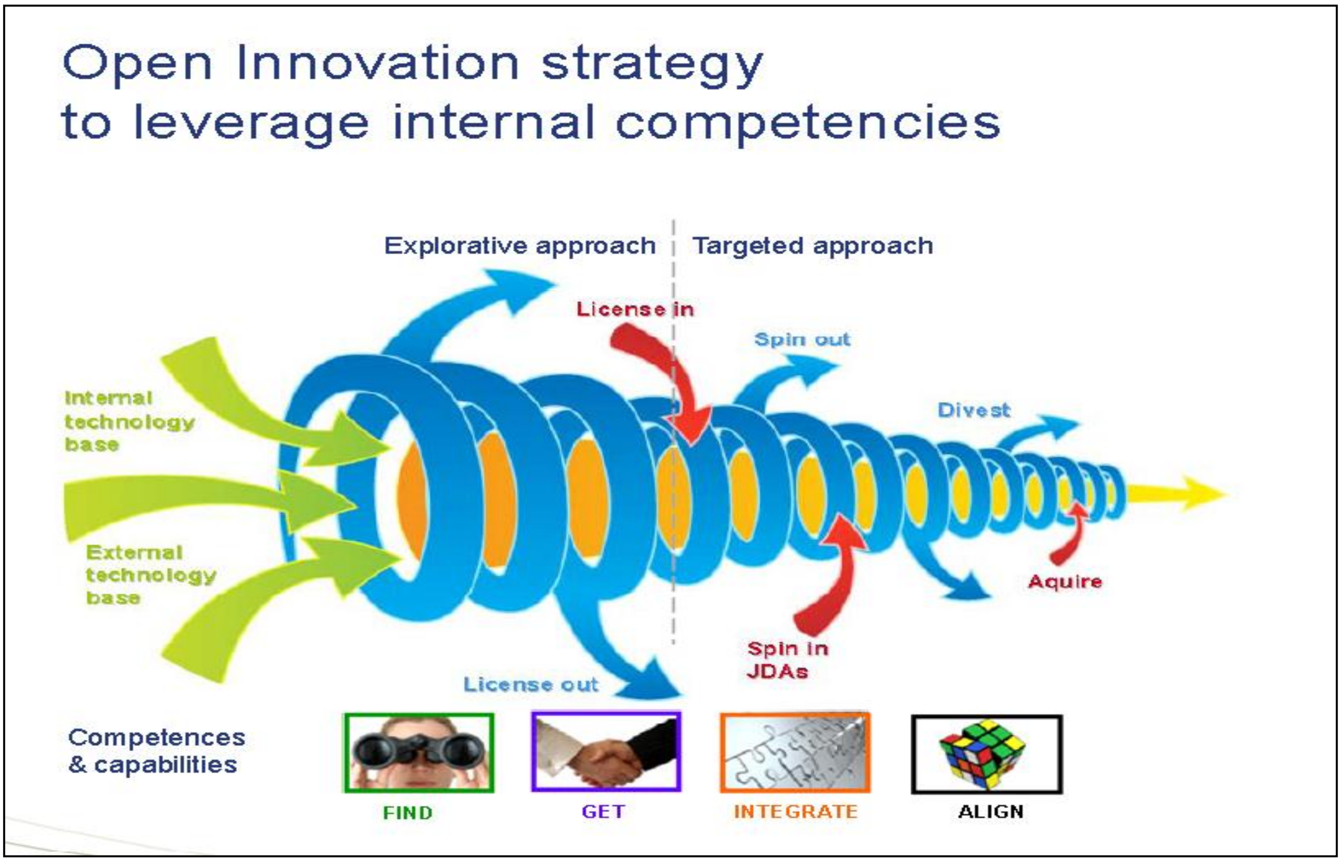

Figure 5-6: Proposed open innovation process included in the Capital Market Day Presentations in 2008

In addition to not understanding the reason for the strategic shift to open innovation, employees also resisted the change because of experiences they had in the past with external partners, where outcomes left the employees red-faced. The VP exemplified this with the following comment:

> "*It has not been a recognition that came out of good stories internally in Coloplast that proved that this was a good idea. On the contrary, we have had some collaborations where you could say we have very convincingly and with statistical significance shown that open innovation is not a good idea. Real horror stories where we have collaborated with other companies, taught them an awful lot of things but the project failed miserably and then they launched a competing product. And you know that is not really good stories to shine on when you want to say open innovation is good.*"

A third issue raised by the engineers in the firm was that by moving to open innovation, the firm was taking away the interesting aspects of their job. The Director of Technology Scouting who is also an engineer explained:

> "*The engineers have been trained under the principle, you give me a problem and I will find a solution. That is what our training is about. If I cannot find a solution, I am a very bad engineer. And now you are trying to say well you are not the best one to find a solution. You have to find someone else who will help you find the solution. This does not seem right to them. They think because they are the specialists, they should do the fun things. Otherwise, they think they lose all the fun aspects of their job. But they do not understand that if you are very clever at going and finding the partner who has already tried something, then you can escape the boring part*

because you can go and do really fun stuff. But they do not know that. So, they also need to learn to see this aspect. But we have a really long way to go."

From the interview data, it was apparent that at the beginning the general feeling in the firm was that implementing an open innovation strategy was not necessary and it would not add any value to the firm. Instead there was a strong feeling that external collaborations could do more harm than good to the firm and the organization members. Coloplast's top management quickly picked up on this resistance and realized that it was difficult to implement open innovation strategically when there was no strong desire from the people in the organization to give it a try. As commented by the VP:

"This is a game that is played on a 15cm field. I mean it is played between ears of people. I cannot force my employees to pick up the phone and call somebody else if they do not want to. They can always invent all different kinds of reasons why they should not do it. I need to convince them to have a genuine interest and believe in this. That is the whole trick."

Therefore, top management responded to this challenge through a number of internal initiatives as described below. As the VP stated:

"*Coloplast has been on a long journey to implement open innovation. There is nothing easy about this. It is hard work and communication in showing the way forward on how you want to do this is vital. And of course there are a number of systems that you can put in place to facilitate this but there are a lot of things you need to clarify. Just a simple thing as what can I tell. I mean that is a big uncertainty. We have a lot of competition.*"

Therefore, management responded to the organization members' resistance by launching a formal drive towards open innovation, which included defining the concept, making some strategic change to the organizational structure of the innovation function and implementing mechanisms to stimulate collaboration within the firm as well as with external parties. These are discussed in the following sub-sections.

5.3.1. DEFINING OPEN INNOVATION

As explained by the VP, "*we* [Coloplast] *started up the journey by defining what is open innovation to us and why is it that we are doing it.*" There are many definitions of open innovation in the literature as discussed in Chapter 2. However, top management at Coloplast struggled to find a definition that would work for them and was simple enough to get the employees interested in supporting the new innovation approach. According to the VP:

> "*We were struggling to get our own definition on why is it that we really really* [emphasized] *want to do open innovation. I think we ended up saying well this is simply too complicated because you can put all kinds of definitions into this. So, we said open innovation is when you 'seek input from somebody who is not from within Coloplast as part of your project'. That is open innovation. We are very modest, not anything fancy."*

The VP explained that they came to this definition after many discussions with managers from different levels of the organization. He added, *"At one point we were in different degrees with people giving different points to open innovation where we had a partnership or a collaboration agreement or we were strategic partners."* In the end it was decided that if the teams just got input then they were on the right track. Therefore, they adopted the simple definition mentioned above. The VP added, "*Of course we would like to take that to a higher level. It is not the most bold definition that I have seen on open innovation.*" However, giving his view on this definition one of the project managers stated:

> *"I would say it is a fairly broad definition. It can be at the idea phase when you are talking to a lot of end-users and perhaps also having a group of end-users that you are in very close collaboration with. It can be an entirely external R&D project. So it is a fairly broad definition. And it is also if you are talking to other companies and universities. It is difficult to put some narrow boundaries on this definition. And I do not think you should.*"

The interview data suggested that Coloplast's top management had come up with a definition of open innovation that was practical and accepted as reasonable by organization members at different hierarchical levels. However, defining open innovation was just the first step. Top management also made the following changes to support their drive towards open innovation.

5.3.2. CREATION OF THE TECHNOLOGY SCOUTING GROUP

In addition to defining what open innovation meant for Coloplast, the top management also made some changes to the firm's organizational structure. One of the key changes was the creation of the technology scouting group to support the firm's open innovation endeavours as shown in Figure 5-7.

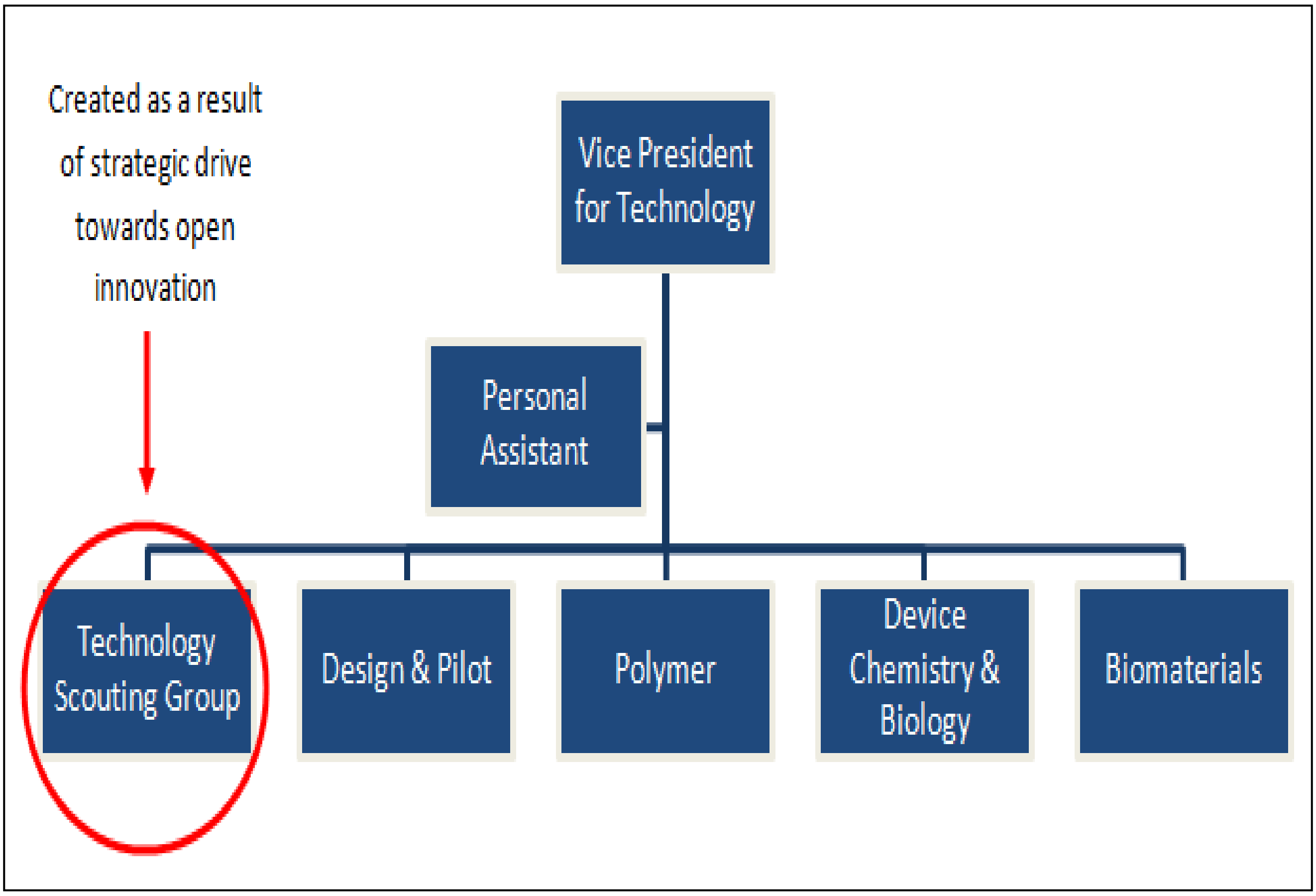

Figure 5-7: Organizational chart for Coloplast's technology division

This group consisted of six employees from different backgrounds whose role was to create a roadmap, a technology foresight database, and to find external technology intelligence to support Coloplast's open innovation strategy. These are described in more detail below.

5.3.2.1. ROADMAP

The roadmap was a total mapping of where Coloplast was and where its competitors were. It covered different perspectives such as intellectual property, product, and marketing. The roadmap was used to identify any obvious gaps in between Coloplast and its competitors. As explained by the VP:

"*We actually map in our own patents and our competitors' patents and products into a picture where we take our technology and divide it into segments. Each segment is subdivided and there we map it out. That is very interesting because it shows you clearly where we are strong, where we are weak, where they are weak and are there any green fields that we say this is a pretty interesting area but no one has really done anything there yet. Surprise, surprise, let's get on the horse and get out there. That is something we are doing and that can easily be done with partners because if there are open fields, it would typically be an area where we do not have core knowledge.*"

At the time of this research, the contents of the roadmap were part of the information used by top management during their CEO business forum, when they were discussing innovation themes and building strategic plans for the year. As per the Director of Technology Scouting:

"*The roadmap comes before the innovation brief. What we do is we take those user needs and go into see what kinds of solutions are available in the market besides us. I mean maybe someone else has the solution. It could be our competitor or someone else. And to see if there is anything else we can use as well. Or we say no one is doing that but we think if we do this kind of technology, we can actually differentiate in this way. So, our results provide direct input in the innovation brief or the pipeline. So, it is more from the strategic point of view. They provide a more holistic picture.*"

Hence, the roadmap was a valuable resource that had become a part of top management's strategic and business planning process. This was complemented by the technology foresight database as described below.

5.3.2.2. TECHNOLOGY FORESIGHT DATABASE

The technology foresight database went into each of Coloplast's business areas and identified any disruptive technology[44] coming up outside the company and assessed it to find out what that meant for Coloplast. As described by the Director of Technology Scouting:

> *"It is easy just to say there is a disruptive technology but we are also doing assessments. So, we are not just stopping to say there is some company doing something. We actually go in and look at it deeply and ask what does that mean for Coloplast. How far has that technology developed and what is its impact in our end-user group, our customer base and is there something shocking or horror some that we have to do something or it is something we have to keep our eye on or something we can just forget."*

This was also explained by the VP in the following statement, "*We have been looking at disruptive technologies and analysing; do we believe that they can potentially take us out of business or substantially change the game we are in.*" This role of the technology scouting group also gave valuable information to the participants of the business forum to make strategic decisions relating to R&D. As explained by the Director of Technology Scouting:

> *"We have actually done this for all Coloplast business areas. So, now we can continue doing risk monitoring so they actually contact us to hear what our evaluation is. We give the assessment so that they can actually make the decisions. That is something new for Coloplast, because they never had any assessments. Now they can make decisions comfortably."*

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[44]Disruptive technology refers to new technologies arising from radical innovation (defined on page 92). In other words, new technologies that did not exist before.

The next sub-section looks at the third function of the technology scouting group, which was to find external technology intelligence.

5.3.2.3. FINDING EXTERNAL TECHNOLOGY INTELLIGENCE

While the two roles of the technology scouting group described above related to competitor analysis and strategic decision making, the third role involved assisting project teams that needed some new technologies. This role required the technology scouting group to work with the project team members to find external partners or companies that had the materials or expertise the team needed. As explained by the Director of Technology Scouting, this role was "*more kind of short-term specific tasks that we call the technology intelligence.*" This function of the technology scouting group resulted in the centralization of the search process whereby teams needing external expertise approached the technology scouting group who used their expertise to find the external partners on behalf of the teams.

As explained by the VP, the purpose of having this function was to give more structure to the search process and the way that Coloplast worked with networks. He suggested:

> "*We have started to map who do we actually have in our partnership database, who are the important ones and who are the well nice to know ones. And that picture we did not have previously. And what we are going to do now is map them out and say well these companies; they are the ones that we really want to develop into a more strategic kind of partnership or we at least define where we want to take them. And these companies are kind of the ones that I need to know the name of and when*

> *they are here, I need to go and have lunch with them or whatever. So, that is a new activity that we have been putting up that goes along with this creating network.*"

This function of the technology scouting group was designed to help the firm systematically identify external partners that the firm could build strategic partnerships with in order to avoid the repeat of situations where collaborative partnerships failed. As one of the project managers commented, "*Having intelligence looking for partners and having a list of that, I think is a very good way of handling external partners or open innovation in a structured way and ensuring that the knowledge is anchored in Coloplast.*"

The Director of Technology Scouting explained that the external partners could have been suppliers, start-up companies, or companies that had the technology that could be used for Coloplast's product lines but was originally developed for some other industry. Hence, there was a wide range of possibilities to explore. Therefore, Coloplast's technology scouting group used various methods of finding external partners with the required technology or expertise. The Director of Technology Scouting explained this as follows:

> "*We are doing internet searching of course. We are also trying to go to conferences to talk with people. We are also doing something that is very interesting and is new for Coloplast. It is what we call e-posting. That is, through some intermediary company we define very clearly what we want and they put it on the internet. They all have their expert panels and people can actually give proposals to say they have a solution for that. Then we can screen through them. For ones we think are interesting, we have close dialogue with them until we find someone we would like to go in collaboration with. This last method is actually quite effective because we*

> *can get hold of many different companies and partners. I mean when you are doing the research yourself, it is slow.*"

However, according to the interviewees while Coloplast had taken these initiatives, these had not translated into successful collaborations at the project level. As explained by the Director of Technology Scouting:

> "*We have not run it for a very long time. We ran two e-postings. We reach the point where we got some very interesting partners. So, the next step is we go to discuss with them. So, we have not gone the whole way through yet. But you have to prepare. That is one of the challenges. You have to be able to communicate with the other organization. Sometimes you do not get anything. There is no guarantee that you will get a solution. It can be because the technology is not mature yet. It can also be you cannot get a deal with a partner for some other wishes that you cannot fulfil. It can also be because you request a change in the system. So, it is a very dynamic situation*".

The Director of Technology Scouting went on to explain that IP was also an important issue when dealing with external partners. According to her:

> "*It is really kind of an interesting game because you can go in and say I have something interesting. You do not need to say concretely what your solution is. But that is really an art because you need to tell in a way we can think it is interesting and at the same time you are not giving anything away. But it is the same thing for us. We have to define our requests in a way that it is interesting and can ask to get some input but on the other hand we are not giving the really central part away so*

they do not know for example, they do not know it is Coloplast, they do not know it is our Ostomy or Continence care. So, you have to translate your requests to kind of general terms. Then they would do the same thing. When you decide you could be a match then you start to open up. Then you say ok we might want to sign an NDA [Non-Disclosure Agreement] *with this partner, and then we can open up. But also some cases they have the IP already, or they have the patent application, then they can open up and say we have something like this if you are interested. It is really a tango. That is why it really requires the internal group. They have to have the competence to do that because you have to have the person to tango with. Otherwise you can never succeed."*

Moreover, the technology scouting group needed to ensure they found appropriate external partners. As explained by the Director of Technology Scouting:

"*First of all they have to meet the technological requirements and we look at kind of the history. If there is anyone we have had bad experience with before, then we do not want to try it again. Then we also look at their company structures, how is their economic situation, are their finances stable, is it a private owner company or is it a public offerer. Have they had experience working with another company or is this the first time? These kinds of things actually give you a background check. Are they easy to build a relationship with or do you have to be careful? So, of course we will choose the ones that will be good for us from the start. But if you do not have a choice then you have to be prepared. That is something you have to be careful with.*"

One of the project managers added to this suggesting that at the project level they preferred to have at least one face-to-face meeting if not more. He explained as follows:

"You want to ensure that your gut feeling is also good. One thing is a contract and another thing is how they are working. How are they able to handle several projects? How are they ensuring that the knowledge is not spread to other competitors but often we would also very much like the knowledge to be kept within few people of that organization to ensure that it is not spread. So, trust is important that they are not spreading the knowledge."

Top management's creation of the technology scouting group and assigning them the three specific roles described above had resulted in Coloplast having effective processes and information infrastructure in place to enable and support the use of open innovation practices. These processes and infrastructure were providing information to organization members, and reducing the level of uncertainty about technological and market advancements, competitors' innovation endeavours, and partner selection issues, which is consistent with one of the roles of MCS as identified by extant literature (Akroyd & Maguire, 2011; Akroyd et al., 2009; Davila, 2000). In other words these tools, especially the roadmap and the technology foresight database, were designed to deal with strategic uncertainties, which was reflective of interactive control systems (Simons, 1995, 2000, 2008). These systems are further discussed in Section 5.5.1.3. Similarly, the third function had resulted in the creation of a structured search process. While the use of this search process was not compulsory for project level organization members, it enabled effective partner selection that could reduce the risks of inter-firm relationships.

The following sections discuss other initiatives implemented by top management to drive the open innovation strategy.

5.3.3. CO-LOCATING INTERNAL EMPLOYEES

In addition to the creation of the technology scouting group, there had also been a change to the structure of innovation groups within Coloplast. As explained by one of the project managers:

> "*Previously we were a defined group of product managers and directors working with external innovation or open innovation if you like. But we have spread this group of people not to the entire organization but within all the groups of R&D and I think that is very wise. Because that ensures that within all groups of the company, we have people that have worked with open innovation and have the knowledge about how to do it. There is of course the risk that you are diluting their knowledge when you are doing that.*"

However, the idea behind this change was that this group of people who had experiences with open innovation would act as enabling agents motivating others in the firm to consider seeking and incorporating external knowledge into their innovation projects. The role of these people was to drive discussions about the use of open innovation practices with project level organization members to help overcome some of the resistance towards this new approach.

Moreover, another change was that employees from different functions were now co-located in the R&D area of the building so that all members working on a project were sitting together. As illustrated by the R&D Controller:

> "*The marketing person responsible for the product now sits with the R&D guys responsible for that product. So they are sitting in project teams instead of I am*

sitting here, you are sitting in other department. I mean you have seen our building, you could be sitting 500 metres away from the person you suppose to work with."

The aim of this change was to shift the silo culture that existed in the firm (as described in section 5.2.2) and increase interaction between the different functions involved in the innovation project. Top management believed that continual interactions among people involved in the projects helped them identify and resolve problems in a timely fashion, which prevented issues at later stages of the project delaying the launch of the product or service to the market. In addition to improved communication between project team members, the VP explained that top management at Coloplast also believed it was essential for project level organization members to communicate more with other organization members they did not usually work with, as well as with external parties. The purpose of this was to broaden their understanding and motivate them to embrace the concept of leveraging the knowledge of external parties to complement and enhance internal capabilities. Therefore, the changes made by top management to strategically drive the use of open innovation practices also included the following initiatives to build communication lines with end-users and fellow Coloplast employees.

5.3.4. SETUP 'MEET THE END-USER' PROGRAMME

Organization members, both at the top management and the project level acknowledged that end-user needs were a key part of Coloplast's existence and innovation endeavours. As suggested by the Director of Technology Scouting, "*They* [*End-users*] *are kind of an expert because that is what their life is about.*" Therefore, involving the end-users in the development process was pivotal for the company. However, before the focus on open innovation only certain groups of people in Coloplast, mainly Sales and Marketing, had direct associations with the end-users. However, as explained in the 2007 annual report (Coloplast, 2007), one of the aims of the company was to move even closer to the end-users. Hence, as part of the drive to open innovation, the company set up a 'meet the end-user' programme where each employee met at least one end-user on a regular basis to get to know the end-user and understand the problems they face in their daily lives because of their medical conditions.

This programme was explained by the VP as follows:

> "*Every employee in R&D has a customer friend and it is a customer friend that they go out and visit. The idea here is not to go out and discuss products. You are not going out to sell. Absolutely not. You are not discussing new products or ideas unless the customer wants to discuss it and has a proposal then you just say that sounds like a good idea. I will take it back. But really it is about listening to the story of their life. Why do you have this Ostomy? What was it like when you came home? What is your daily life like? What is important to you? It gives a lot of perspective and a lot of motivation."*

The VP went on to explain this further with an example:

> "*Yesterday one of my colleagues was talking to a lady. She had her ostomy in the late 70s as a complication to her pregnancy. She ended up with a baby and an ostomy at the same time. And you know these types of stories tell you something about what we are really supplying. You can just say we are supplying plastic bags with an adhesive but really it is much much more to these customers and it is quite common for the customers to refer to Coloplast as kind of their second family. I know to people coming from the outside it sounds like ok here we took it a little bit*

to the top. They stretched the story but it is actually the words that the customers use themselves when we talk with them."

As reported in the 2007 annual report (Coloplast, 2007), the reports that the organization members submitted following their end-user visits gave the decision makers a unique insight into what users wished for, their thoughts and dreams. This was important for the firm as their strategy was to develop products and services that served the needs of people with intimate health conditions. Therefore, these reports provided valuable insights for the CEO business forum (that is, the strategic planning process). A similar initiative promoting interactions with end-users was the 'STOMA website' as described in the next sub-section.

5.3.5. SET UP 'STOMA' WEBSITE (AN OPEN INTERNET FORUM)

'Stoma innovation by you' was an open internet forum set up by Coloplast. This forum allowed end-users to discuss their problems and ideas for new solutions to their problems. They could discuss these ideas with others as well as submit their ideas to be considered for further research and development. Top management's view on this was presented by the Director of Innovation in a report on Coloplast's website shortly after the stoma website was launched in February 2009, which stated:

> "*In this way* [the open forum], *you can get many different perspectives on a problem, and sometimes two or three different but related problems can come together and find a single solution. Users become co-innovators.*"

The website was very popular among people with stomas. The report by the Director of Innovation stated that there were over 700 user registrations, 200 message posts and nearly

80 innovative idea submissions in its first week-and-a-half (Coloplast, 2009b). However, as explained by the Director of Technology Scouting, "*People are very much active and we got a lot of input but we do not know how to handle it.*"

The VP elaborated on this,

> "*In an internet forum, it works in a way that they really want us to go in and comment on it but we are very reluctant. Basically, everyone in the organization can sign in and you can see that this is a Coloplast person commenting because it says expert panel and they know that is Coloplast. However, it is quite seldom that we do it because I think of this fear of what I can say and what I cannot say. And I think that is a big issue.*"

According to the VP, there were a few reasons behind the organization members' fear of commenting. Firstly, this was a public forum that could be viewed by anyone with an internet connection, including Coloplast's competitors. Therefore, the employees needed to be careful with what they were saying as it could be read by the competitors. Secondly, the discussions were about people's real-life problems. Consequently, there were a lot of emotions involved and organization members needed to be careful that they did not insult or offend customers. Thirdly, their comments could create false expectations for end-users. For instance, as described by the VP, "*they could also see this* [employee comments] *as a promise that we would actually have this product. But this was just a feedback so that is something that is unclear how we actually handle that*". The Director of Technology Scouting explained this further, suggesting that the people using the website thought that when they gave an idea, Coloplast should have taken it.

> "*They are not aware that there are a lot of ideas we are not doing. You have to screen and prioritize. But they do not understand why you did not take their ideas because they think it is good. That is something I tried on my body and I know it functions for me so it has to function for everyone so why not just produce it tomorrow. Right that is very simple. That is their logic. They do get upset because why in hell are you making this website if you are not using our ideas. How do you handle that? It is really difficult.*"

Therefore, to avoid these complications, the organization members preferred not to comment and neither did they incorporate the end-users' input into their internal innovation projects because of fear of proprietary issues in later stages of the innovation process. The VP summed up Coloplast's current position in the following quote,

> "*We have got the tool, more than most companies and we have found what the difficult thing here is. So, so far so good but then what? And that is what we do not know at the moment.*"

However, as part of the strategic drive, top management also implemented the following initiative, which involved project level organization members being encouraged to build internal networks. The management believed that this might help organization members to move out of their comfort zones and embrace the idea of collaborative innovation projects, possibly resulting in them finding creative but safe ways of making open innovation work for their projects.

5.3.6. BUILDING THE INTERNAL NETWORK

As explained by the VP, "*sometimes inspiration is not necessarily found on the other side of the earth. It can also be in the room next door*". One of the issues identified by top management was a lack of interaction among Coloplast organization members at the project level. Therefore, they saw this as an area that could be improved and potentially help their drive to implement open innovation. Consequently, the following two initiatives, the 'employee catalogue' and the 'specialist academy' were set up to help the firm build internal networks and increase the level of interactions among project level organization members.

5.3.6.1. EMPLOYEE CATALOGUE

The employee catalogue was a searchable electronic database of all employees in Coloplast accessed through the company's website. This catalogue showed what the organization looked like, where individual employees were positioned, their contact details and, more importantly, Coloplast had asked each employee to add three core competences that they acquired at Coloplast or from previous jobs or during their studies. This was explained by the VP as:

> "*Something where they say this is what I am pretty good at and you need to know. And that has been quite beneficial because people might not necessarily know that they actually have a colleague who is an expert in laser welding for example. But now they say geez he really knows something about laser welding, we need to call him. I think calling this open innovation might be taking it a little too far but it is kind of on the same note that you look in places where you usually did not look.*"

The notion behind this catalogue was that when organization members accessed the information in the database, they would realize that there is a large body of knowledge around them and it is not difficult to build networks with people they usually did not associate with. This initiative was complemented by the 'specialist academy' programme as described below.

5.3.6.2. SPECIALIST ACADEMY

The specialist academy was a programme whereby on a regular basis Coloplast got people who knew something about a specific area to give a one-hour university style lecture, including notes. This allowed people to share their knowledge with colleagues and also acted as a training session for the organization members. This lecture was also video recorded and was uploaded onto the company intranet as a resource that people could access whenever they liked. Moreover, as suggested by the VP:

> "*Part of that is to conserve our knowledge and make sure that what we know is not lost when people transit out of the company for whatever reason and to make it alive so that people can actually see well oh ok he really knows about this. I need to go and talk to him. So, it is also about profiling some of these people internally.*"

The VP explained that while this initiative was not directly promoting open innovation, just like the employee catalogue, it was encouraging organization members to network and collaborate internally with people that they usually did not work with. Moreover, the management's intention was to get the organization members used to searching and communicating with people while collaborating during innovation processes so that when dealing with external parties, they would already have had some practice. Top management believed that as a result, there would be less resistance to the idea of seeking input from external parties and incorporating external knowledge into their innovation projects. The VP commented that:

"You could see this as an easy non-dangerous early step because if I start to share what I know internally then it kind of opens up the well maybe I am not the one who knows the most. There might be other guys and if there could be somebody inside then there could be somebody outside."

This section discussed the changes introduced by top management to enable and support the use of open innovation practices in Coloplast. The following section discusses the impact these changes had on routine innovation practices of organization members in the three years following the shift to a formalized open innovation process.

5.4. IMPACT OF CHANGES IMPLEMENTED BY MANAGEMENT

As described above, the top management at Coloplast implemented a number of initiatives to drive open innovation in the firm and overcome internal resistance to change. This included going through a formal process to define open innovation for Coloplast, creating a specialist group to aid the open innovation efforts, creating an environment within the firm that encouraged employees to collaborate with people that they would not normally associate with, as well as setting up schemes such as 'meet the end user programme' and the 'stoma website' to increase the level of interaction between organization members and end-users. This section discusses the impact of these management efforts based on the observations of the interviewees.

5.4.1. ELUCIDATION OF OPEN INNOVATION IN COLOPLAST

Going through the process of defining open innovation and clarifying what the move to open innovation meant for Coloplast cleared a lot of doubts and misconceptions that people initially held. The VP explained that it answered organization members' questions such as, "*how do we actually handle that type of projects* [external projects]*? How do we actually work with partners?"* Moreover, it clarified for management and organization members that open innovation was not simply outsourcing the R&D activities to an external party. According to the VP, "*it has an internal component also, we are doing part of it and they are doing some part of it. That has been a great learning for us.*" This also helped organization members at all levels realize that handling an external partner required a lot more attention than people usually thought it did The VP exemplified this with the following comment:

> "*People have a feeling that if I have a partner, you just tell them what to do and cheerio, see you in half a year and you will be back with a solution. Do we agree? Yea we do. And when they come back, that is just not the way it works because just like any internal project or any employee, you need to give guidance, direction, discuss the solutions, what are we doing, what are we not doing. And I would say if it is just a fair size, you need a full time Coloplast employee that handles that relationship and does nothing but handle that relationship if you want something that is just a little bit suitable and that can be difficult to understand for the organization. Because now I have paid this horrible amount of money to this company so of course they can run on their own, I do not need also to assign a project manager from my end. We do not need to babysit them, do we? But you do if you really want to be successful. To secure what they are thinking is the same as what you are thinking because there are a lot of things that are not explicitly given in an agreement but it is things that you just know because you have the Coloplast DNA and thinking.*"

Furthermore, as suggested by the VP, Coloplast organization members, especially, top management realized that a firm should not move to an open innovation strategy because they thought it was easier or cheaper because it was not. He explained that one of the big issues in Coloplast at the beginning was that top management thought that "*open innovation equals free innovation*". They were thinking that open innovation meant the solution was already out there so it was just a matter of finding it and obtaining it at no cost. They thought, "*Oh just call people and ask them, can I get the solution free. That is a great idea, fantastic concept, why did not we do that before."* However, this misconception clouded the judgement of Coloplast's top management. Firstly, in most cases the solution was not already available. The technology may have been available in some form but it still needed to be altered to fit the purpose of the focal firm. Secondly, in most cases the solution came at a cost for example, the company might need to buy the technology or pay a royalty for the use of the IP. Thirdly, there was a cost to searching for the technology and talking to the external partners. As stated by the VP:

> "*Finding the technology you are looking for is not necessarily cheap. I mean if you are looking for an old pirate treasure, it takes an expedition that can be very costly and people forget that. Especially in cases where we do not know what the treasure looks like and we do not even have the map. We just have a good idea that there might be one out there.*"

Consequently, going through the process of defining open innovation in Coloplast was a learning process for all organization members from top management who rolled out the strategy, to the engineers who were resisting the change. While this process did not directly change the routine innovation activities in the firm (as discussed later in the chapter), it got people talking about open innovation and engaged members from different parts of the organization in the drive towards open innovation. Hence, top management was able to overcome some of the internal resistance from the project level organization members. They also realized that some of their expectations at the time they rolled out the strategy were not realistic. Consequently, the narrow definition of open innovation based on just one dimension of open innovation, that is, outside-in dimension as discussed in Chapter 2 was adopted. The VP summed the impact of the process with the following comment, "*It is not all misery which you could think when we first started.*" Other effects of the changes that top management believed made their efforts worthwhile are discussed in the following sub-sections.

5.4.2. CHANGE IN MANAGEMENT'S[45] APPROACH

According to the interview data, one of the key results of the strategic drive towards open innovation was that managers had changed how they approached their projects. As suggested by the VP, "*I think we have probably transformed ourselves from being more driven by intuition and indignation about what we are seeing to be much more structured.*" The R&D Controller also suggested that the information collated by the technology scouting group alerted managers to opportunities and knowledge outside the firm that they could leverage and benefit from. This was summed up in the following comment from the R&D Controller; "*I think it is really that we have realized that we need to be more out there to understand of course the customers but also understand what is out there in terms of different techniques, ways of doing things.*"

Consequently, according to the VP, management changed its approach to managing projects, which he exemplified with the following comment, "*We have shifted the question so now we do not ask how long you need for this. But we tell the project teams that you are supposed to launch here and ask what it will take to launch there*". He went on to suggest that the management now told the team members to be proactive as reflected in his following comment:

[45]Management here refers to decision makers at different hierarchal levels that is, top management, middle management as well as lower management.

> "*Managers now tell the team members, do not just come back and say well it would take these and these resources internally but we are lacking this and this so we cannot launch. Ok that is fair enough we do not have this knowledge but what will it take to get access to this know-how or this resource so that we can launch on time. That is a change where we force the projects to really think in terms of how can I mitigate my gaps and the usual answer there is open innovation in one way or another.*"

The Head of R&D also highlighted this change in an interview with a Danish newspaper where he stated:

> "*We have set a maximum of two years to develop a new product. With this time limit we then need to determine what is possible. Our aim is to achieve even more within the two years and the two years are not up for discussion*".

He went on to explain that "*the tighter time schedule works because the whole organization has accepted new conditions and is working purposefully together.*"

The description of these changes by the members of top management that is, the Head of Innovation and VP suggested the change was forcing team members to think about open innovation and consider leveraging the knowledge outside the firm to speed up the internal innovation process and achieve time-to-market targets. However, an analysis of changes to the routines of project level organization members suggests at the time of this research there had not been a significant change towards the use of open innovation practices, which is discussed in section 5.5. However, there had been a positive change in the project level organization members' attitude as described below.

5.4.3. CHANGES TO EMPLOYEES' ATTITUDE

The 'meet the end-user' programme and the internet forum were two direct formal initiatives by top management to enhance employee and end-user interaction. As explained by the VP, top management believed that when employees listened to the story of the end-users' lives, it gave them a good deal of perspective and motivation. It gave the employees a different understanding of why delivering new or improved products to the market as soon as possible was so important. The VP expressed this view with the following comment, *"That picture and that feeling that you get from these customers, you understand how much our products really mean to them. That gives a tremendous sense of urgency in the development process."*

He went on to illustrate that if a team was thinking of launching a particular product in the market in five years time, when they saw that the end-users really needed the product right now they realized that five years was not good enough. They had to take the product to the market in less time than that. The VP explained that as a consequence of the increased end-user interactions, *"there is indignation about the situation that we are not capable to do more for the customers. That is an incredibly strong driver in the company and where people get very passionate and really get emotional about what we are doing."*

The general consensus among the interviewees was that as a result of these interactions with the end-users, employees were increasingly motivated to be more innovative and performed better to deliver good quality products to the market as quickly as possible. Employees were driven by their emotions and being able to help the end-users acted as an intrinsic reward, which enticed employees to put their personal interests aside and do what was necessary to satisfy the needs of end-users.

5.4.4. IMPROVED COMMUNICATION

Another positive outcome of the changes was the improvement in communication among people within Coloplast. The R&D Controller and one of the project managers explained that co-locating people working on a project and having them all sitting together reduced the number of miscommunications and misunderstandings that used to happen before. As exemplified by the R&D Controller:

> "*It used to be a lot of we wanted this, you developed that, no you said that. There has been a bit of arguing. Marketing say ok I want one of this thing, then they send that request to R&D. R&D started to work. One year later they come back and ok here it is. But marketing go I wanted it in blue. So, it has been like that. I am in my silo and you are in yours and let's stick to that. But I think we are really integrating the organization now.*"

Furthermore, as explained by one of the project managers, co-location helped with transfer of knowledge which was a huge issue in development projects. The project manager went on to explain that by increasing their contact with external parties, Coloplast employees had improved their internal communication. He explained this as:

> "*Previously I would say, external parties had much clearer communication because they had to present their knowledge to Coloplast but if you were running an internal project, well the knowledge was in-house so it was not written down in the same I would say good manner. As we started dealing with external partners much more, we have also become much better at presenting and documenting our knowledge. That was interesting to see. I was very surprised the first time I saw a presentation from an external partner to us. I would say I was very satisfied. But*

now I am also very satisfied when I see presentations from internal development teams."

This improvement in communication enhanced performance in the firm as problems were identified and addressed appropriately in a timely manner, which also contributed to the reduction in time-to-market, as discussed below.

5.4.5. REDUCTION IN TIME-TO-MARKET

Interviewees also indicated that the above changes had a positive impact on an important measure for Coloplast's R&D function, that is, time-to-market. There had been an evident drop in the average time Coloplast's project teams took to launch a product. This change was highlighted in Coloplast's 2008 annual report (Coloplast, 2008a) which read:

> "*Since the 2007 financial year, our Group has focused on enhancing the development processes and on complementing the in-house development skills with a strong network of external partners. These efforts have resulted in shorter development time*".

This was again mentioned in the 2009 annual report (Coloplast, 2009a) which read, "*The time-to-market for new products has been reduced substantially during the last two years*".

The R&D Controller expanded on this explaining that,

> "*We have gone from four years on average down to two years. I think it is really true. I am not sure what we did during those four years but it took a long time*

before. To be honest, I think in regards to time, we have really done a good job there."

Operating in a highly competitive market[46], Coloplast's success was contingent on its ability to be first to market with the best medical devices and service solutions. Therefore, time-to-market was an important measure. As stated in Coloplast's 2009 annual report (Coloplast, 2009a), "*being able to develop new products faster than the competitors has many benefits for Coloplast*". For example, by bringing products faster to the market, Coloplast was fulfilling the needs of its end-users faster, which led to the creation of additional customer value. Moreover, by entering the market first, they were able to capture a significant proportion of the market share before the competitors entered the market which contributed to higher revenue and growth prospects. Furthermore, the 2009 annual report stated "*by reducing the time-to-market, Coloplast is in a position to allow third-party input to the process, including via the internet without the risk of the competition having sufficient time to capitalize on the open innovation process before we bring a product to market*". Hence, it could be argued that in Coloplast there was an endogenous relationship between open innovation practice and time-to-market. The drive to formalize the open innovation process resulted in a reduction in the time-to-market which in turn enabled the firm to seek external input and collaborate with external parties without the fear of competitors capitalizing on the information that may leak to the public domain.

This link between the reduction in time-to-market and the drive to formalize the open innovation process is interesting, as it may be a significant benefit of implementing the open innovation strategy, which has not been highlighted by previous studies. As discussed in

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[46] According to Coloplast's Enterprise risk management guidelines, Coloplast's products are marketed globally in a niche market, which is characterized by intense competition. Changes in the competitive landscape can lead to diminishing profit margins for Coloplast.

Chapter 2, previous studies have identified a number of benefits of implementing open innovation such as increases in revenue streams and reduction in costs as firms save time and money by leveraging external knowledge and technologies (Chesbrough, 2006a, 2007). However, this study adds to the extant knowledge by showing that improvements in internal processes is another benefit of formalizing the open innovation process which can further reduce costs by improving performance during the innovation process. So, even though a firm might not benefit from increases through new revenue streams or a reduction in cost through use of external technologies (as opposed to developing them from scratch), which has been highlighted by previous studies, the firm can still benefit as exemplified by Coloplast.

For instance, in the three[47] years since open innovation was implemented, Coloplast did not benefit from new revenue streams as they were only using the outside-in dimension of open innovation. Moreover, as explained by the VP and the R&D Controller, they did not benefit from any direct cost savings. There was no reduction in internal salaries or employee related costs which were the biggest expenses for the R&D function. Instead, as the R&D Controller explained, more management and administration time was devoted to the external projects that they were involved in compared to internal projects; plus they had to pay for engaging those external parties.

However, as explained above, the belief amongst the management was that the drive to open innovation had significantly reduced the time-to-market as Coloplast had become more efficient. Therefore, as shown in Figure 5-8, Coloplast had potentially benefited from the drive to formalize the open innovation process through the increases in revenue by being first to market, through the reduction in time-to-market and through cost savings by improving the efficiency of the internal innovation process.

[47] To the time of the interviews in 2010.

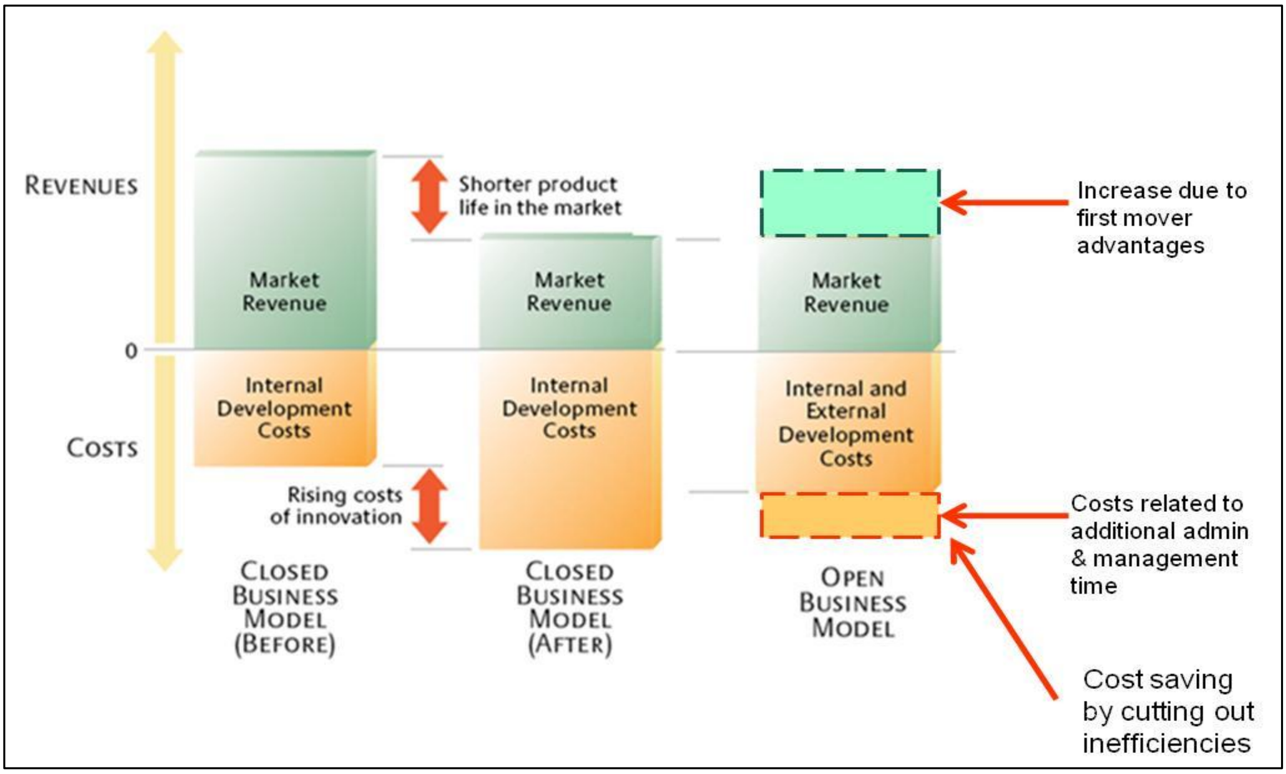

Figure 5-8: Benefits of open innovation in Coloplast (Adapted from Chesbrough, 2006a)

Therefore, there appears to be a relationship between the reduction in time-to-market and the formalization of the open innovation process, which could be examined in more detail in future studies.

5.4.6. SUMMARY OF COLOPLAST'S OPEN INNOVATION JOURNEY

As described above and depicted in Figure 5-9, Coloplast's open innovation journey began with a recommendation from a consulting firm. As it was pointed out on a number of occasions during the interview with the VP, this was part of the reason for the internal resistance to the roll out of the open innovation strategy. It was not a strategy that emerged from the organization members, or one that was supported by their experiences in the past.

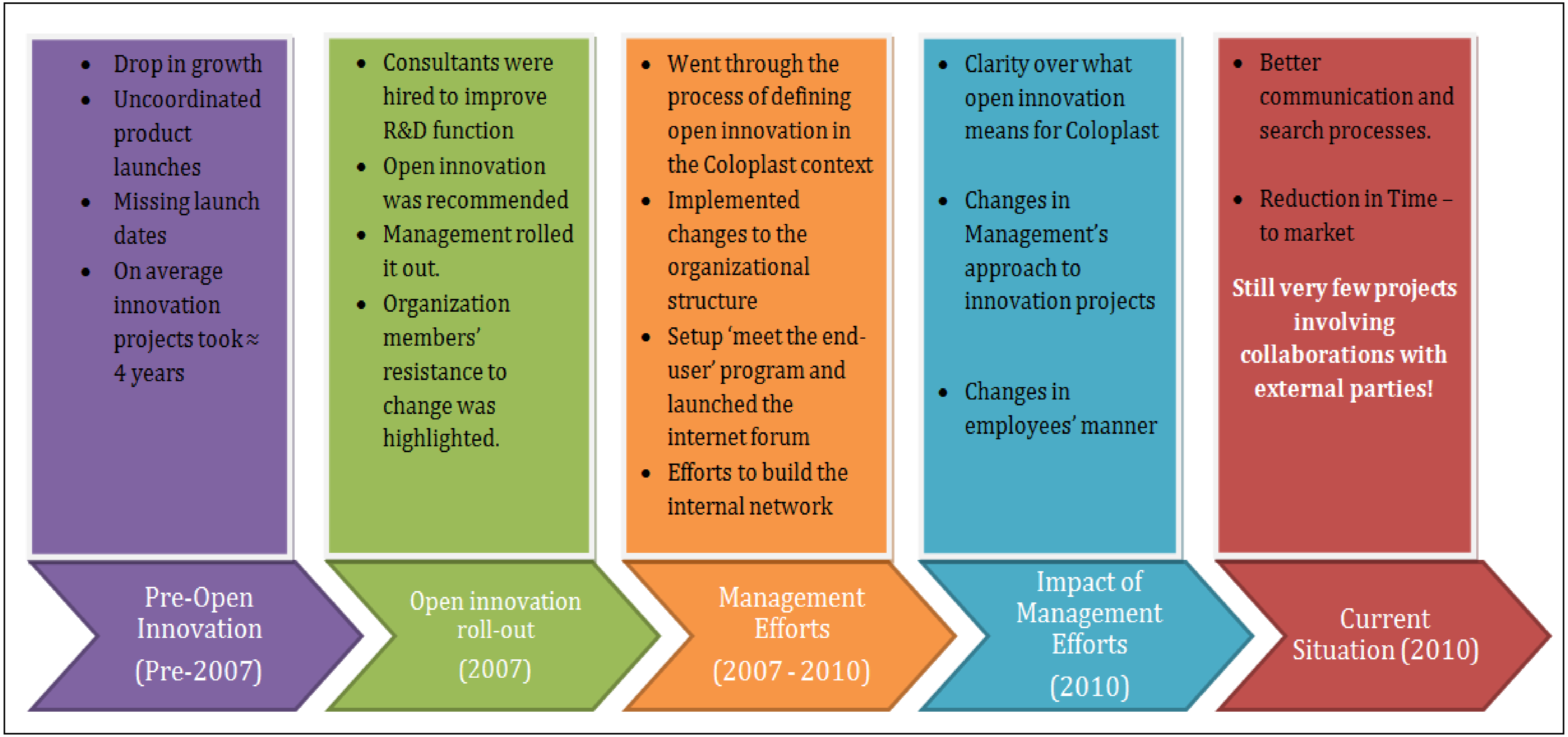

Figure 5-9: Coloplast's open innovation journey

The organization members below the top management level viewed this roll out as being told by an external party to change their approach to innovation and adopt the open innovation practices. Moreover, the project level organization members could not understand the reason for the change as this approach was contradictory to lessons they had learned from past experiences, which suggested that collaborating with external parties could be disastrous for the firm. Also as described above, the organization members (especially engineers) feared they might lose the interesting aspects of their work. The reactions of the organization members in Coloplast were consistent with the findings of other open innovation studies that looked at the challenges of the process of implementing an open innovation strategy (Chesbrough & Crowther, 2006; Chiaroni et al., 2011; van de Vrande et al., 2009; van der Meer, 2007; West & Gallagher, 2006). However, the current study went further in examining how management responded to resistance and the changes that took place. An analysis of the changes helped identify that even though the use of open innovation practices did not increase as top management hoped, the changes benefited the firm by improving performance, which helped reduce the time-to-market (an important measure for innovative firms who compete on the basis of being first to deliver new inventions).

The rest of this chapter discusses the use of open innovation practices in Coloplast at the time of this research that is, the routines around open innovation practices in 2010 and how the formalized MCS influenced the use of open innovation practices in Coloplast.

5.5. DISCUSSION

The definition of open innovation adopted by Coloplast as discussed in section 5.3.1 suggests that Coloplast had adopted an outside-in approach (Chiaroni et al., 2011; Gassmann et al., 2010) to open innovation where the aim was to seek input from external parties for their internal innovation process. However, discussions with interviewees suggested that while

Coloplast's top management installed the infrastructure required to seek information from external parties, there was limited use of open innovation practices by organization members at the project level. In other words, Coloplast had very few projects since the open innovation process was formalized in 2007 where project teams incorporated external knowledge or technologies during their innovation process.

For instance, Coloplast had set up the STOMA website to seek input from end-users. While this website was a great success in terms of getting input from end-users, this information had not been incorporated into Coloplast's innovation projects. Similarly, Coloplast's technology scouting group had been successful in getting input from various suppliers and researchers around the world through the e-posting mechanism. However, according to the Director of Technology Scouting, this information had again not been incorporated into innovation projects. To put this into perspective, the R&D Controller commented that from Coloplast's portfolio of 20 innovation projects in 2010 only one involved open innovation while the rest were internally driven.

The Director of Technology Scouting explained that from training sessions and group meetings it appeared the organization members understood the concepts of open innovation and agreed that they should try to find technologies externally if those technologies were not identified in the roadmap as Coloplast's core competencies. However, when it came to practice, they wanted to do the projects themselves. This indicated that while the formalization of the open innovation process in Coloplast by top management had led to a number of formalized MCS being put in place, the routines of the project level organization members in terms of their innovation practices had not gone through a similar level of change. Therefore, using the extended theoretical framework described in Chapter 3, the following section examines why the routines remained stable when the formalized MCS changed. However, the first step of the analysis involved the identification of the formalized MCS that applied to the innovation function at Coloplast, which is outlined in the next sub-section.

5.5.1. FORMALIZED MCS

In line with Chapter 4, Coloplast's MCS relevant to innovation activities have also been conceptualized by drawing on the Simons' (1995) levers of control framework. This framework suggests the MCS as outlined in Table 5-1 on the next page are linked to the key constructs that stem from the firm's business strategy. As stated in sub-section 5.2.2, Coloplast's business strategy was to achieve profitable growth by developing and marketing products and services that made life easier for people with intimate healthcare needs before the competitors could do so. Hence, at Coloplast, management's key concerns centred on meeting customer needs through effective R&D activities. Table 5-1 discusses these concerns and the formalized MCS Coloplast had in place to achieve its business strategy. It is divided into four parts in accordance with the four key constructs from the Simons' (1995, 2008) levers of control framework: core values, risks to avoid, strategic uncertainties, and critical performance variables. These key constructs relate to the four levers of control as described below.

5.5.1.1. BELIEF SYSTEMS

In Coloplast, it was fundamental that the organization members understood the needs of people who would use their products. This enabled the firm to respond to those needs by improving their product offerings and services in the shortest possible time in order to achieve profitable growth. It was equally important for the firm to maintain customer loyalty and trust. As explained by the VP, Coloplast was providing for customer needs that were very personal in nature and so the customers needed to be able to trust the products and services they were using.

Key Constructs	Management concerns at Coloplast	Levers of Control	Formalized MCS in the Innovation Function
Core Values	Being able to understand the needs of users and respond by finding new ways to do things better in the shortest possible time. Maintaining customer loyalty and trust - Coloplast was providing for customer needs that were very personal in nature and hence the customers needed to be able to trust the products and services they were using. As put by the VP: "*They must have trust and confidence in what we are doing and if not they will switch as quickly as possible*".	**Belief Systems**	**Mission Statement** - *Develop and market products and services that make life easier for people with intimate healthcare needs*. **Vision Statement** - *Setting the global standard for listening and responding*. **Values Statement** - This statement which was published on their website defined the way Coloplast executives wanted the organization members to think and act both as individuals and as a company. The values included in this statement are: • *Closeness to customers (end-users and health professionals) as well as colleagues within the firm.* The aim was to create the '*we culture*' at Coloplast. • *Passion to make a difference to lives of people.* • *Respect and responsibility to guide the actions of the individuals.* - These values were executed in the firm through the 'Meet the end-user' programme, employee catalogue, and specialist academy
Risks to be avoided	Valuable information leaking to competitors allowing them to capitalize on it by taking away Coloplast's market share. Refer to Figure 5-10 below for examples of risks identified under the enterprise risk management programme.	**Boundary Systems**	**Rules on Non-Disclosure agreements** - Coloplast got all external parties to sign a non-disclosure agreement to stop the spread of sensitive information. **Enterprise risk management programme** - Coloplast had compiled a long list of risks that the company faced which was quarterly updated and monitored. As per the former CEO of Coloplast who implemented this programme in 2008, "*The purpose of this programme is to ensure that risks are timely identified, assessed and responded to by responsible employees at all levels within the company*".

Strategic uncertainties	Technological developments by competitors that may impact Coloplast's profitable growth prospects. Changes in market trends.	**Interactive control systems**	**Roadmap and Technology Foresight Database** - These mechanisms opened up discussions about technological developments outside Coloplast and possible actions that needed to be taken. These discussions helped management make strategic decisions and take appropriate actions in a timely manner. **STOMA Website** - While this platform was designed to enable interaction between organization members and end-users, discussions within the firm relating to information posted by end-users helped the firm understand changes in market trends that could have influenced the firm's strategic decisions.
Critical performance variables	Quality - Malfunctioning of products in the market or bad service could negatively impact Coloplast's reputation and reduce market share. Moreover, as specified in the enterprise risk management guideline, "*ongoing quality problems related to products or processes can lead to loss of different authority approvals or certifications, which will limit Coloplast from access to markets*". Speed of development - Launching to the market before the competitors was essential for Coloplast to achieve the first mover advantage and capitalize on the open innovation process. - Technical problems with the project. Cost - With the objective of having profitable growth, it was essential for Coloplast's organization members to stay within cost forecasts.	**Diagnostic control systems**	**Quality management systems** - This system comprised of compulsory quality control tests and monitoring systems based on regulations and market standards that Coloplast's products needed to meet. As part of this system, Coloplast conducted internal and external audits (e.g. monitoring the quality standards of suppliers) as well as provided quality management training to all organization members. **Time to market schedule** - At the start of projects, management set a launch date (max of 2 year time-frame) and gave the team a time schedule to work by. The launch date was non-negotiable and managers monitored teams' progress to ensure that this was achieved. **Quarterly Forecasts** - The R&D costs were managed through the quarterly forecasts which were reviewed and updated monthly to ensure the function was on track. **Stage-and gate innovation system (AIM)** - The stage-gate system allowed the managers to discuss the projects in detail with the project teams at the gates where concerns were resolved and the forthcoming course of action to be taken by the teams for the next stage was discussed. **Cross-functional team structures** - The cross-functional team structure whereby the team members were co-located ensured effective flow of information to enable the resolution of problems as they occurred. This reduced future delays due to technical problems with the project.

Table 5-1: Formalized MCS relevant to Coloplast's innovation function

With a number of competing products available in the market, Coloplast's top management recognized that if they lost customer trust, customers could easily switch to the competitors' products, resulting in Coloplast losing market share. Therefore, top management put in place a number of belief systems to guide the behaviour of the organization members in understanding customer needs and maintaining customer loyalty and trust. These included the mission statement, vision statement and the values statement as described in Table 5-1.

Coloplast's mission and vision statement were contained in their corporate governance principles manual, which was reviewed once a year by Coloplast's Board of Directors and Executive Management. The values statement stemmed from the mission and vision statement and was published on the Coloplast website. It defined the way Coloplast's top management expected the organization members to think and behave with people outside the firm, such as customers and suppliers, as well as with their colleagues within the firm.

Part of top management's efforts to formalize the open innovation process involved the execution of the value statement through programmes such as 'meet the end-user' and the 'specialist academy'. These belief systems were used to appeal to the social value of collaborations with external partners. For instance, by establishing lines of communication between end-users and R&D organization members through the 'meet the end-user' programme, the organization members realized that they did not know everything and they needed to put their own interests aside to help the people in need of solutions today. So, these interactions with the end-users resulted in employees being motivated to be more open to the idea of seeking input and improving their performance. Top management believed that the execution of the belief systems in this manner helped them change the internal culture whereby now employees placed less importance on their personal interests and being able to help the end-users acted as an intrinsic reward. Their view was that this change might in future entice the project teams to turn to using open innovation practices to further reduce their development time.

5.5.1.2. BOUNDARY SYSTEMS

The second key construct discussed in Table 5-1 is the risks that need to be avoided. Coloplast faced a number of risks from various sources. To enable organization members to identify and respond to the risks in a timely fashion, top management put an 'enterprise risk management programme' in place where management compiled a long list of risks that the company faced. A partial list is shown in Figure 5-10. This programme suggested to the organization members what they needed to be careful of and what they needed to avoid.

Identify risks

Market	Price	Competition	Innovation	Operations	Financials	Human Resources	Business portfolio and growth	Insurance / Accidents / Facility
Market developments & trends	Health care reforms / Reimbursement	Sales	Patents and Intellectual property	Product and process quality	Foreign currency exposure	Employee expertise	Business area portfolio / MA&D	Fire/Flood/
Key Players	Parallel import	Market share incl. NPD-rate	Key player / end user interaction	Global Supply Chain	Interest	Management / leadership skills	Market portfolio	Accidents towards key personnel
Goverment & Regulations		Product & Service portfolio	Clinical studies	Raw materials	Tax	Attractiveness to potential employees	Mentor integration	Accidents in production area
		Substitution areas		Suppliers		Employee satisfaction level		

LIST IS NOT EXHAUSTIVE

Figure 5-10: Examples of risks identified under the Enterprise Risk Management programme

This list was updated and monitored on a quarterly basis to capture any new risks that may come to light and to identify any existing risks on the list that may require immediate action to be taken to mitigate negative consequences arising from that risk. One of the risks on this list that was particularly relevant for R&D organization members was the risk of valuable information leaking to competitors, allowing them to capitalize on it by taking Coloplast's market share. To avoid this risk, organization members were required to get all external parties to sign a non-disclosure agreement to stop the spread of sensitive information. They were also required to negotiate issues around IP ownership at this stage to avoid disputes at a later stage. Another risk identified by Coloplast's top management was changing market trends, which related to the strategic uncertainties the firm faced. This is discussed in the next sub-section.

5.5.1.3. INTERACTIVE CONTROL SYSTEMS

Strategic uncertainties relating to technological advancements produced by competing firms and changing market trends were a key concern for top management at Coloplast. Failure to address these uncertainties in a timely manner when or before they eventuated could result in Coloplast losing customers to competing firms and negatively impacting Coloplast's profitable growth prospects. Therefore, during the shift to the formalized open innovation process, top management grabbed the opportunity to implement interactive control systems such as the roadmap, technology foresight database, and the STOMA website, as described in Table 5-1, which facilitated discussions about the strategic uncertainties and possible strategic actions the firm could take.

According to the interview data, top management believed these interactive control systems provided valuable information for timely and informed strategic decision making as well as acted as platforms to allow organization members to identify opportunities for external collaborations and help them to find appropriate partners. For instance, as the Director of Technology Scouting explained, the roadmap and technology foresight database were useful mechanisms that were designed to assist the partner selection process. Using these mechanisms, the technology scouting group could identify external parties with relevant technology or know-how. These mechanisms were also used to store information about any links between partners and competitors. Therefore, Coloplast's top management put in place appropriate infrastructure to support the search and selection of external partners to collaborate with. Through effective use of this infrastructure Coloplast had the capability to sustain the use of open innovation practices in the firm by selecting appropriate external partners with whom organization members could build long-term trusting relationships.

5.5.1.4. DIAGNOSTIC CONTROL SYSTEMS

The fourth key construct outlined in Table 5-1 is the critical performance variables. According to the R&D Controller, there were three main critical performance variables for Coloplast's R&D function: quality, speed of development, and cost. As Coloplast operated in the medical devices industry, quality of its products was paramount. A number of industry regulations governed the standards of quality that needed to be maintained. To ensure compliance with these standards, top management at Coloplast put in place quality management systems which comprised compulsory quality control tests and monitoring systems that all innovation projects went through. To ensure all products fully complied with the standards before they were launched in the market, top management designed the formalized rules around quality based on the regulatory and industry requirements. The top management took quality standards very seriously and ran a number of compulsory quality management training sessions throughout the year for organization members. It also conducted quality audits of suppliers and had internal practices to ensure the routines in the firm encoded the formalized rules.

Secondly, as Coloplast operated in a highly competitive environment, being first to market with innovative products was critical for its aim of maintaining and increasing its market share. Therefore, to ensure that innovation projects were completed in the shortest possible time Coloplast's top management put in place diagnostic control systems in the form of a time-to-market schedule[48]. This schedule set out a non-negotiable launch date for each project, which was used by managers to monitor teams' progress and ensure that the launch date was achieved. As explained by the VP, top management's logic for this approach was that giving employees a fixed launch date encouraged the employees to change their innovation practices and embrace external collaborations. The VP suggested that top management believed that it could not directly force employees to collaborate with external partners if they were not motivated to do so. However, by establishing the time-to-market guidelines, the top management was able to force people to think outside their comfort zones to meet pre-set launch dates. The time-to-market guidelines shifted the accountability for not achieving the launch dates to the organization members at the project level. Top management believed in the future this added pressure will result in project teams using all available resources to complete projects faster. Therefore, they expected the project teams to turn to the newly established technology scouting group to seek help in finding external technologies or experts to assist the teams to achieve their objectives.

Another concern that could hinder the speed of development was technical problems with projects. These are always a possibility with innovation projects, so, firms need to be prepared

[48]This is a new control that was implemented after the formal shift to the open innovation approach in 2007.

to identify and respond to any problems in a timely manner. At Coloplast, the top management used a structured stage-and-gate process (R. G. Cooper, 2009; R. G. Cooper & Edgett, 2008) as well as co-located cross-functional teams, as outlined in Table 5-1, to ensure technical problems were picked up and resolved in a timely fashion to avoid delays in the development process.

Cost was also a critical performance variable for the R&D function. As Coloplast's objective was to achieve profitable growth, top management expected all functions to stay within their cost allocations. As explained by the R&D Controller, R&D costs were managed through the quarterly forecasts. These forecasts were reviewed and updated on a monthly basis to ensure that the function was on track.

5.5.2. INFLUENCE OF FORMALIZED MCS

As summarized in Table 5-1, Coloplast used a number of formalized MCS to manage its innovation activities and ensure its business strategy was achieved. However, the aim of this case study is to understand the influence of formalized MCS on the use of open innovation practices at Coloplast. Discussions with the VP and the Director of Technology Scouting suggested that a number of the formalized MCS in place in Coloplast today were changed during the formalization of the open innovation process. These MCS were specifically designed and implemented by top management to encourage the adaptation of day-to-day innovation activities of organization members to overcome the initial resistance to change and support the use of open innovation practices. For instance, at the start of Coloplast's journey to open innovation in 2007, past experiences of organization members, their dominant belief in their internal ability to find a solution and the fear of losing aspects of their jobs that they enjoyed were all contributing factors to the resistance faced by top management in their efforts to implement an open innovation strategy. Therefore, to get over this resistance, top management executed the belief systems through the 'meet the end-user' programme, the 'employee catalogue' and the 'specialist academy' to make the project level organization members comfortable dealing with people that they usually did not work with. This approach also showed project level organization members that they did not know everything. In other words, the aim of the programmes was to make the project level organization members recognize that there was a benefit in talking to other people and incorporating outside knowledge into their innovation projects.

Furthermore, to facilitate this interaction with external partners and avoid the repeat of past experiences the project level organization members had had with inter-firm relationships; top management changed the boundary systems and the interactive control systems as outlined in Table 5-1. These changes ensured that appropriate partners were selected for projects. Partner selection is an important aspect of any inter-firm relationship (Anderson & Dekker, 2010; Ireland et al., 2002). However, the partner search and selection process gains more importance when the transaction is associated with exchange hazards (Anderson & Dekker, 2010; Li et al., 2008; van der Meer-Kooistra & Vosselman, 2000). Given the highly competitive environment that Coloplast operated in, combined with the uncertainties associated with innovation projects, top management recognized that it was essential that Coloplast had effective partner selection processes to avoid the repeat of collaboration experiences it had in the past.

Hence, by establishing the technology scouting group and centralizing the search process, Coloplast's top management allocated the role of selecting partners to organization members with the appropriate skills and knowledge to make informed decisions. This reduced the risk of less informed project level organization members collaborating with external parties, who may have had alliances with competitors, without taking appropriate steps to avoid information leakage. As suggested by one of the project managers, even though they got external partners to sign non-disclosure agreements, these acted like insurance policies in case something went wrong and the agreement needed to be terminated. It was top management's aim to build long-term relationships with external partners that could be sustained. Hence, finding the appropriate partners in the first instance was crucial for the firm. As suggested by one of the project managers, the ideal partners would have been ones that had the technological capabilities that Coloplast was searching for plus did not have any associations with Coloplast's competitors.

The R&D Controller explained that the few external collaboration projects that organization members had been involved with were all managed in the same way as internal innovation projects were managed. These projects still went through the stage-gate process; however, there were additional activities relating to the search for technology or external partners and negotiating the contracts they entered into. In addition, as they were communicating with external partners, extra management time was devoted to the projects as the managers needed to be heavily involved to ensure the objectives were being achieved, because it was more difficult to stop projects where Coloplast had entered into a formal contract with an external partner. Moreover, for the few external collaboration projects that Coloplast organization members engaged in, they used the concept of co-location, whereby some Coloplast organization members were positioned at an external party's premises for the duration of the project; alternatively, they had external parties' employees positioned in Coloplast. As discussed earlier, this concept helped with knowledge transfer and also helped build trust between employees of different organizations. It also ensured Coloplast organization members were aware of any issues with the project as they arose so that they resolved them in a timely manner. Furthermore, as quality was a critical performance variable, all projects (whether internal or external) were subject to quality management systems. Therefore, management of inter-firm relationships at Coloplast also involved communicating quality standards to external partners and ensuring the standards were met.

The interview data from Coloplast showed that top management changed some of the formalized MCS to address internal resistance to the change they faced when the strategy was rolled out in 2007. The role of these formalized MCS was to enable and support the use of open innovation practices by firstly, showing the organization members the incentives of collaboration and secondly, building the information infrastructure that would reduce uncertainty and manage the risks of inter-firm relationships.

By showing organization members the incentives for collaboration, top management managed to persuade organization members to recognize that there was more to gain from the use of open innovation practices compared with the perceived loss of the interesting aspects of their jobs that they initially feared. Top management also put the information infrastructure in place to allow organization members to make informed decisions in relation to partner selection. The VP summed up the changes with the following comment:

> "*We are much more deliberate today in our strategic search for technologies. We use external consultants to scan the market for us. We actually run competitions to find solutions and that often leads to ideas, IPs where the natural next step will be partnerships in one kind or another to develop a specific product. That part of really going systematically searching for something also for solutions and technologies inside our absolute core that is new and is an absolute eye opener to the organization because we have found technologies. A lot where we have said ok we knew that already; show us something new. But also something where we said well that we did not see and we need to have a look at that.*"

Hence, the strategic drive to formalize the open innovation process made organization members at all different levels realize the benefits of seeking input from external parties and as stated by the Director of Technology Scouting, "*people like it when they see what can come out of it*". Therefore, top management's belief was that the changes to the formalized MCS made organization members more open to the idea of searching and incorporating external knowledge or technologies into their innovation processes. However, the question that arises is; *did these changes influence the routines and everyday actions of organizations members*? This is discussed in the next sub-section.

5.5.3. IMPACT ON ROUTINES

The analysis of the interview data suggests the changes to the formalized MCS were a result of top management's actions, which depicted its beliefs and perceptions. As discussed in section 5.4, these changes did influence some of the routines in the firm. For instance, the existence of the interactive control systems, that is, the roadmap and technology foresight database, led to a change in the strategic planning process. Hence, at the time of this research top managers reviewed and discussed the information extracted from these systems before making their decisions. Moreover, all project level organization members had an end-user friend whom they visited and interacted with on a regular basis[49].

However, the interview data suggests that project level organization members' routines that changed were those that were reproductions of actions made compulsory by top management. For example, top management made it compulsory for every organization member to have an end-user friend that they must interact with and submit a report to management on the

[49]It can be argued that this change in routine was not triggered by a change in belief systems but was triggered by a change in the way the belief systems were executed in the firm. While before the belief system was just displayed on the website or the intranet and was available for access if the project level organization members wanted to refer to it, now it was being put into action through the programme to force the project level organization members to behave in accordance with the pre-established belief systems.

interactions. As shown in Figure 5-11, the perspective behind top management's action in implementing this 'meet the end-user' programme was that it was fundamental that organization members understood the needs of the end-users in order to respond to those needs by improving Coloplast's product offerings and services. This programme, which encoded the firm's belief system, became a routine for the project level organization members as they reproduced these actions and enacted them over and over again. As shown in Figure 5-11, this routine led to a change in the perspectives of project level organization members, who now better understood the needs of the end-users and appreciated the need for urgency in their development process.

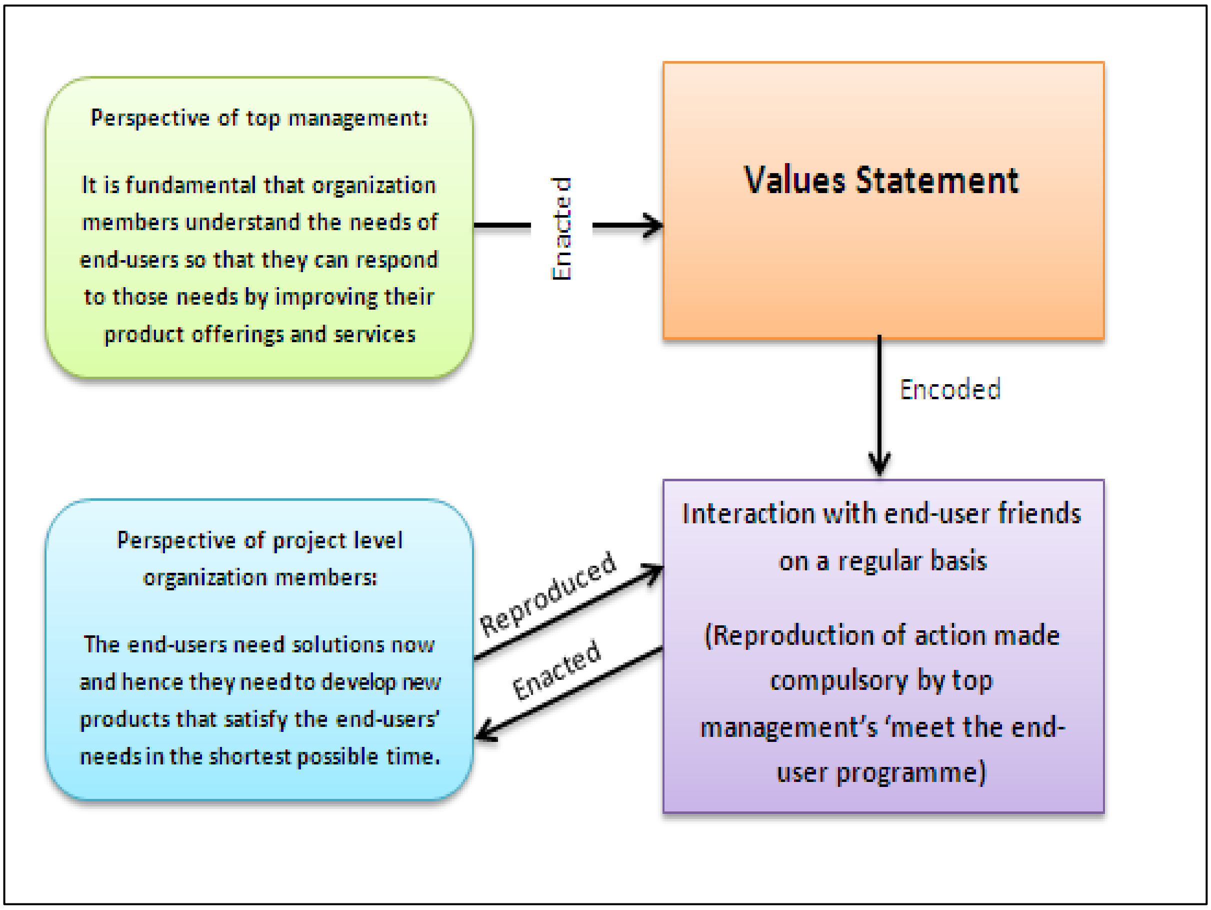

Figure 5-11: Result of changes implemented by top management

On the other hand, where the project level organization members had the power to choose to follow the prescribed actions formulated in the formalized MCS or used their own ways to complete the assigned tasks, routines and everyday actions emerged that were decoupled from the formalized rules. The consequence of this decoupling was that the majority of the project level organization members' everyday actions and therefore, their routines remained stable. In other words, the dominance of closed innovation practices continued while the use of open innovation practices was limited. The project teams continued to research and develop the products and services entirely in-house using internal resources and personnel. As a result, the external input collected via mechanisms such as the STOMA website or the e-postings done by the technology scouting group was not being incorporated into the innovation projects, nor were the project level organization members utilizing the information infrastructure that was put in place by top management to facilitate the use of open innovation practices. There was a disconnect between the expected actions of project level organization members by top management who put the formalized MCS in place and the actual routine actions of project level organization members.

The VP attributed this disconnect to the degree of uncertainty felt by organization members relating to the information they had to share with external parties. The extremely competitive environment that Coloplast operated in made it difficult for the organization members to collaborate with external parties without a real threat of the information being leaked to competitors. The intensity of Coloplast's competition was included in its enterprise risk management guidelines, which was an integral part of the day-to-day operations of the firm. Hence, all organization members were frequently made aware of the threat. However, there was a difference in opinion about Coloplast's ability to deal with this threat, which explained the disconnect and lack of change in project level organization members' routines, shown in Figure 5-12.

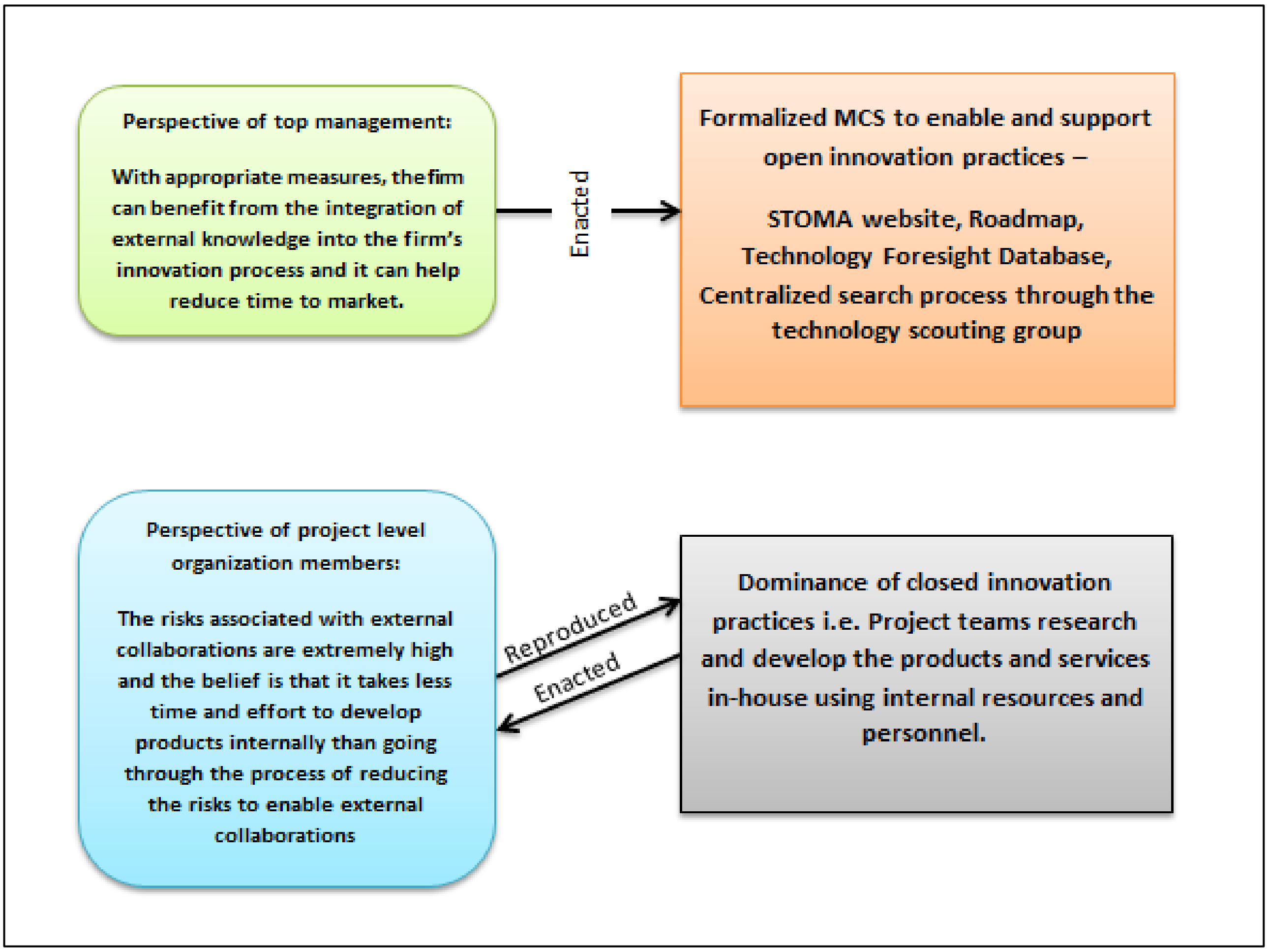

Figure 5-12: Result of different perspectives of top management and project level organization members

Top management believed that the formalized MCS they put in place were effective ways of dealing with this threat, allowing the project level organization members to appropriately collaborate with external parties. However, the project level organization members continued to be uncomfortable working with external parties because they believed the formalized MCS did not eradicate all the risks. Their opinion was that to be able to collaborate with external partners, they first needed to work on building trust with these parties. This would take time and so, the reaction of the project level organization members was that it would be more effective if they just got on with the job in-house and got results themselves. According to one of the project managers and the Director of Technology Scouting, this attitude was the key reason for the stability of the routines in Coloplast despite the changes to the formalized MCS.

However, organization members from different hierarchical levels interviewed for this study suggested that their belief was that Coloplast's use of external knowledge in their innovation projects would increase over time. They suggested that the shift to open innovation was still at an early stage. However, they were confident that as project level organization members became more comfortable dealing with external parties, their innovation routines would change. As put by the VP, "*There is nothing easy about this. It is hard work and communication in showing the way forward on how you want to do this is key.*"

Hence, a follow-up study has the potential to observe changes in the routines of project level organization members several years after the changes to the formalized MCS, which may provide additional insights on the influence of the formalized MCS on the use of open innovation practices at Coloplast. Nevertheless, the following section concludes this chapter with discussions of the contributions of the current study.

5.6. CONCLUSION

This chapter described and analysed Coloplast's strategic drive to formalize the open innovation process, which began with internal resistance to change. While this reaction to the implementation of open innovation is consistent with the finding of previous studies, this study went further by examining how top management responded to the resistance and the changes that took place as summarized in Figure 5-13.

Figure 5-13 and the discussions in this chapter showed that in the past Coloplast operated under a closed innovation system, which was seen as industry best practice (Chesbrough, 2003b) at that time. Consequently, top management had implemented formalized MCS to support internal development, which influenced the actions of the individuals and resulted in a dominance of internal R&D activities.

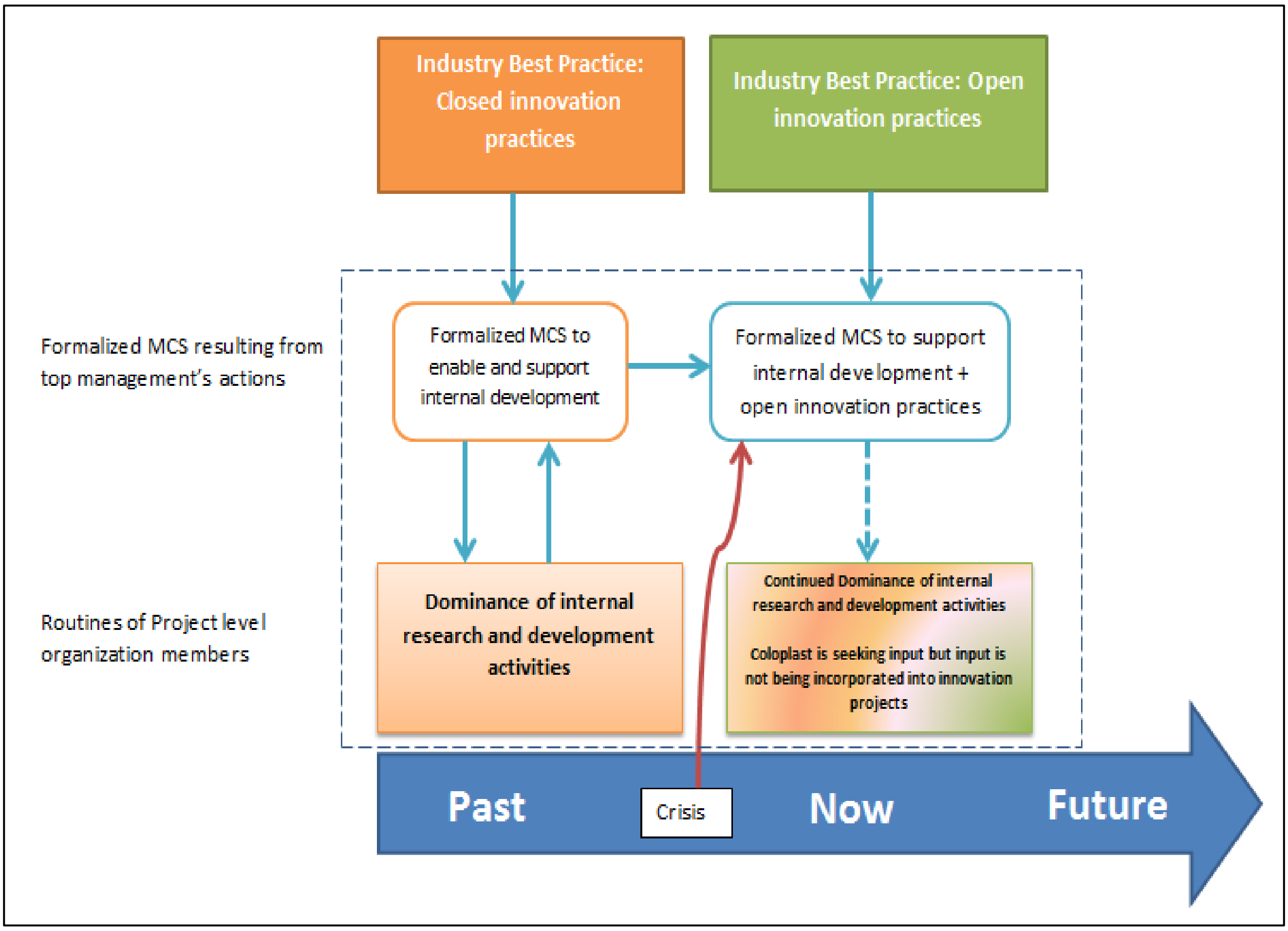

Figure 5-13: Analysis of changes to formalized MCS and routines in Coloplast

This practice continued until the firm was faced by the crisis of declining growth and inefficiencies in the R&D function, as discussed in section 5.3. This crisis was partly influenced by the change in the competitive environment as more firms entered the market and began offering substitutes for Coloplast's products, as well as a change in the size of Coloplast as it grew significantly through various mergers and acquisitions. One of the solutions proposed by a consulting firm to deal with the crisis was a shift to an open innovation strategy, which in the last decade has been hailed as the new best practice for innovative firms (Chesbrough, 2003b; Chesbrough & Schwartz, 2007; Chesbrough et al., 2006; Enkel et al., 2009; John, 2009; van de Vrande et al., 2009). Consequently, Coloplast's top management rolled out this change. However, to deal with resistance to the change, top management had to implement formalized

MCS to encourage and support collaborations with external parties while avoiding the risk of sensitive information leaking to competitors that may capitalize on it. As the actions of project level organization members were still partly influenced by the closed innovation culture existing in the firm, the move to the new approach of using open innovation practices had been slow. Some change in the internal culture of the firm occurred, with organization members becoming more open to the idea of external collaborations and starting to seek input from external partners using the infrastructure top management had set up. However, there were still very few projects that had proceeded to the stage of incorporating the information. Despite this, Coloplast's organization members observed a number of changes to their internal innovation activities that improved performance and, most importantly, reduced the time it took for them to take an idea to the market.

As discussed earlier, this is an important observation that has not been highlighted by previous studies. The improvements in internal processes and reduction in time-to-market, an important measure in R&D because of the associated first-mover advantages, could be one of the reasons for practitioners to go down the path of strategically formalizing the open innovation process in their firms.

Moreover, this case study found that the use of formalized MCS can help top management deal with the challenges of implementing open innovation that were identified by previous studies (Chesbrough & Crowther, 2006; van de Vrande et al., 2009; van der Meer, 2007; West & Gallagher, 2006). In particular, at Coloplast the MCS were used to enable and support the use of open innovation in the following two ways. Firstly, the MCS were used to deal with internal resistance to change by showing the organization members the advantages of collaborating with others. Secondly, the MCS's role was to act as the information infrastructure to reduce uncertainty and manage the risks involved with inter-firm relationships.

Furthermore, the observations from this case study also support the argument presented in the extended theoretical framework: that the perspectives of top management, which were embedded in their actions, were reflected in the formalized MCS of the firm. On the other hand, the perspectives of the project level organization members, which were embedded in their actions, were reflected in their everyday routines. Where the project level organization members' perspectives were different from the perspectives of top management, decoupled routines emerged. As summarized in Figure 5-14 in this case study, the perspectives of the top management were in favour of the use of open innovation practices, which led to changes in the formalized MCS to enable and support open innovation practices.

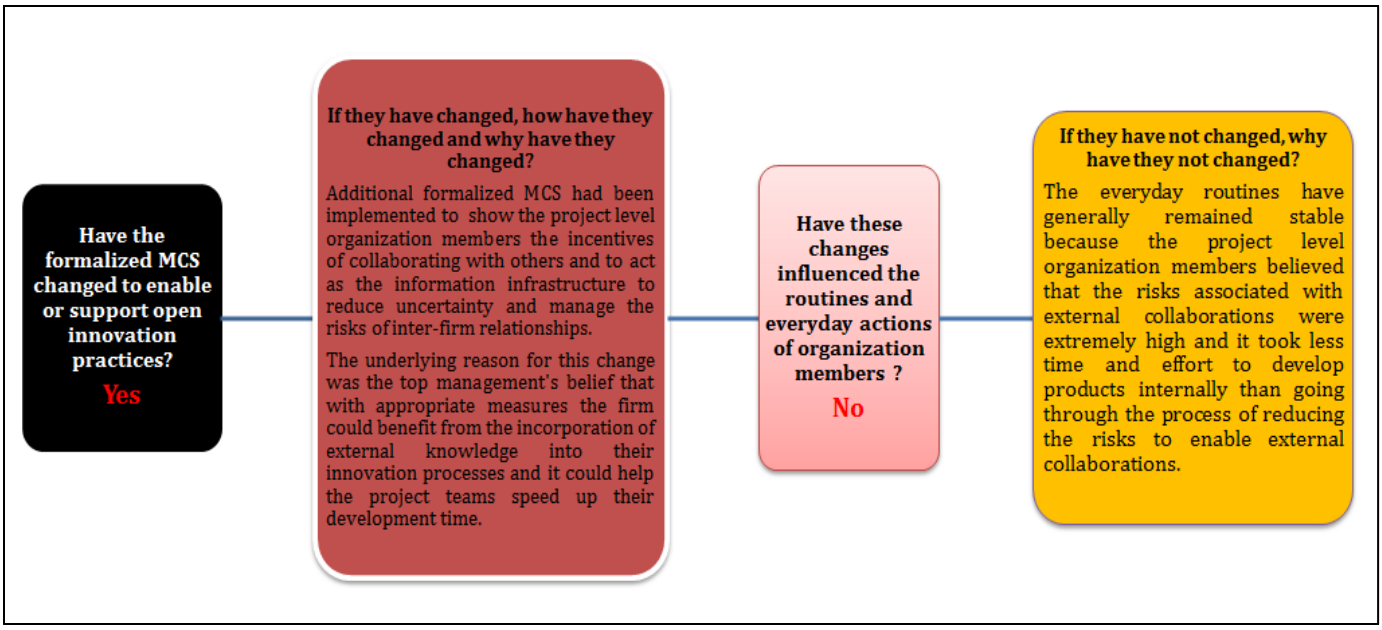

Figure 5-14: Responses for sub-research questions at Coloplast

However, the perspectives of the project level organization members did not endorse the top management's view and where they had the ability to exercise their perspectives, they by-passed the formalized MCS and continued to use closed innovation practices. In other words, because the project level organization members held the perspective that open innovation practices were not effective because of the high risks involved, the routines of the project level organization members generally remained stable despite changes to the formalized MCS. Conversely, it was seen that where top management implemented rules that made it compulsory for the project level organization members to change their routines, the actions of project level organization members did change to encode those rules. The reproduction of these actions over a three[50] year period influenced the perspectives of the project level organization members in relation to the need for urgency in the development process and motivated them to be perform better; however, to the date of this research they had not resulted in changing the project level organization members' perspectives in relation to the use of open innovation practices.

The discussions in this chapter suggest there are similarities and differences between this case study and the case study presented in Chapter 4. Therefore, the next chapter documents the results of a cross-case analysis of FPH and Coloplast.

[50]From the time the changes were made in 2007 to the time the interviews were conducted in 2010.

CHAPTER 6. CROSS-CASE ANALYSIS

VS

6.1. INTRODUCTION

The purpose of this chapter is to compare and contrast the two case studies, Fisher & Paykel Healthcare (FPH) and Coloplast, discussed in Chapters 4 and 5 respectively, to understand the reasons for the variations in their use of open innovation practices. At the time of this research, both companies were operating in the medical devices industry and placed a great deal of importance on R&D. However, this study found that the two companies differed immensely in terms of their use of open innovation practices. As described in Chapter 4, FPH had been successfully using open innovation practices for over a decade without ever going through a formal implementation phase involving management initiatives being put in place to encourage external collaborations or to give these collaborations a strategic view. In contrast, Coloplast went through an entire open innovation process where management put in place a number of initiatives to enable and support the use of open innovation practices. As discussed in Chapter 5, this formal drive towards open innovation resulted in some positive changes that helped the project teams to reduce their development time by instilling more efficiency in the day-to-day activities of the organization members. However, the management initiatives did not result in a drastic increase in the use of open innovation practices.

This chapter begins with a short literature review on institutional research examining practice variations, to identify possible explanations for the variation in the practices of the two firms. Next, the similarities and differences between the two case studies are documented. This is followed by a discussion of possible explanations for the variation. Finally, it concludes with a discussion of the findings with reference to the research question and the extended theoretical framework.

6.2. LITERATURE REVIEW ON PRACTICE VARIATIONS

Institutional studies have often focused on institutional stability and isomorphism (Burrell & Morgan, 1979; Scott & Meyer, 1991). However, in recent years the study of organizational heterogeneity and practice variation have become an important area of institutional research (Dacin et al., 2002; Inês et al., 2009; Lounsbury, 2007, 2008; Scapens & Varoutsa, 2010; Seo & Creed, 2002; Sharma et al., 2010). In other words, recent studies are going beyond isomorphism and symbolic conformity and placing an emphasis on actors and practices as well as the relationship between institutional forces and micro-processes (Inês et al., 2009; Lounsbury, 2008; Parker, 2008; Scapens, 2006; Sharma et al., 2010).

This body of literature has identified two key reasons for practice variations. The first reason is the existence of conflicts or tensions between institutional (legitimacy) and technical (efficiency) pressures (Dillard et al., 2004; Hopper & Major, 2007; Seo & Creed, 2002). These studies suggest that firms enact practices to mimic changes in the field or to gain legitimacy. However, if during these enactments actors experience contradictions or inconsistencies with their technical understanding, taken-for-granted assumptions, norms or beliefs, they may resist the institutionalization of the imposed practice resulting in loose-coupling or decoupling between the imposed practices and actual practices within a firm. For instance, Hopper and Major (2007) in their study of the adoption of ABC in a Portuguese telecommunications company found that ABC was implemented in this firm because it was imposed by the external regulators. This new accounting system was embraced by the commercial managers as "*ABC's* *formal rationality and design reciprocated their market rationality*" (Hopper & Major, 2007, p. 90). However, the production managers resisted the use of ABC because their information needs and interests were neglected. Hence, ABC was decoupled from the internal processes of the production department as they experienced contradiction between the imposed activities of the ABC system and their technical understanding. This study suggests that practice variation was a result of the contradiction between the institutional thinking and the technical understanding.

However, Inês et al. (2009) in a study examining how the management control rules and procedures imposed by a global hotel chain were adopted by a joint venture set up with a Portuguese partner in the hospitality industry in Portugal, found that practice variation can occur even when the institutionalization of imposed practices is not resisted by organization members. In other words, they suggest dialectic tensions between institutional and technical pressures may not be a necessary condition for practice variations. Instead, they found it was the existence of multiple logics[51] which informed the consciousness of local actors, leading them to adapt the imposed practices.

Similarly, Lounsbury (2007) examined variations in practices of mutual funds and found that two distinct logics rooted in different geographical locations led to different forms of understanding, which led to distinct investment practices despite operating in the same industry. This study countered the approach of institutional theorists who focus on isomorphism and stability. Instead it emphasised how contagion ultimately drives adoption behaviour, and as argued by Lounsbury (2007, p. 302), "*a focus on logics has the potential to*

[51]The concept of logic generally refers to "*the broader cultural beliefs and rules that structure cognition and guide decision making in a field*" (Lounsbury, 2007, p. 289).

redirect this long-standing tradition by emphasizing how technical mechanisms such as performance and efficiency are institutionally embedded as opposed to decoupled from broader institutional beliefs". Hence, focusing on competing logics, Lounsbury (2007, p. 302) highlighted how the spread of new practices can be shaped by multiple forms or modes of understanding suggesting that "*by conceptualizing organizational environments as multiple and fragmented, researchers can generate new insights about sources of resistance as well as about organizational and practice variety.*"

Thus, the literature suggests variations in practice can be a result of either institutional contradictions (i.e. conflicts and tensions between technical and institutional understanding), or existence of multiple logics informing the consciousness of the organization members. While the practice variations between the imposed practice and actual practice within firms for FPH and Coloplast are discussed in Chapters 4 and 5 respectively, the next section includes a cross-case analysis to identify variations in the use of open innovation practices between the two firms and discusses the possible reasons for these variations in light of the suggestions from the literature.

6.3. CASE COMPARISONS

Following suggestions from Eisenhardt (1989) and Patton (2002), the case comparison involved looking for patterns that were similar and different across the two firms, FPH and Coloplast. Using the Nvivo nodes and the narrative descriptions of the individual cases, the elements outlined in Table 6-1 were identified. These are discussed in more detail in the next two sub-sections.

Elements	Similarities (Parallels)	Differences (Variations)
Industry	✓ Both firms were operating in the medical devices (MedTech) industry.	Their product lines differed as Coloplast was dealing with ostomy, urology, continence, and wound care while FPH was dealing with respiratory, acute care, and obstructive sleep apnea.
Size	✓ Both firms were considered large firms in their respective contexts.	Coloplast was 4.6[52] times larger than FPH in terms of revenue.
Type of company	✓ Both companies were profit-oriented and publicly listed.	Coloplast was listed on the Copenhagen Stock Exchange while FPH was listed on the New Zealand Stock Exchange and the Australian Stock Exchange.
Emphasis on R&D	✓ Both companies viewed R&D as an essential part of their growth strategies.	Coloplast spent 4.3% of its revenue on R&D while FPH spent 7%.
Use of Formalized MCS	✓ Both companies used all 4 levers of controls to manage their innovation function. In particular, both companies used their belief systems to guide organization members' behaviour in relation to interactions with end-users. Also, both companies valued IP ownership and hence, they both used boundary systems to protect sensitive information and enable the attainment of IP for their products. Furthermore, both companies used diagnostic systems to ensure projects stayed on track and that the regulatory requirements were met. Furthermore, they used interactive control systems to deal with strategic uncertainties such as technological and market changes.	Compared to FPH, Coloplast used a larger variety of formalized MCS and had specific formalized MCS to enable and support open innovation practices.
Use of Open innovation Practices	After initial resistance from the Coloplast organization members, at the time of this research, both companies' organization members agreed that they could benefit from the use of open innovation practices.	✓ FPH's project level organization members frequently used open innovation practices. However, at Coloplast, the use of open innovation practices was minimal.
✓ = Similar with only minor differences. ✓ = Significant difference.		

Table 6-1: Case Comparisons (FPH vs. Coloplast)

52Operating revenue of Coloplast is NZ$2,303m and operating revenue of FPH is NZ$503m.

6.3.1. PARALLELS

Firstly, as stated earlier, both companies were operating in the same industry even though their product lines were different. At the time of this research, Coloplast was dealing with ostomy, urology, continence, and wound care products while FPH was dealing with respiratory, acute care, and obstructive sleep apnea products. However, both these product lines fell under the medical devices (MedTech) industry and they were subject to the same regulations such as the FDA regulations, medical devices directives, quality system regulations, and good manufacturing practice regulations.

Secondly, both companies were considered large firms in their respective contexts. For instance, as described in section 5.2.4, Coloplast was in the top 5% of the MedTech companies in Denmark (Medicoindustrien, 2008) with operating revenue of NZ$2,303 million (Coloplast, 2010) and employing over 7000 people (Coloplast, 2011) . This was about four times larger than FPH, which had operating revenue of NZ$503 million (FPH, 2010a) and employed 1,900 people (FPH, 2011). However, as described in section 4.4.1, FPH was the largest player in the New Zealand medical technologies sector and was recognized as a large company by local vendors.

Thirdly, both companies were profit-oriented and publicly listed and so were subject to their respective stock market regulations. Coloplast was listed on the Copenhagen Stock Exchange in Denmark while FPH was listed on both the New Zealand Stock Exchange and the Australian Stock Exchange.

Furthermore, both companies placed a great deal of emphasis on R&D and viewed it as an essential part of their growth strategies. For instance, an extract on FPH’s website describing its R&D endeavours read:

"*We believe that product development and clinical research is critical to our success. We continue to expand the range of innovative medical devices that we provide to assist clinicians to improve patient care and outcomes. New and improved products and processes, along with the development of new medical applications for our technologies, are critical drivers for our annual revenue and earnings growth.*"

Similarly, Coloplast's website included a letter from the CEO which read: "*Our competitive strength and growth opportunities rely not only on the company's profitability, but equally on our innovative skills*". Hence, both FPH and Coloplast spent a significant portion of their revenue on R&D. To illustrate, in 2010 FPH spent 7% of its revenue on R&D, equating to NZ$35 million while Coloplast spent 4.3% of its revenue, equating to NZ$99 million. With increases in revenue over the years, both firms also consistently increased their R&D expenditures as shown in Figures 4-1 and 5-2.

Moreover, as summarized in Tables 4-1 and 5-1, both companies used all four levers of control to manage their innovation functions. For instance, both companies used belief systems to guide organization members' behaviour in relation to interactions with end-users. While FPH's belief system was in the form of a values statement, Coloplast used a combination of the mission statement, vision statement, and values statement to communicate the top management's expectations of the organization members' behaviour. Also, as described in section 4.4.2 and 5.3.2.3, both companies valued IP ownership and one of top management's key concerns was the protection of sensitive information. Consequently, they both used boundary systems in the form of rules on IP ownership and non-disclosure agreements to protect sensitive information, as well as to attain IP for their products. Loss of sensitive information could have resulted in a competitor capitalizing on the information by releasing the product to the market or obtaining a patent ahead of FPH or Coloplast. In that case, the company would have lost market share and due to an existing patent, their patent application may have been declined.

Furthermore, maintaining a high quality of products and services was also essential for both firms. Because they were dealing with medical devices, both firms were obliged to meet a number of regulatory and industry requirements to be able to continue trading. Therefore, both firms had stringent design and testing controls to ensure the regulations were complied with at all times. They also used other diagnostic control systems such as project reviews and structured innovation processes with decision gates to ensure projects were on track to be completed on time and within budget. Finally, both companies used interactive control systems to deal with strategic uncertainties.

Thus, both companies used formalized MCS to manage their innovation function despite the difference in the variety of forms of MCS used. For instance, as summarized in Table 4-1, FPH had three distinct diagnostic control systems while Coloplast as shown in Table 5-1, had five distinct diagnostic control systems. Similarly, FPH used the business planning process as an interactive control system to deal with strategic uncertainties while Coloplast used the roadmap and technology foresight database along with the information generated from the STOMA website.

Despite the above parallels, as mentioned earlier the two companies differed greatly in relation to the use of open innovation practices. While the organization members at the top management level as well as the project level for both firms did not dispute the concept that one could learn and benefit from outsiders, how they executed this idea in their day-to-day activities differed immensely. These differences and the perspectives of the different levels of organization members on the use of external collaborations have been summarized in Table 6-2 and are discussed in the next sub-section.

	Fisher & Paykel Healthcare	Coloplast
Change to formalized open innovation process	No	Yes
Use of open innovation practices at the consumer end of value chain	Integrated part of innovation process.	Increasingly sought input but the input was not directly incorporated into innovation projects.
Use of open innovation practices at the supplier end of value chain	Frequent non-pecuniary collaborations with local firms.	Very limited collaborations
Top management's perspective on use of open innovation practices	Preferred to keep R&D activities in-house as it reduced the risks associated with new product introductions.	With appropriate measures, the firm could benefit from the external knowledge and it could help reduce time to market.
Project level organization members' perspective on open innovation	Collaborating with small local vendors who had the expertise saved time and as the vendors had commercial motivation to help FPH (as discussed in Chapter 4) the project level organization members viewed the level of risks associated with inter-firm relationships to be minimal.	The risks associated with external collaborations were extremely high and the belief was that it took less time and effort to develop products internally rather than going through the process of reducing the risks to enable external collaborations.

Table 6-2: Differences in relation to use of open innovation practices

6.3.2. VARIATIONS

As described in Chapter 5, Coloplast's top management had formalized the open innovation process to encourage and support the use of open innovation practices. At the time of this research, the term 'open innovation' was widely used by top management in communications with organization members and also featured in the company's annual reports and investor presentations.

Moreover, Coloplast's top management formally addressed the challenges of open innovation identified by previous studies (Chesbrough & Crowther, 2006; van de Vrande et al., 2009; West & Gallagher, 2006). That is, top management put in place mechanisms and processes to try and address issues with searches for external partners, issues with management of inter-firm relationships, and issues pertaining to organizational members' concerns about external collaborations. For instance, as discussed in section 5.3, they centralized the search process by establishing a technology scouting group with the expertise to find appropriate external partners. They also set up the 'meet the end-user' programme and the STOMA website to facilitate organization member interactions with end-users. Furthermore, they set up the 'employee catalogue' and the 'specialist academy' to encourage organization members to collaborate with people they usually did not work with and so helped them overcome the fear of collaborating with external partners.

As explained by the interviewees, the top management's logic behind taking this path was that the use of open innovation practices would be beneficial for the firm as per the consultant's recommendations. However, they recognized the challenges of using open innovation practices and believed that with the appropriate rules and processes in place, they could manage the challenges and allow the organization members to leverage from the expertise of external parties.

However, these changes did not yield the expected results in terms of an increase in the use of external collaborations. In other words, the changes made by top management did not greatly alter the day-to-day routines of the project level organization members. This stability in the routines was attributed to the organization members' continued discomfort about collaborating with external partners due to their perception that risks associated with external collaborations were extremely high. They believed internal R&D was more effective and efficient considering the amount of effort and time required to manage the risks of inter-firm relationships even before any project related activities could be undertaken. Hence, there was a significant difference in the perspectives of Coloplast's top management and that of the project level organization members. As a consequence, the routines of Coloplast's project level organization members did not reflect the formalized open innovation process that Coloplast's top management had implemented.

On the other hand, FPH did not go through a similar route to formalize the open innovation process. As described in section 4.4.2 and 4.4.3, the top management's thinking behind this approach was that external collaborations involved high risks. Therefore, they preferred to keep R&D activities inside the firm as they believed this would reduce risks associated with new product development. Consequently, they abstained from implementing a formalized open innovation process. Instead, they had strict rules around IP and confidentiality issues, which addressed the perceived risks. However, the use of open innovation practices at FPH was evident at both the end-user and supplier end of the value chain (as described in Chapter 4). This was because, contrary to the views of FPH's top management as well as Coloplast organization members, FPH's project level organization members' view was that the risks associated with external collaborations when they were dealing with local vendors and hospitals in New Zealand was minimal and allowed them to leverage their expertise and speed up their projects' development times. Hence, they repeatedly collaborated with local vendors and medical professionals, which resulted in interactions with these external parties becoming part of FPH's project level organization members' everyday routines.

In summary, these were two similar firms but their use of open innovation practices varied greatly. The next sub-section discusses the possible reason for the variation.

6.3.3. REASON FOR VARIATION

As discussed above, literature suggests that practice variations could be a result of either institutional contradictions (Dillard et al., 2004; Hopper & Major, 2007) or the existence of multiple logics informing the consciousness of the organization members (Inês et al., 2009; Lounsbury, 2007, 2008). It is inferred in this study that as both companies were operating in the same industry and the majority of their sales were in the same market, that is, Europe and US, they were subject to the same industry regulations and, so they were faced with the same legitimacy pressures. Therefore, as suggested by Lounsbury (2007), the variation in practice following the change in the field could be explained by analysing the logic behind the actions of the organization members. In other words, the variation in the use of open innovation practices at the two companies was related to intra-organizational perspectives and varying logics of organization members.

For instance, the logic of project level organization members at FPH was that collaborations with local vendors were effective. They held this view because they could leverage their expertise at minimal risk and cost as opposed to going through the process of acquiring the knowledge internally from scratch before applying it to the innovation projects. This logic was reflected in their routine practice of collaborating with local vendors. On the other hand, Coloplast organization members' logic was that in-house R&D was more effective because external collaborations were very risky and the process of eliminating this risk increased their development time: hindering their performance, which was measured in terms of time to market. This logic was reflected in the routines of Coloplast's organization members, which were dominated by the continued use of in-house R&D activities. The different logics of the organization members in the two companies were reflected in their actions, which in turn shaped the varying routines of the two companies.

The organization members from both companies explained that the logic behind their actions in relation to open innovation practices was influenced by the location of the firms and their perceptions about their ability to trust the external parties they were dealing with. These two factors are discussed in the following two sub-sections.

6.3.3.1. LOCATION

As discussed in Chapter 4 (sub-section 4.4.3), FPH was located in New Zealand where it was the biggest MedTech firm in the country, with no direct competitors. Therefore, the organization members' view was that the small local vendors had an incentive to work ethically with FPH organization members and gain their trust as they may land some lucrative supply contracts. Similarly, as there were no direct competitors in New Zealand, the organization members believed the risk of a medical professional or an end-user leaking valuable information relating to FPH innovation projects to a competing firm was relatively low.

On the other hand, as described in Chapter 5 (sub-section 5.2.4), Coloplast's situation was the complete opposite. It was surrounded by firms who were competing with them in the same industry and had similar product lines. This had resulted in the organization members perceiving the risk of losing sensitive information to competitors as very high. They perceived their ability to trust external parties as very low; hence, they protected themselves by avoiding external collaborations.

Therefore, the evidence from these two case studies suggests that a firm's level of use of open innovation practices could be dependent on its project level organization members' ability to trust the possible external partners, which in turn is influenced by the physical location and competitive environment of the firm. Where there was high competition and external parties did not have an incentive to tie themselves to one large organization, the project level organization members' ability to trust the external partners was low; and hence the use of open innovation practices was limited. However, where there were few competitors and external partners had commercial motivation to help the larger organization, the project level organization members' ability to trust the external partners was higher, and consequently their use of open innovation practices was more frequent. This concept of trust is discussed further in the next sub-section.

6.3.3.2. TRUST

In recent years, following the proliferation of inter-firm relationship studies (see Caglio & Ditillo, 2008; van der Meer-Kooistra & Vosselman, 2006 for a review of the extant literature) the concept of trust is increasingly becoming popular among management accounting researchers. These studies have examined trust as a key control mechanism and have argued that by establishing trust firms can reduce governance costs, encourage inter-organizational activities and increase performance of partner organizations (Dekker, 2003; Langfield-Smith & Smith, 2003; van der Meer-Kooistra & Vosselman, 2000). However, as summed up by Berry et al. (2009), these studies show the complex nature of the relationship between trust and control. For instance, some studies have examined trust as an alternative to control (Dekker, 2003) whereas others argue that the existence of effective control systems can help build trust (Seal et al., 1999). Moreover, some researchers have suggested that control structures and practices may themselves be objects of trust (Mouritsen & Thrane, 2006) while another group argues that trust may be a necessary condition for the adoption of some control practices, such as open-book accounting (R. Cooper & Slagmulder, 2004). However, what these studies have in common is that they have generally looked at trust from the perspectives of top management or decision makers who design and implement the formalized MCS. The evidence from FPH and Coloplast showed that the perspectives of top management and project level organization members in regard to the level of trust can differ significantly. The findings from these cases showed that it was the project level organization members' ability to trust the organization members of external partners they worked with on particular projects that influenced their decisions about the use of open innovation practices. Therefore, this study argues that although it may be important to examine top management's perspective on the level of trust when analysing the design or reasons for implementation of formalized MCS, when analysing the level of trust and its impact in relation to operational activities, the research needs to focus on the perspectives of project level organization members. This is because where there is a difference in perspectives; the formalized MCS are likely to be decoupled from the firms' routines. This could be a useful insight for researchers designing studies to examine micro-processes and operational activities such as innovation projects.

In addition, this study also recognizes that the level of trust is not static. It can change over time as organization members move past the hurdle of deciding to collaborate with a selected partner. For instance, Langfield-Smith (2008) found that activities leading up to the alliance and during the alliance led to an increase in goodwill trust and reduced managers' perceptions of both relational and performance risk (Das & Teng, 1998, 2001). Therefore, one would deduce that as the organization members' perception of trust changes it would influence their behaviour, making them more comfortable to further collaborate with external parties. This point was highlighted by the project leaders at FPH who suggested they were more likely to select an external partner they had worked with before and trusted the organization members of that partner rather than an external partner they had never worked with, even though they may have had slightly more expertise to offer. To understand the impact of the changes in organization members' perceptions of trust, the next case study (described in Chapter 7) examined the development of an established collaborative relationship over time and analysed the changes in organization members' behaviour as the perception of trust changed.

The next section summarizes the findings of the cross-case analysis and discusses the findings with reference to the underlying research question and the extended theoretical framework.

6.4. DISCUSSION

The evidence from the cross-case analysis shows that the variation in the practices of the two companies in their use of open innovation practices can be explained by the differences in the logics behind the actions of the project level organization members. This is consistent with the findings of Lounsbury (2007) where variations in the practices of mutual funds were explained by the existence of competing logics. In addition, the above evidence shows that the underlying reason for the difference in logics of organization members in the two companies in the use of open innovation practices are influenced by the companies' location and the project level organization members' ability to trust external partners. The next sub-section discusses these findings in relation to the underlying research question for this thesis.

6.4.1. INFLUENCE OF FORMALIZED MCS

The underlying research question for this thesis is: *can formalized MCS influence the use of open innovation practices in a firm?* The individual case analysis of FPH as documented in Chapter 4 showed that even though top management did not formalize the open innovation process and hence, formalized MCS were not specifically changed to enable and support open innovation practices, the existing formalized MCS were instrumental in enabling and shaping the project level organization members' routine use of open innovation practices. In other words, these formalized MCS created a culture among the organization members that valued the importance of knowledge outside the firm and in which members felt comfortable collaborating with external partners where they perceived low risk of misappropriation on the basis of trust and mutual understanding. Moreover, the formalized MCS created a boundary regulating the selection of appropriate partners to protect the firm from operational threats and complexities. Hence, in FPH the formalized MCS enabled the project level organization members to effectively use open innovation practices by creating a balance of flexibility and constraint on the activities of the project level organization members.

Conversely, the individual case analysis of Coloplast, as documented in Chapter 5, showed that top management formalized the open innovation process by implementing specific formalized MCS to enable and support the use of open innovation practices. They did this by firstly showing the organization members the incentives of collaboration, and secondly by building the information infrastructure to reduce uncertainty and manage the risks of inter-firm relationships. However, these formalized MCS did not lead to a significant change in the routines of the project level organization members, who continued to use in-house R&D activities.

Hence, the influence of formalized MCS in the two companies was significantly different. The cross-case analysis of these two companies showed that this variation can also be explained by the difference in the logics and perspectives of the project level organization members of the two companies regarding the use of open innovation practices. The cross-case analysis showed that the influence of formalized MCS on the use of open innovation practices in a firm was not based on the design or implementation of the formalized MCS. Instead, it was contingent on the firm's project level organization members' perspectives on their ability to use open innovation practices. For instance, in FPH despite the formalized MCS not having been specifically designed and implemented to enable and support open innovation practices, the project level organization members' believed that the risk of collaboration was low enough to allow them to effectively leverage the knowledge of local vendors. Therefore, they were using the existing formalized MCS, for example, design control tests and formal project reviews that were consistent with their perspectives, to effectively manage their collaborative innovation projects. Where the formalized MCS were not consistent with their perspectives, the formalized MCS, for example, the rules around IP ownership, were by-passed (as described in section 4.4.3).

On the other hand, in Coloplast, even though the formalized MCS had been specifically designed and implemented to enable and support open innovation practices, the project level organization members did not utilize these formalized MCS (such as the expertise of the technology scouting group and the STOMA website) because they believed the risk associated with collaboration was so high that it was easier to keep the R&D activities in-house.

Hence, the findings of the cross-case analysis suggested that the logics of organization members, which were influenced by their location and their ability to trust the external partners they were dealing with, were reflected in their actions, which in turn shaped their routines. As the project level organization members of FPH and Coloplast had competing logics in relation to external collaborations, their use of open innovation practices varied, with the two companies sitting at opposite ends of the open innovation spectrum. Therefore, the influence of the formalized MCS that was in line with the top management's expectations was limited to situations where the formalized MCS were consistent with the perspectives of the project level organization members. The next sub-section discusses these findings with reference to the extended theoretical framework.

6.4.2. EXTENDED THEORETICAL FRAMEWORK

The evidence from the two case studies supports the assumptions of the extended theoretical framework that the perspectives of top management are reflected in their actions, which influence the formalized MCS; while the perspectives of the project level organization members that differ from top management's views are reflected in their actions, which leads to routines being decoupled from formalized MCS. Thus, to be able to identify and analyse the difference in perspectives, it is essential to separate the formalized rules from the routines of project level organization members (Sawabe & Ushio, 2009), in particular the routines that are decoupled from the formalized MCS. Using this approach, this study found that the use of open innovation practices in the two firms was dependent on the logics or the perspectives of the project level organization members which were reflected in their actions.

The evidence from the case studies showed that while the top management's perspectives reflected in the formalized MCS had some influence over the actions of the organization members, there was no significant change in organizational routines. For example, FPH's strict rules on IP led to a more restricted use of open innovation practices, while Coloplast's execution of formalized MCS resulted in more interactions between end-users and Coloplast's project level organization members. However, it did not stop FPH organization members from collaborating with local vendors nor did the Coloplast organization members' use of external collaborations increase significantly. This was because the project level organization members continued to practice what they believed was most effective, which resulted in organizational routines that were decoupled from the formalized MCS.

Accordingly, if this study had not separated formalized rules and routines, the decoupling of the routines from the formalized MCS may not have been identified. In other words, if formalized rules had been grouped together with routines, the completeness of the analysis for this study would have been compromised. Instead, separating the formalized rules from the routines of project level organization members enabled this study to focus on the reasons behind the existence of routines that were decoupled from the formalized rules, which helped identify the different logics and perspectives of organization members. This in turn explained the variation in the practices of the two firms. The next section concludes the discussions in this chapter.

6.5. CONCLUSION

This chapter has discussed and analysed the variations in the use of open innovation practices at FPH and Coloplast. The case discussions in Chapters 4 and 5 suggest that the formalized rules and routines in the two companies were decoupled, which can be explained by the difference in perspectives of two dominant groups of individuals in the firms: the top management and the project level organization members. These perspectives were reflected in each group's actions, which can be traced to the formalized MCS and routines of the firm as assumed by the extended theoretical framework presented in Chapter 3. Therefore, by applying the extended framework, this study was able to identify some reasons for the decoupling between the formalized MCS and routines, which helped explain the reason for the variation in the use of open innovation practices at the two companies. More specifically, a cross-case analysis suggested that the key reason for the variation was related to the project level organization members' ability to trust the possible external partners which in turn was influenced by the physical location and competitive environment of the firm.

Based on these findings, it can be seen that the physical location and environment of a firm's operations is an important aspect for practitioners as well as researchers to consider when analysing firms' operations and changes to formalized MCS. This has particular relevance as globalization increases and more firms are choosing to set up operations in low-cost economies. While cost may be an important factor, other aspects such as the firm's ability to be able to collaborate with external parties are also relevant, especially as emphasis on innovation grows and a firm's ability to effectively compete in the market place becomes increasingly contingent on its ability to deliver new products to the market in short time periods.

Finally, this chapter also touched on the changing nature of trust as a collaborative relationship develops over time, which is discussed in more detail in the next chapter where the third case study, Zespri is discussed.

CHAPTER 7. CASE STUDY 3

7.1. INTRODUCTION

"At the end of the day a piece of paper is worthless but there are a bunch of principles and a bunch of formality that we can fall back on about how we can work together."

-Zespri's Innovation Manager-

The purpose of this chapter is to describe and analyse the third case study, Zespri. This case is different from the previous two case studies described in Chapters 4 and 5, as Zespri's innovation function had been formally designed to seek and incorporate external knowledge into its innovation process. This function was extensively used by the organization members across their entire innovation portfolios. In particular, the firm had built collaborative relationships with research partners that enabled it to innovate effectively with a very small internal R&D team. As defined by Whipple, Lynch and Nyaga (2010, p. 507), a collaborative relationship is "*a long-term relationship where participants generally cooperate, share information and work together to plan and even modify their business practices to improve joint performance*". In other words, Zespri had formed a number of collaborative relationships[53] with external partners with a substantial level of commingling between partners, who pooled resources and capabilities together (Madhok & Tallman, 1998) to achieve the innovation objectives of Zespri and the kiwifruit industry as a whole.

It is also worth noting that unlike Fisher & Paykel Healthcare (Chapter 4) and Coloplast (Chapter 5), Zespri did not operate in the manufacturing and health care devices industry. Instead, it was a marketing company that was part of a primary sector industry which had a unique governance structure. Therefore, this study demonstrates the applicability of the open

[53]Some of these relationships are discussed later in this chapter e.g. Zespri's relationship with Plant and Food Research as well as Zespri's relationship with Fonterra.

innovation concept in this setting. It also shows how the unique industry structure promoted unity in relation to R&D among the different sectors involved across the New Zealand kiwifruit supply chain and how it had enticed Zespri to seek input from external parties.

However, the core aim of this case study is to understand whether the formalized MCS influenced the use of open innovation practices at Zespri. Moreover, this case study builds on the findings of the previous two case studies to understand how the organization members' perceived level of trust changed over time as a collaborative relationship developed. Hence, this chapter documents the results of the retrospective analysis used to examine the development of one of Zespri's collaborative relationships and to understand the changes as well as the impact of the changes on the routines of the organization members and their use of formalized MCS.

According to Langfield-Smith (2008), an increase in organization members' perceived level of trust does not lead to a change in the use of formalized MCS. Langfield-Smith (2008) found that retaining the commitment of the external party's staff was a continual challenge as staff were looking ahead to the end of their time on the project and were thinking and planning for their next job. Therefore, the need for the use of MCS remained consistent throughout the lifecycle (Das & Teng, 2002) of the inter-firm relationship. However, the difference between this case study and Langfield-Smith's (2008) is that she was studying a fixed term inter-firm relationship that was transactional[54] in nature, whereas the current study looks at a collaborative on-going inter-firm relationship, which is at the other end of the spectrum, with no specified end-date. The marketing literature that puts these two types of inter-firm relationships at opposite ends of a classification continuum (Ganesan, 1994; Heide & John, 1990; Kalwani & Narayandas, 1995; Noordewier et al., 1990; Whipple et al., 2010) suggests

[54]A transactional relationship is defined as "*an agreement where participants conduct business for a specific time period according to terms generally outlined in a standard contract*" (Whipple et al., 2010, p. 507).

that the relationship antecedents are significantly higher for collaborative relationships than for transactional relationships, indicating that collaborative relationships are managed differently from transactional relationships. For example, there is a higher level of commitment, higher trust, more dedicated resources, greater sharing of rewards and costs, and higher communication and information sharing (Whipple, et al., 2010). Therefore, it could be argued that the use of formalized MCS for the two types of inter-firm relationships would be different. However, management accounting literature has been skewed by fixed term inter-firm relationships that are transactional in nature (Caglio & Ditillo, 2008; Langfield-Smith, 2008; van der Meer-Kooistra & Vosselman, 2006), even though in practice collaborative relationships, especially for innovation purposes, are increasing in popularity (Chesbrough et al., 2006; Gassmann et al., 2010; Teece, 2007). Therefore, this case study aims to contribute to this literature by examining whether the influence of formalized MCS changes as a collaborative relationship develops over time and the organization members' perceived level of trust changes.

This chapter is structured as follows. It begins with a description of Zespri and the kiwifruit industry in New Zealand, including its history, which led to Zespri's innovation model (based on the open innovation concept), which existed at the time of this research. Next, the chapter discusses one of Zespri's key research areas, that is, development of new cultivars, as an illustrative example of Zespri's innovation process. It also includes a detailed description of a collaborative relationship with a key research partner, illustrating the role this external partner played in Zespri's endeavours to develop new cultivars, and how Zespri managed this inter-firm relationship. This is followed by a discussion on the changes observed over the life of the collaborative relationship and the influence of formalized MCS on these changes.

7.2. COMPANY DESCRIPTION

Zespri® Group Limited (Zespri) is a New Zealand company based in Mt Maunganui, which established the Zespri® brand. This brand sets the benchmark for guaranteed excellence and delicious kiwifruit. At the time of this research, Zespri was the world's largest marketer of kiwifruit, selling it in more than 60 countries and managing 30% of the global volume of kiwifruit traded.

The company was governed by the Kiwifruit Industry Restructuring Act 1999, which acted as a boundary control (Simons, 1995). It defined the scope of activities that Zespri was allowed to undertake and specified what they could not do. For example, Zespri was limited to only dealing with kiwifruit. It could not market any other fruit, for example, apples or avocados, even though they were distributed through the same pack-houses. Hence, Zespri had a specified function. It did marketing, distribution management, innovation and supply chain management for kiwifruit. It did not deal with any other fruit, nor did it grow, pack, transport, or distribute kiwifruit. The reason for this approach is embedded in the history of the kiwifruit industry, as described in the next sub-section.

7.2.1. HISTORY OF KIWIFRUIT INDUSTRY[55]

The history of Zespri is intertwined with the history of the kiwifruit industry in New Zealand which goes back to the early 1900s. As explained on the Zespri website, the story of kiwifruit in New Zealand began in 1904 when a Wanganui teacher, Isabel Fraser, came back from a trip to China with some kiwifruit seeds, which at that time were referred to as 'Yang Tao' or the 'Chinese gooseberry'. These seeds were sprouted by horticulturist Alexander Allison, which started the tradition of growing kiwifruit in New Zealand.

[55]Information for this section was obtained from the Zespri (Zespri, 2011) and PFR websites (PFR, 2011) combined with archival articles from the New Zealand Kiwifruit Journals dating from January 2000 to April 2010).

In 1928, Hayward Wright developed a new variety of kiwifruit, the 'Hayward kiwifruit', later named Zespri® Green, which has since been grown and exported all over the world forming a large part of the kiwifruit industry in New Zealand. Kiwifruit exports began in 1952 when the first shipment of kiwifruits was sent to England. The industry expanded rapidly, with many orchards being established around the country. The growers banded together to pack and export their fruit overseas but they competed against each other for markets.

In the 1970s, the Kiwifruit Marketing Licensing Authority was formed to provide growers with control over their industry structure and regulate the activities of the exporters. This structure enabled grade standards to be established and allowed the industry to take a coordinated approach to marketing. However, in the mid-to-late 1980s, the New Zealand kiwifruit industry was faced with a crisis as there was more supply in the market than global demand. The New Zealand dollar was rising and interest rates were high. In the markets, the price of kiwifruit fell to an all-time low. Consequently, growers faced financial hardships and with multiple exporters competing against each other, the price and grower returns were driven down further.

In 1988, the Government intervened and established the New Zealand Marketing Board as a single desk exporter under grower control. This gave the industry unity and strength. However, in 1992, the industry faced another enormous challenge as New Zealand kiwifruit had to pay millions of dollars for an anti-dumping case brought by Californian growers. This was followed by a price crash in the oversupplied European markets and the result was a financial disaster for the industry, which led to a significant number of growers quitting the industry.

In 1993, a complete review of the industry was undertaken. As the industry began to rebuild, a marketing driven strategy, which involved building on the reputation of delivering the world's best kiwifruit, was at the forefront of the change. Moreover, the continuity of a single export entity was endorsed by growers across New Zealand.

Hence, in 1997 Zespri was formed as a global marketing organization providing a single point of entry for the export of New Zealand-grown kiwifruit. The Government passed the Kiwifruit Industry Restructuring Act 1999 to establish a statutory framework for governance and regulatory oversight of Zespri's operations by Kiwifruit New Zealand, to ensure the New Zealand kiwifruit industry continued to lead the world in kiwifruit innovation, production, and supply. As one of the Innovation Leaders suggested, "*the government stepped in because there were only ashes left and it said we need to fix this problem*".

The Kiwifruit Industry Restructuring Act 1999 brought into effect corporatization as part of the restructuring plan, which was overwhelmingly supported by the growers (Zespri, 2001). As a result in 2000, Zespri Group Limited was formed as a public company[56] in which eligible kiwifruit growers were issued shares based on their production volumes. Zespri International Ltd became its major operating subsidiary. In this process the Zespri® kiwifruit brand was born with a commitment to grow and sell the best kiwifruit. As explained by one of Zespri's executives:

> "*Zespri is a strange company. It is owned by growers. So, the front end of the supply chain, the place where the fruit comes from is Zespri as well. We are almost one would say the same. We are their marketing company and we exist because they want us to exist. They can crush us very quickly too. In the middle there is a competitive post-harvest sector. Growers pass their fruit to a service provider to pack it and deliver to Zespri's specification at the wharf.*"

[56] However, Zespri shares can only be owned by current or former New Zealand kiwifruit growers.

In other words, as shown in Figure 7-1, the New Zealand kiwifruit industry for kiwifruit exports included three parts: the growers (that controlled the front end of the supply chain), the post-harvest sector (that controlled the transportation and distribution parts of the supply chain), and Zespri (which was the marketing team collectively owned by the growers).

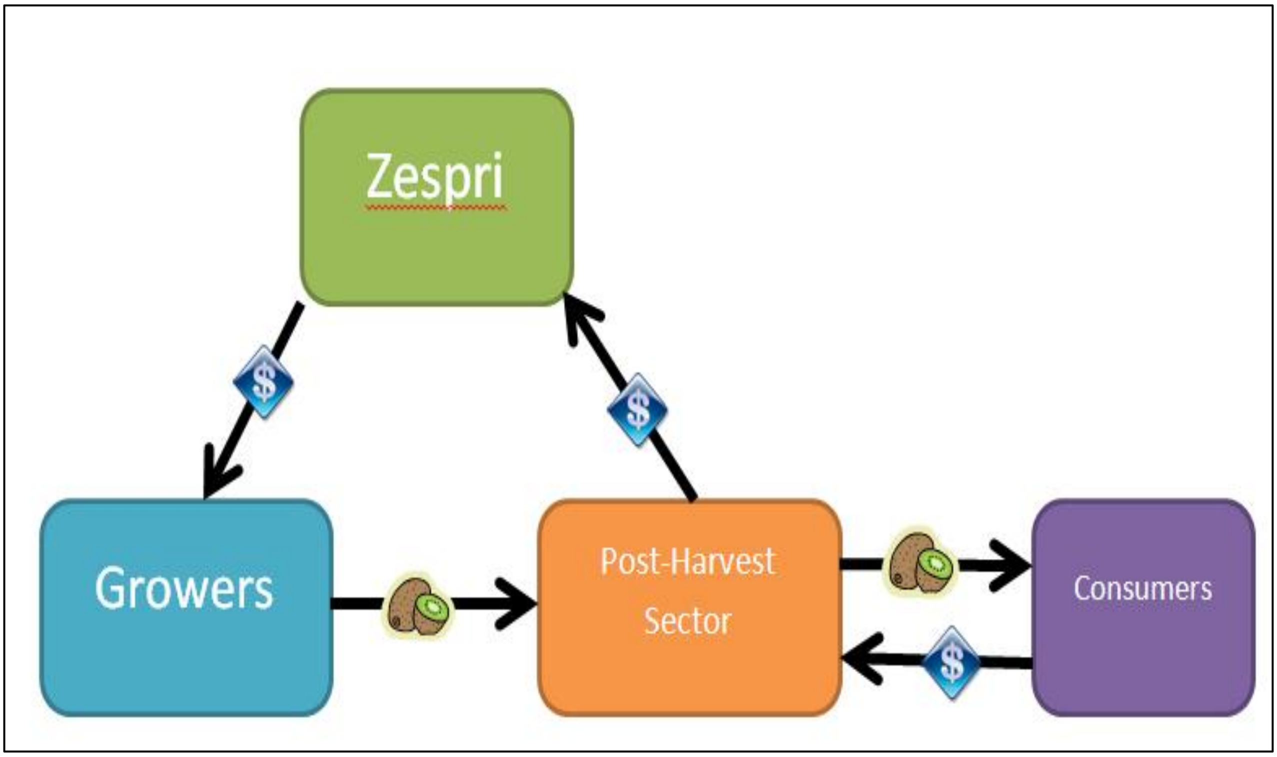

Figure 7-1: Kiwifruit industry structure

As explained by the Innovation Manager, this setup helped define clear roles in the industry and encouraged the different sectors to work together to promote activities that yielded good results for the industry, as opposed to favouring a single sector. In the Innovation Manager's words, it was "*national level optimization versus company level optimization.*" The interdependence created by this setup meant improvements in one sector had a positive impact on the other sectors. Hence, Zespri's innovation portfolios covered R&D for all the different structural functions. This is discussed in more detail in the next sub-section.

At the time of this research, Zespri continued to operate under a co-operative structure whereby over 3000 current and past growers were the shareholders and their representatives were the members of the Board that ran the company. The company employed around 250 people, with about 150 based in New Zealand, around 50 based in Europe, and another 50 spread throughout Asia. In 2010, Zespri exported three categories of kiwifruit: Zespri® Green, which included the Classic green kiwifruit (previously known as the Hayward variety) and sweet green varieties; the Zespri® Gold, which included the Classic Gold and the Sungold varieties; and the Zespri® Organic kiwifruit variety.

The success of Zespri was heavily reliant on its kiwifruit growers and, as stated on the Zespri website, "*one of Zespri's most significant achievements has been to find a way to bring you delicious top quality Zespri® kiwifruit all year round by forming partnerships with experienced growers around the world*." At the time of this research, Zespri had over 2,700 growers in New Zealand, over 150 in Italy, over 800 in Japan, 130 in Korea and around 50 in France, Chile, and the United States (Zespri website). For the 2010 financial year, Zespri sold 108.3million trays of kiwifruit, earning $NZ1.5 billion in global sales (Zespri, 2010a). As shown in Figure 7-2, global sales for Zespri kiwifruit had increased gradually over the 10 years from 2001 to 2010 and the company aspired to double in size in the next 15 years (Zespri, 2010c).

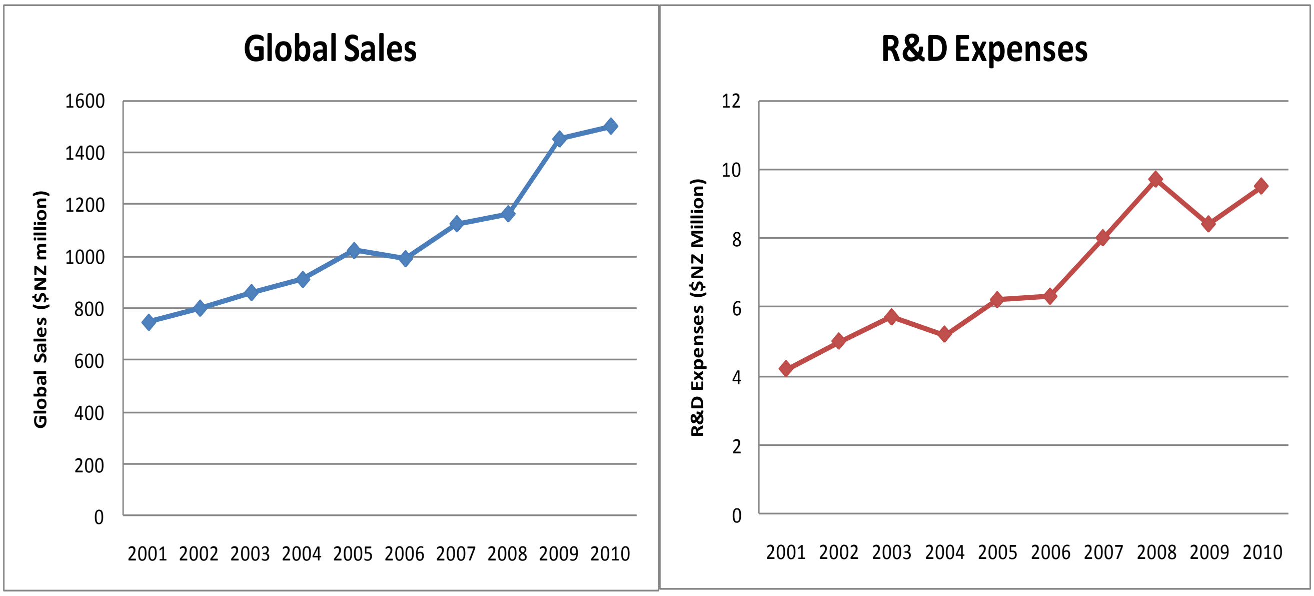

Figure 7-2: Zespri's global sales and R&D expenditure from 2001 to 2010[57]

7.2.2. STRATEGY AND INNOVATION FUNCTION

Zespri's vision was to be "*the acknowledged world leader in kiwifruit by providing unrivalled excellence in brand-based consumer focus, customer relationships and innovation, underpinned by cost-effective global sourcing of superior fruit.*" According to Zespri's Head of Innovation, "*Zespri has achieved almost everything in that vision. We are the world's top kiwifruit brand, like 15 times bigger than our next best competitor.*"

Although all of Zespri's functions, that is, marketing, distribution management, innovation and supply chain management, were deemed important for the operations of the firm, innovation was seen as one of the cornerstones for Zespri's success and the key driver for future growth. Innovation at Zespri included the following research areas:

- Developing new varieties
- Developing new ways to use kiwifruit's great taste and health benefits
- Finding new markets and customers

[57]Data obtained from the annual financial statements from 2001 to 2010.

- Using quality assurance processes
- Improving orchard management
- Improving environmental growing methods

As explained by the Innovation Leaders, because of the unique industry structure, successful innovation outcomes in any one of these areas directly or indirectly resulted in an increase in sales and market share, which benefited everyone in the industry. Firstly, growers gained as they were able to sell more of their produce at appropriate prices, leading to an increase in individual growers' incomes. Secondly, the post-harvest sector benefited, as the quantity of fruits being distributed increased, resulting in higher income for pack-houses, transportation suppliers, and distributors. Finally, Zespri gained as it got a percentage of the increased sales. In other words, improvements at any stage of the kiwifruit supply chain had positive impacts for everyone in the industry. Therefore, the Innovation Leaders explained that even though the majority[58] of the innovation activities, as discussed in the next section were managed and largely funded through Zespri, most of its innovation projects had an 'industry good' focus.

7.3. OPEN INNOVATION MODEL

At the time of this research, the innovation function was part of Zespri's main operations. However, about seven years ago the innovation function was operated as a separate company[59], Zespri Innovation Company Ltd. This company was established in 2000 to support innovation and the long-term sustainability of Zespri's kiwifruit supply chain. The company's primary responsibility was to build knowledge and capacity of on-going industry development

[58]While innovation in the growers sector is managed extensively through Zespri, the post-harvest sector which comprised about 13 entities had some competitive rivalry among the firms. Hence, to differentiate their services they invested in their own innovation activities to develop patented processes that gave them an edge over the competitors. However, this made up a very small percentage of the total investments in innovation for the kiwifruit industry.

[59]This company was a subsidiary of the Zespri Group.

that would maximize returns for growers. The company attempted to do this through in-house R&D, which was limited to just those innovation activities directly related to planting, marketing, and distribution of fresh kiwifruit as specified by the Kiwifruit Industry Restructuring Act 1999. As explained by one of the executives, "*they tried that model for about three years but it did not work. It was definitely antagonistic to the research community in New Zealand. It cannot have a significant skill set on tap just working in kiwifruit."*

According to Zespri's top management, this innovation model was inefficient and could not be justified from an economic point of view. Therefore, in 2004, they modified the innovation model to resemble an open innovation strategy where the idea was to get external partners to do the R&D activities, which were managed by a small internal innovation team employed by Zespri. As explained by the Innovation Manager:

> "*There were many drivers for Zespri to move to an open innovation model which included access to external world-class research that was not available otherwise; greater flexibility of research areas being investigated; alignment between Zespri and external research activities; and greater ease of scaling up or down existing R&D work on set targets.*"

Moreover, the open innovation model made more sense for a firm of Zespri's size. One of the Innovation Leaders drew a comparison with Fonterra[60] suggesting that a company of that size could justify employing teams of people for R&D as they were operationally large and they had many different areas in which to innovate. However, the Innovation Manager suggested that to

[60]Fonterra is a multinational dairy company operating under a cooperative structure. That is, 13,000 New Zealand dairy farmers own the company. It is the world's largest exporter of dairy products with revenue of about $NZ20 billion (Fonterra, 2011).

have the same level of investment in building internal R&D capabilities for a company like Zespri, which was restricted to trading one fruit in its original form only (which made up just 0.3% of the global fruit bowl), equated to inefficient use of scarce resources.

Furthermore, as Zespri's focus for innovation was industry good, it was more practical to leverage on the expertise of industry to get the best results. Consequently, Zespri put in place an innovation management infrastructure as depicted in Figure 7-3, which involved a broad range of knowledgeable people from the industry making decisions that benefited everyone in the New Zealand kiwifruit industry.

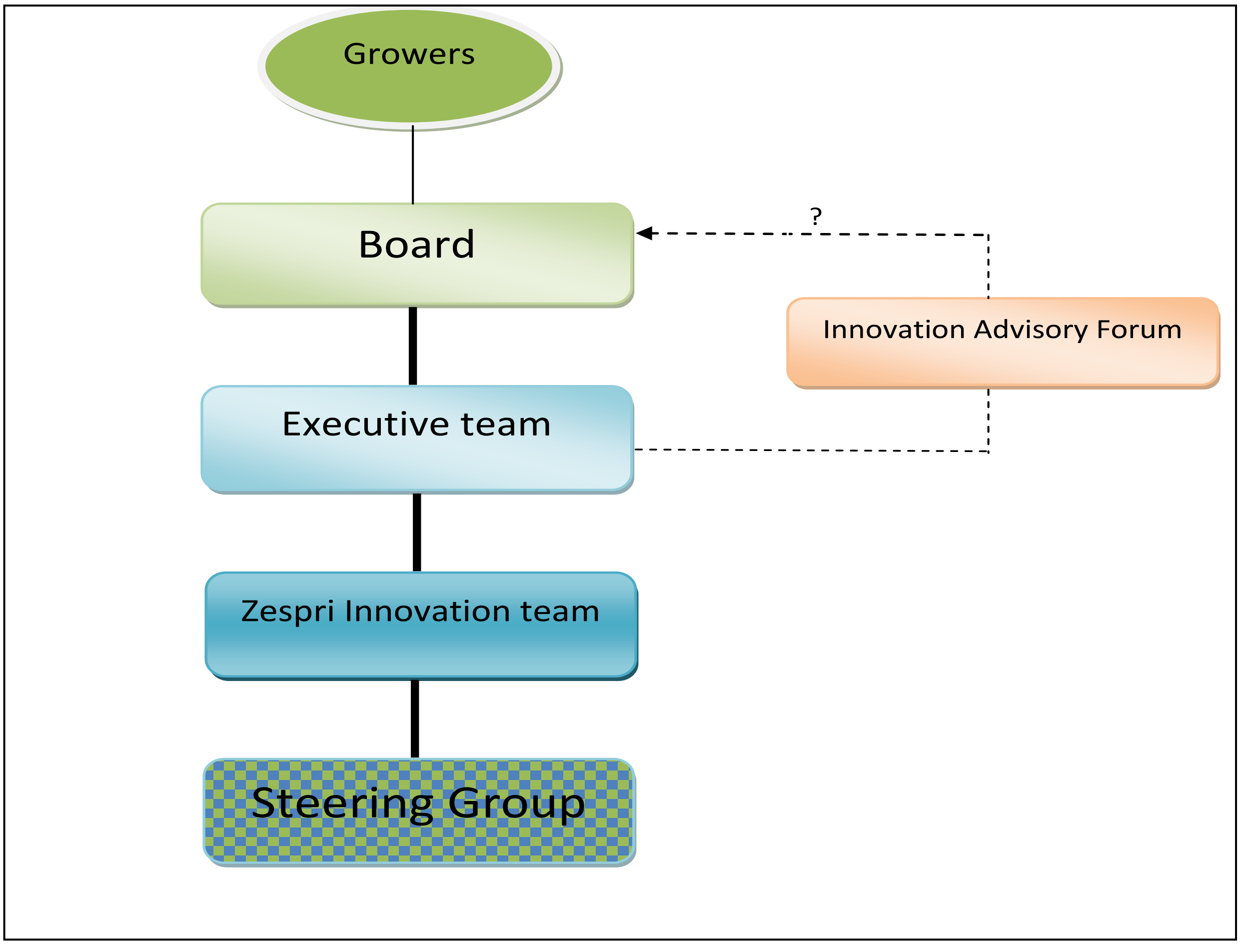

Figure 7-3: Organizational structure for innovation[61]

[61] The question mark in this Figure represents a conflict in the organization around whether the Innovation Advisory Board is advising the executives or whether it is an extension of the Board being advised by the Executives as explained on page 241.

As shown in Figure 7-3, at the top of this structure was the Board, which was made up of the representatives of the growers including independent and non-independent members. The Board decided on the bigger issues such as the yearly budget allocation to the different innovation portfolios and innovation strategy with input from the management. Below the Board was the CEO whom the executives reported to, including the Head of Innovation as shown in the organization chart (Figure 7-4). Under the Head of Innovation sat the innovation team which comprised three Innovation Leaders who reported to the Innovation Manager. This team looked after the different innovation portfolios and managed the steering groups that evolved around the projects under the different Innovation Leaders' portfolios. This is discussed in more detail in the next sub-section.

The steering group was a small cross-functional project team that effectively managed the project (s). A project steering group had a project champion who resided as an expert. That person's role was to defend the logic of the project from a technical perspective. This could have been either an internal or external person. The group generally had a business champion who was an internal person such as the Head of Innovation or an operations person whose role was to defend the logic of the project from a business perspective and to ensure the project was not cut from the budget. This person also provided the information link to other functions of the organization so that everyone knew what was going on. The group also included a marketing person, a supply chain person, and an Innovation Leader who was responsible for managing the project from a cash perspective. It also had relevant industry people and scientists that were involved in the project. This group was expected to review the projects as they went along or at the end of critical points in the project, for example, stop/go points of the innovation process. So, the steering group reconvened several times over the life of a project to ensure it was comfortable with all facets of the project, including costs being incurred.

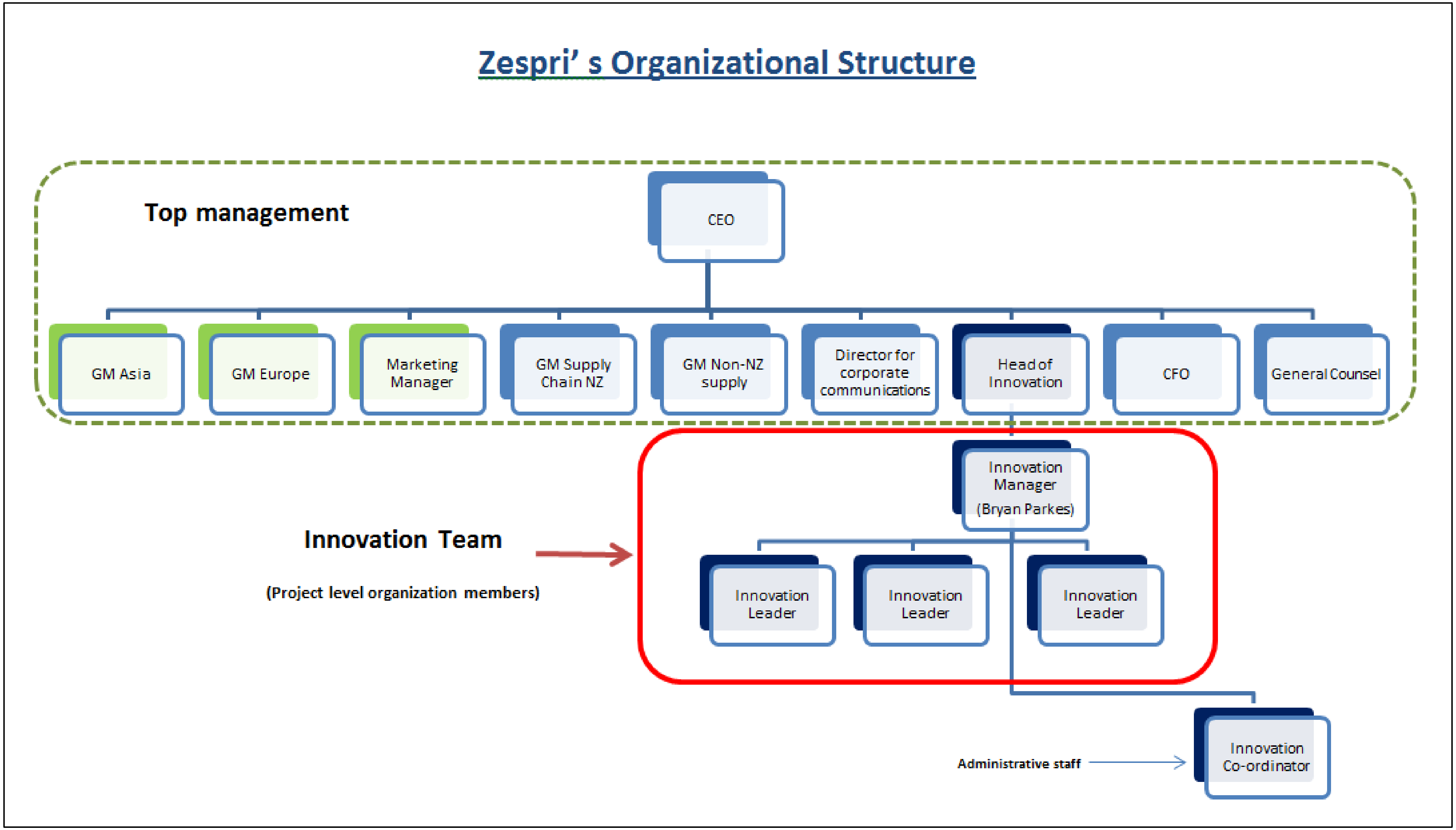

Figure 7-4: Zespri's organizational chart

Another group that was included in this structure was the Innovation Advisory Forum (IAF). The intention behind the creation of this forum was that it would provide a platform to bring together knowledgeable people with valuable expertise from across the industry to provide direction and guidance to the executives on how Zespri should be spending its innovation funds. However, as the majority of the members of this forum were Zespri Board members, there was a conflict as to whether this forum was advising the executives or was it just acting as an extension of the Board, who were seeking guidance from the executives. This conflict is marked by the question mark in Figure 7-3. Despite this conflict, it is important to note that Zespri's innovation function directly and indirectly involved many external parties from across the industry. These associations were effectively managed by Zespri's innovation team, who were responsible for ensuring that the intended objectives of the innovation function were achieved, as discussed in the next sub-section.

In summary, Zespri's innovation model promoting collaborative behaviour was a result of the antecedents of the kiwifruit industry. As shown in Figure 7-5, the collapse of the kiwifruit industry in New Zealand prompted the Government to intervene, which resulted in the Kiwifruit Industry Restructuring Act 1999 coming into effect. This Act led to the creation of the unique triangular industry structure for kiwifruit in New Zealand, encouraging the industry to work together as improvements in one sector had positive externalities for others. This resulted in the development of the innovation model with a decision-making structure (as shown in Figure 7-3), which involved experts from all sectors of the kiwifruit industry. Although this was beneficial in the sense that innovation related decisions were made with input from all sectors of the industry, thus incorporating a wider range of perspectives, it also meant that Zespri's innovation team was forced to seek input from the otherwise external parties. The downside to this model as described by the Innovation Leaders was that Zespri's innovation team could not undertake a new innovation project until it was approved by the relevant groups of people in the decision making structure. The Innovation Leaders suggested that some of these groups were conservative in nature and so projects tended to get reviewed in that context. As a consequence, most of the projects undertaken by Zespri were subtle changes as opposed to radical innovation. One of the Innovation Leaders commented:

> *"The opportunity to sit and say, 'oh it is a completely different way of growing kiwifruit or it is a completely different way of handling these things, let's give it a go' would be quite hard. It is like everything here. We might think, this is worthwhile doing but then you have to put it through the steering group and the IAF. And then we are looking at well what is wrong with the way we grow it now."*

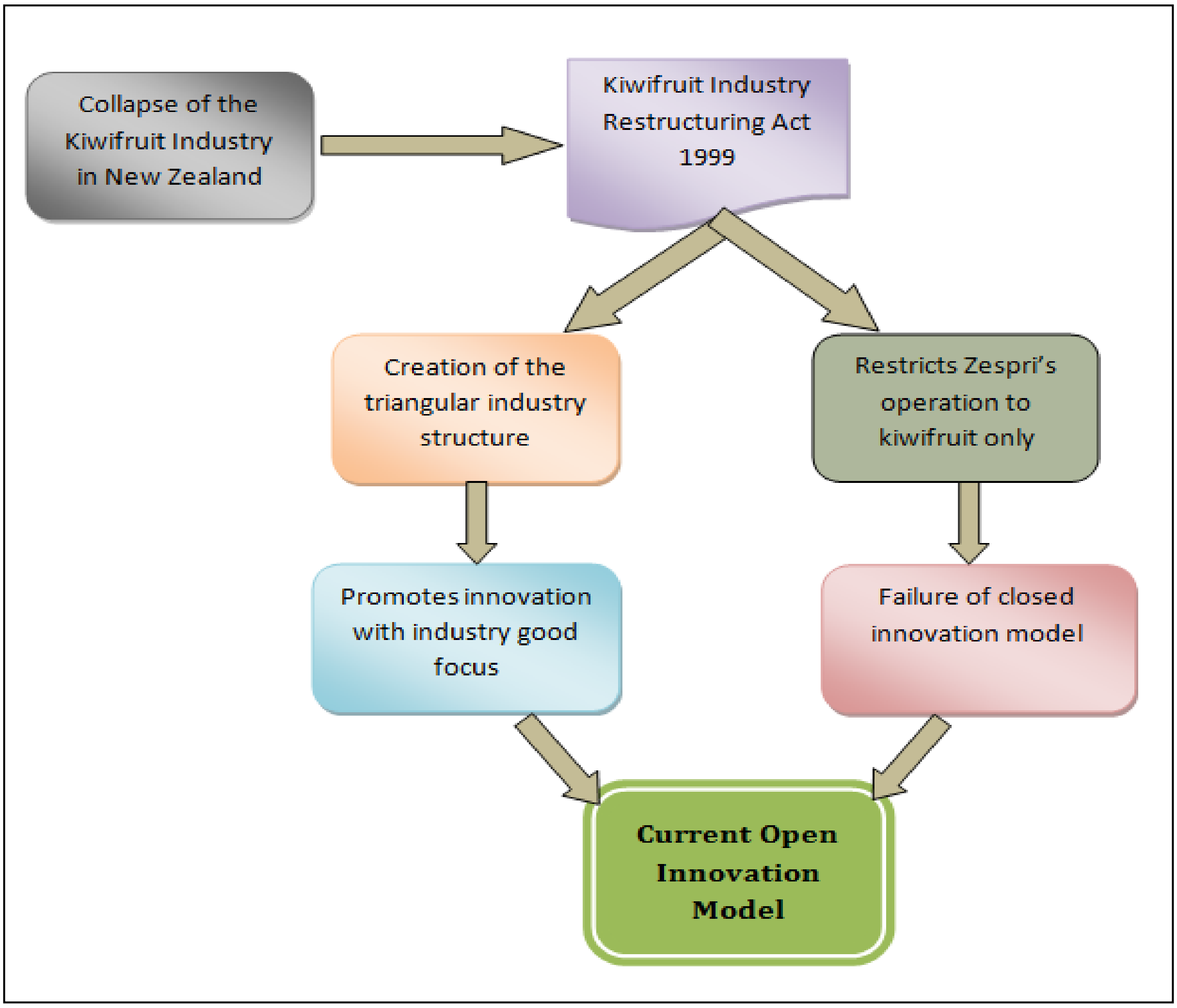

Figure 7-5: Evolution of the current open innovation model

At the same time, the Act defined the scope of activities that Zespri was allowed to do, which was narrowed down to dealing with kiwifruit in its natural form only. As exemplified by the Innovation Manager, "*We cannot just react to a diamond. We cannot just go off and start working on kiwifruit processing technologies as we are a fresh fruit company. We cannot go off and work on avocados even though they go through the same pack-house.*" In other words, Zespri's innovation team needed to ensure its activities were within the confines of the Act. This narrow scope meant Zespri could not sustain having a strong internal R&D function and had to move to the open innovation model. This model led to a reduction in the number of people directly employed in Zespri's innovation function. These remaining team members had well-defined responsibilities as described in the following sub-section.

7.3.1. INNOVATION TEAM

As shown in Figure 7-4, Zespri's innovation team was comprised essentially of three Innovation Leaders and an Innovation Manager. Each person in the team was in-charge of one of Zespri's innovation portfolios:

- New Cultivars development
- Orchard management
- Supply chain performance and fruit quality
- Sustainability and health & nutrition

While analysing the interview data, it was inferred that the responsibilities of the innovation team members could be grouped into three categories: scanning for opportunities, building inter-firm relationships and managing innovation projects. These are described in the following sub-sections.

7.3.1.1. SCANNING ACTIVITIES

At least once a year, the Innovation Leader for each of the innovation portfolios brought together a steering group and they started brainstorming and debating what went well in the past, what needed to be improved, what facets they needed to add, and what activities needed to be done. As explained by one of the Innovation Leaders, "*Our brainstorming does not limit itself to just Zespri. It expands to brainstorming with the entire industry as best we can".* These discussions helped identify innovation opportunities.

Innovation Leaders also participated in related external studies to sense out potential opportunities. For example, a few years ago, the Innovation Leader responsible for the health and nutrition portfolio got involved with a National Health Study that was done in New Zealand, looking at iron intake. As explained by the Innovation Leader:

> "*We had iron fortified cereal and the question was if you ate your iron fortified cereal with vitamin C enhanced tablet or juice or banana or having fresh kiwifruit will that affect the viability of the iron in the cereal. The motivation for that was the young women tend to be iron deficient and so iron fortified could be affected by getting iron quicker but it is not that effective unless partnered with something else. So, the opportunity was to see if the kiwifruit was a good partner. And what that showed was that we were more effective than the equivalent amount of vitamin C tablet and other fruits like bananas and so on. It is a good carrier. It was enhancing the functionality of that iron fortified cereal. That gave us confidence in the space that potentially opportunity was available and us thinking about how we really develop the underlying science in there*."

The identified opportunities following these activities were discussed at steering group meetings, with other Innovation Leaders and were included in strategic planning discussions. For opportunities that were included in the approved strategic plans, the Innovation Leader then tried to find ways of exploring that opportunity further, which led to activities to build relationships with external parties as described below.

7.3.1.2. BUILDING INTER-FIRM RELATIONSHIPS

As Zespri did not have internal R&D capabilities, to realize the innovation opportunities and reap benefits the Innovation Leaders needed to form relationships with external parties. Therefore, the innovation team was responsible for finding appropriate external partners and negotiating formal or informal arrangements with these external partners to carry out a project. For example, in the past Zespri entered into an exclusive agreement with a Crown research institute, as described in section 7.4, to explore opportunities around new kiwifruit varieties. Also, Zespri formed a consortium with Fonterra to explore the opportunities around health benefits of eating kiwifruit in conjunction with other foods. The Innovation Leader responsible for the health portfolio explained that thinking about where health was evolving in the future and the combination of foods was a stretch area for both organizations. However, they entered into this consortium with the motivation that if they succeeded, value would be added to their brand because of the first mover advantages associated with the potential outcomes. The Innovation Manager emphasized this view with the following comment, "*if we can demonstrate that kiwifruit can enhance the bio viability of a particular milk constituent or cheese or some other formulation, it would have halo effects back on the brand.*"

Furthermore, Zespri had strategic partnerships with leading research organizations such as the Riddet Institute, which provided Zespri with the opportunity to scientifically validate health claims and present health messages about Zespri's kiwifruits to consumers and healthcare professionals around the globe. As explained by one of the executives, "*this is all about increasing margins as you can show to the consumers that you have something extra that others do not have*". Hence, consumers would be willing to pay premium prices for Zespri's kiwifruits, helping Zespri as well as the growers obtain better returns while also getting a sustained increase in market share.

In summary, the innovation team seized opportunities by finding appropriate external partners to develop identified prospects and worked out the terms of partnership to enable the collaboration to proceed. Once the inter-firm relationship was established, the innovation team needed to manage the projects and the relationship to ensure the intended objectives were achieved.

7.3.1.3. MANAGING INNOVATION PROJECTS

Innovation projects are by nature characterized by technological and market uncertainties (Davila et al., 2006). However, combining this with inter-firm relationships poses additional threats due to cooperation, coordination and appropriation problems (Bruce et al., 1995; Caglio & Ditillo, 2008). Hence, part of Zespri's innovation team's role was to manage these threats to prevent high failure rates. To understand how the projects were managed including the identification of the formalized MCS in place, this study examined one of the key areas of Zespri's innovation function, the new cultivars programme, and the corresponding relationship with the Plant and Food Research Institute (PFR). This is discussed in the following sections.

7.3.2. NEW CULTIVARS PROGRAMME

Developing new cultivars was a key part of Zespri's innovation activities. As acknowledged by Zespri executives, the targeted growth of doubling in size[62] to $NZ3 billion by 2025 (Zespri, 2010c) was not going to come just on the back of doing what Zespri already did. As stated by the Head of Innovation, "*we need to diversify into new cultivars, more new cultivars, and that would be one of the main drivers for hitting those sales targets*". Hence, Zespri's top management set up an extensive new cultivars programme, which was seen as one of the company's key pillars. This programme was designed to help the company reinvent itself but at the same time ensure that the growers did not lose financially. As pointed out by one of the executives, "*We could be a $3 billion company but our growers could go broke*". This scenario would lead to the collapse of the kiwifruit industry in New Zealand. Therefore, it was important that the release of any new cultivar or commercialization of any projects took into consideration the economic viability of the growers as stated in Zespri's mission statement, which read, "*Maximize net returns for Zespri growers and shareholders*".

As explained by the Innovation Manager, the strategic rationale behind the new cultivars programme was that given the cost of production in competing countries like Chile, the economic benefits of exporting kiwifruit from New Zealand was not justified despite the New Zealand kiwifruit industry enjoying higher prices for its fruit relative to its competitors. He described this in detail stating that:

> *"Generally the wholesale price we get in the markets is twice that of the same cultivar produced in a different country. So, our prices that we get compared to Chile or the Southern Hemisphere at the same time is about double for the New Zealand produced fruit of the same cultivar and that is because of the market*

[62]Here size is measured in terms of revenue.

power that Zespri has, being about fifteen times bigger than anyone else; and the other half is the quality systems that we have delivering a better quality product. So, that is good but even double the price is not enough to justify the economics on average very much given the cost of land, cost of labour and cost of transport out of New Zealand. So, the cost of land and labour in Chile is a whole lot less and even getting twice the price of Chile it does not necessarily stack up economically for everyone depending on the yield per hectare they get in New Zealand. So, then we have to add a third dimension to it which is the new cultivars as far as the strategic strength of New Zealand."

Although the industry had been working on the development of new cultivars since the 1970s, Zespri's top management took this initiative to a new level in 2004 when it entered into the exclusivity agreement with PFR as described in the next section. The Innovation Manager suggested that in 2010, the majority of Zespri's R&D budget of $10 million was spent on the new cultivars programme. As explained by the Head of Innovation, while $10 million did not seem like much for a $1.5 billion company, it was important to note that Zespri was just the middle man. Most of this revenue came into Zespri from the customers via the post-harvest sector and went directly to the growers for the supply of the produce as shown in Figure 7-1. Zespri's margin was just about $25 million (Zespri, 2010a). So, $10 million out of $25 million was a substantial percentage and was symbolic of the level of importance placed on innovation by Zespri's top management.

Hence, apart from the exclusivity agreement with PFR that is discussed in the next section, two key formalized MCS put in place by Zespri's top management to manage the new cultivars programme were the annual innovation budget and the structured innovation process. These are discussed in the following sub-sections.

7.3.2.1. INNOVATION BUDGET

Zespri's R&D budget was determined by the Board on a yearly basis with input from management and the Innovation Advisory Forum. According to the Head of Innovation, the R&D budget was generally around 7% of the total industry revenue but tended to increase following release of new cultivars, when some problems were expected. The Board also decided on the split between the innovation portfolios. However, as explained by the Innovation Manager, the splits were not fixed. There was some movement of funds between the portfolios when unexpected hurdles or potholes came along and one team needed to spend more money in a certain area. Moreover, there were no requirements in terms of sharing funds across research or service providers. The Innovation Leaders could decide to spend 100% of their allocated funds with one provider or split their budget among different providers. In other words, the innovation budget was a means of diagnostic control to ensure Zespri's total expenditure on R&D was reasonable and within the limit the company could afford.

In addition to the Board's budget allocation to the new cultivars programme, Zespri's innovation team also leveraged a lot of money from the Government and benefited from PFR's resources as part of their exclusivity agreement. For instance, as outlined by the Innovation Manager in the New Zealand Kiwifruit Journal (Zespri, 2010b), in 2009 Zespri received $35.7 million from the Foundation of Research, Science and Technology (Government funded organization) for a new cultivar consortium while PFR invested $1.9m from the Kiwifruit Royalties Investment Portfolio for parental development. This PFR investment was part of the terms of the exclusivity agreement whereby Zespri paid PFR royalty on their Gold variety and in return PFR needed to spend 75% of that on further kiwifruit R&D. However, the Innovation Manager explained that:

"While Zespri Board's budget allocation tends to fund near market-end or near commercial-end innovation, the KRIP funding (i.e. PFR royalty money) tends to fund research that are one step closer to blue sky. Moreover, the government funding generally through the Foundation for Research, Science and Technology (FORST) tends to fund the blue sky research which still has links to the kiwifruit industry and Zespri has an increasing involvement in what gets funded there as well."

However, this funding also had an industry good focus and Zespri was accountable to the funding providers for the use of these funds. Therefore, Zespri used highly structured innovation processes depicting the formalized stage-and-gate system (R. G. Cooper, 2001, 2009; R. G. Cooper & Edgett, 2008) to keep track of its innovation activities, described in discussion of the stages of the new cultivars programme below.

7.3.2.2. STRUCTURED INNOVATION PROCESS

Zespri's innovation projects around new cultivars generally started with market research that was done by marketing consultants hired by Zespri. These consultants identified opportunities in the market based on consumer tastes and preferences, distribution requirements, and consumer behaviour. Zespri took the information from the consultants and formulated innovation strategies, stating the opportunities it would like to pursue. These strategies were discussed with the relevant people and the new cultivars programme was undertaken in five stages as shown in Figure 7-6.

The first stage, that is, the parental development stage, refers to the breeding activities that took place at PFR and were covered under the exclusivity agreement, described in section 7.4. The Innovation Leaders expressed that this was a valuable partnership for Zespri as PFR had the largest and most resourced breeding programme in the world for kiwifruit. It had a large collection of kiwifruit germplasm[63] from China, which was where kiwifruit originated from, and PFR had been breeding and improving the material from the wild for over five generations. So, that material was a valuable resource for developing new kiwifruit cultivars and PFR was continuing to improve that parental programme with government funding as well as its own reinvestment of the kiwifruit royalties. The aim of this programme was to improve as well as understand the kiwifruit genetics and develop green tools around that. As explained by the Innovation Manager, "*that is PFR's part of the new cultivars programme. They do parental development which improves the offspring but in small numbers and looks for factorials.*"

The second stage, that is the seedling stage, was where the programme came into Zespri's domain. At this stage Zespri went to PFR and asked it to give Zespri its very best parents that from PFR's experience, when crossed together would give a particular combination of attributes. So, PFR provided the genetic resource and Zespri combined that with its market knowledge of the opportunities that existed in the market and parents were selected for further development of new cultivars that would meet the opportunities identified.

Zespri took responsibility for the material at this point and funded the crossing of the parents. From this point Zespri owned the genetic material from those parents and Zespri produced many seedlings. Each female seedling was a potential new variety of kiwifruit and at the time of this study, Zespri had approximately 75,000 potential new varieties in the programme (Zespri, 2010a). Therefore, it was a massive programme; each of these potential varieties would have different fruits and they all had to be evaluated.

[63]A germplasm is a living tissue from which a plant can be grown.

Figure 7-6: Stages of the new cultivars program (Source: Zespri's 2010 annual review)

Zespri used a structured stage-and-gate process for this as the seedlings were monitored and assessed for fruit taste, size, shape, storage capabilities and shelf life as they grew. The steering groups that set up the projects reviewed the seedling candidates at each stage and either graduated them to the clonal stage, turned them down, or recycled them depending on their attributes.

The clonal stage, which was the third stage in the programme, was where Zespri worked with the growers. Zespri had seven sites across the country. Five of those were grower sites and two were PFR sites. At the clonal stage, Zespri took cuttings from the identified original seedlings and grafted them at the different sites throughout the country. After two or three years the grafted vines started producing clonal copies of the original seedlings. Zespri evaluated the entire vines as they were the factory or manufacturing plant for their produce that they were testing. They then evaluated the product, which was the fruit. Zespri took the fruit and put it through supply chain testing and consumer testing to try to get an understanding of the commercial viability of the cultivars at the initial stage. The decision to progress to the next stage was driven by the yield per hectare, the cost of growing it, and what Zespri thought it could sell the fruit for. The anticipated selling price was based on consumer response studies of "*do they like it or not and how novel was the product*". The steering groups added these factors together and asked if this picture warranted going from effectively seven sites with about eight vines per site, to twenty sites with about quarter of a hectare of vines per site. So, in other words should this cultivar proceed to the final stage of block trials or pre-commercial trials? The final decision at this stage was made by the Zespri Board, based on the information supplied by the steering groups.

If the Board agreed, the cultivars were put into those sites and two years later when the fruits appeared, tests similar to the clonal stage were carried out. However, this time they were done a lot more robustly. So, a lot more consumer work was done to determine whether the consumers really liked the new produce. A lot more storage work was performed to test how robust the fruit was. Questions such as *"does it really meet the product space that Zespri is looking to fill?"* were addressed. Then again after two to four years, depending on how long the robust testing took and how much opportunity there was in the market versus the risks, Zespri commercially released the new cultivars.

The new cultivars programme was a classic example of Zespri's collaborative innovation process, which was divided into stages and gates. During the different stages, Zespri contracted external partners such as market research firms, universities, or research institutes to perform the R&D activities. While at the gates, decisions on whether the project should progress to the next stage were made by steering groups comprising of internal and external industry experts. Seeking and incorporating external knowledge into the innovation process was an essential element of Zespri's innovation model, which over the last decade had been accepted by the organization members as the way to think about and manage innovation activities. The consequence of this innovation model was the development of a number of inter-firm relationships. As illustrated above, one of these inter-firm relationships was with PFR, which featured heavily in Zespri's new cultivars programme, especially in the early stages. PFR's outstanding expertise in this field made it a valuable collaboration for Zespri. At the same time Zespri's ability to use and commercialize PFR's expertise rendered value for PFR as well. The next section reviews the development of this relationship in detail to understand the influence of formalized MCS and how the organization members' perceived level of trust changed over time.

7.4. COLLABORATION WITH PFR

At the time of this research, PFR was a government-funded horticulture provider based in New Zealand that was globally one of the best in its fields of expertise which included development of new kiwifruit cultivars. As stated by one of Zespri's executives:

> "*They [PFR] do not cover all the fields of expertise but importantly for us in the new cultivar development they are world class and in a lot of supporting activities that go around supporting new cultivar, they are also at least New Zealand class and in some cases world class.*"

Zespri (then known as Kiwifruit Marketing Licensing Authority) and PFR (then known as HortResearch) had been working together since 1994, when PFR developed the golden kiwifruit that was commercialized by Zespri. Therefore, the two organizations had been familiar with each other's capabilities and competencies for a long time. However, as explained by the Innovation Manager, the dealings between the two organizations were not undertaken under an umbrella agreement or a broader shared vision. Instead the dealings remained transactional in nature with organization members needing to go through the negotiation process to agree on the terms of the contract each time they wanted to work together on an innovation project.

Hence, in early 2004, following Zespri's decision to move away from the in-house innovation model, it was recognized by Zespri's top management, in particular the CEO, that there was a very good opportunity for Zespri to enter into a formal long-term relationship with PFR. This would allow Zespri to integrate PFR's expertise into Zespri's breeding programme while giving PFR an avenue for additional funding and the ability to commercialize its research outputs in the kiwifruit area. This perspective was shared by PFR's top management.

Consequently, in March 2004 Zespri's top management enacted this perspective by entering into a formal exclusive operating agreement with PFR. Under this agreement, Zespri had unprecedented access to the world's best research capabilities for kiwifruit. Also, the IP ownership of the golden kiwifruit that was commercialized by Zespri for PFR passed to Zespri along with all new cultivars for kiwifruit that were to be developed in the future by PFR. The terms of this agreement also made PFR Zespri's exclusive provider of breeding, its principal provider of research services, and a key strategic partner. The terms of the agreement drafted by the top management made this a win-win relationship from the perspectives of both organizations. However, the agreement did not restrict either of the two organizations from collaborating with other external partners. For instance, Zespri did not have to use PFR solely. It could use other providers where their research strengths were better than PFR's. Similarly, PFR could work with others where this was of benefit to the New Zealand industry.

The Head of Innovation suggested that it was more beneficial for Zespri when PFR worked with other industries as it "*both expands the skill set applied to the project and it exposes both groups to other's knowledge and views of the world resulting in more robust projects and synergies between both research parties.*" Furthermore, as stated by one of the executives, "*when PFR works with other industries, it means that someone else is helping keep PFR alive not just Zespri.*" In other words, PFR was not financially dependent on the kiwifruit industry. Hence, the industry enjoyed the benefits of working with PFR without bearing all the overhead costs.

The formalization of the relationship using the exclusivity agreement was a result of top management's perspective that both firms would benefit from the establishment of a steady collaborative relationship. However, as found in the previous chapters, if the project level organization members' perspectives differ from the views of the top management, the actions of the top management in the form of formalized rules may not alter the routines of the project level organization members as desired. Therefore, the following section discusses the perspectives of the project level organization members by examining the development of this relationship at the project level and the changes to the routines of the project level organization members since the exclusivity agreement was signed.

7.4.1. DEVELOPMENT OF THE RELATIONSHIP

As previously discussed, the benefits of this collaborative relationship were apparent to top management and the organizations had a history of working together. However, according to Zespri's Head of Innovation, the start of this new formal relationship at the project level was not exactly what the top management was anticipating. There was resistance and uneasiness among the project level organization members, which was heading towards a discontinuation of the collaborative relationship. In the interview evidence, both Zespri's innovation team and the PFR Team Leader attributed this to trust issues that Zespri organization members suffered from. As the Innovation Manager said, the development of the working relationship under the agreement at the project level followed the "*forming, storming, norming and performing model*"[64] as shown in Figure 7-7.

Zespri's Head of Innovation and the Innovation Manager both explained in their interviews that there were two key concerns of the organization members contributing to their resistance to openly collaborating with PFR after the agreement was signed. Firstly, Zespri members feared that PFR objectives might not be aligned with Zespri's. As Zespri was not in control of specific personnel used by PFR, there was concern that the innovation team could end up with higher costs than were otherwise necessary and not achieve adequate outcomes. With the innovation team being accountable for their innovation budgets, they were not comfortable

[64] This model emanates from work done by Tuckman (1965).

taking the risks. Secondly, the organization members at Zespri were concerned that the information about the new cultivars would be leaked to competitors, for example, the Chilean companies or Italian competing interests who might capitalize on that information before Zespri got patents for the new cultivars.

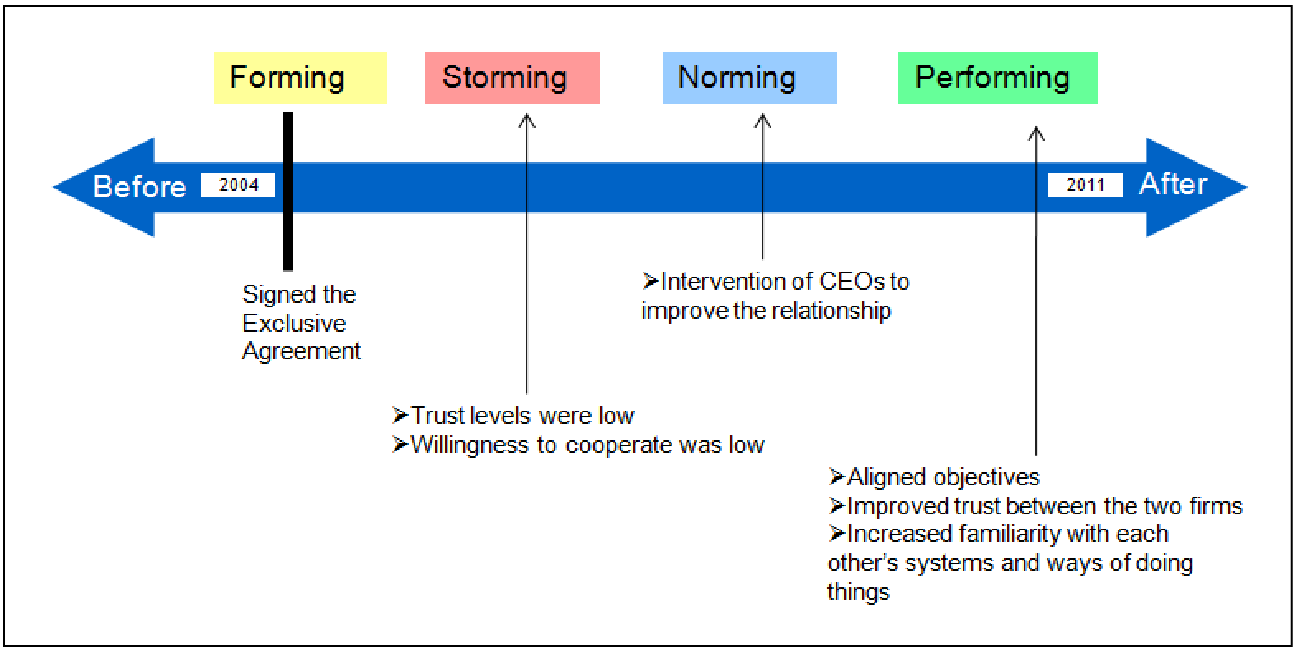

Figure 7-7: Changes observed over the life of the collaborative relationship between Zespri and PFR

In response to these concerns, despite the existence of the exclusivity agreement, Zespri's Innovation Leaders used a number of stringent operational rules and procedures to manage the innovation projects they were involved in with PFR. These operational rules and procedures included requesting detailed written reports at each stage of the project, setting tangible milestones that were closely monitored by Innovation Leaders throughout the project, and having detailed meetings before a project started to outline Zespri's expectations, followed by regular review meetings to get feedback on the progress of the projects. The purpose of these measures was to closely monitor the activities of PFR organization members and ensure Zespri's project objectives were achieved.

However, the intensity of the rules and procedures used by Zespri's organization members were counter-productive for the relationship as they attracted resistance from the PFR organization members. The Team Leader at PFR described the intensity of these procedures with the following example, "*Say you have a contract with Zespri to deliver 19,000 plants that PFR has said ok we will deliver 19,000 plants. Zespri actually sends someone to come and count that there are 19,000 plants*."

The PFR Team Leader also commented on the accountability expected by Zespri with the following example:

> "*Sometimes we had to spend days writing a report trying to explain why the flowers did not open. I do not know why the flowers did not open. This is just a silly example but gives you some sort of an idea. While in other situations you would write the flowers did not open and I did this one instead. But with Zespri, we were accountable. Because the flowers did not open, you did not produce the seeds, you did not deliver this, now you are responsible for the non-deliverable of the contract. Well hold on, we could not just go and whisper to the plant flower please.*"

These extreme measures made Zespri organization members' lack of trust obvious to the PFR organization members who viewed it as derogatory. As explained by the Team Leader, the organization members at PFR did not need nor appreciated that level of monitoring. They argued that instead of the diagnostic approach, if Zespri just trusted the PFR organization members, they would feel more comfortable and willing to be more cooperative.

As shown in Figure 7-7, shortly after the agreement was signed Zespri's organization members' lack of trust translated into stringent rules and procedures that were resisted by PFR organization members, whose willingness to work with Zespri was diminishing. This observation is consistent with Madhok and Tallman (1998) who suggested excessive reliance on overly and overtly protective measures tends to hamper the developments of a closer and more mutual relationship.

However, as explained by the Innovation Manager, the deteriorating relationship was salvaged through the intervention of the CEOs of the two organizations. The CEOs maintained their strong willingness to work together, which they explicitly communicated with organization members. They also made necessary changes in their specific organizational structures including the recruitment of new employees in key positions to develop and sustain the collaborative relationship. They personally encouraged the organization members to bond together to build trust between the two organizations. The following comment from the Innovation Manager sums up the role played by the CEOs to make this relationship work:

> *"I think a lot of the increasing levels of trust flowed from the relationship between the CEOs. That is where the power lies and the ability to influence how the groups interacted. So, the key to the relationship was the two CEOs working together."*

In other words, the resistance of the project level organization members was countered by the top management's actions to implement changes that would encourage increased interactions to build trust in both organizations. One of the main changes was the appointment of a designated Innovation Leader (later the Innovation Manager) to be solely responsible for the dealings with PFR in the new cultivars programme covered under the exclusivity agreement. One of the key performance indicators of this role was to extract maximum value from the relationship with PFR. This performance was reviewed against the IAF expectations of the collaborative relationship. This change gave the accountability for the success of the collaborative relationship to the project level organization member, that is, the responsible Innovation Leader. Through this change top management put pressure on the Innovation Leader to make the relationship work so that both firms could benefit from the collaboration. These changes were also reciprocated by PFR's top management to modify their project level organization members' deteriorating willingness to work with Zespri. Similar to the Zespri Innovation Leader, the PFR Team Leader for kiwifruit was given the responsibility of ensuring the relationship was effectively sustained.

These changes resulted in both the responsible organization members putting in extra effort to restart the relationship building process. They interacted with each other on an increasingly social basis to learn more about each other's activities to determine how best to make the relationship work in an effective manner. In their interviews, both these personnel suggested that this increased interaction resulted in an increase in the level of perceived trust, which they continued to share at the time of this research.

In 2010, the general consensus among Zespri's innovation team was that their relationship with PFR had developed significantly over the last four or five years. The change they observed was summed up by one of the Innovation Leaders with the following comment, "*PFR has gone from being a service provider to now having a shared vision and looking to deliver value to the greater industry.*" The following comment from the Head of Innovation also reiterated this view:

> "*PFR now realize that the kiwifruit industry is also a key pillar for their success and they are adapting their competency to meet our challenges and our strategic goals for the next fifteen years. And that is impressive. They are not as elitist as they once have been.*"

At the time of this research, the relationship was at the *performing stage* where the two organizations' objectives were aligned with each other, the perceived level of trust was high, and organization members from both organizations were communicating more effectively. These changes were related to a change in the routines of Zespri's organization members and their use of formalized MCS, as discussed in the next sub-section.

7.4.2. CHANGES IN ROUTINES AND USE OF FORMALIZED MCS

As previously described, not having control of the skill sets employed by PFR was perceived as a risk by Zespri's organization members at the start of the relationship. However, as explained by the Innovation Leaders, over the years the relationship had become close enough that they did not regard this as much of a risk anymore. Instead, Zespri was now consulted on many of PFR's key decisions involving matters relating to kiwifruit. As stated by the Head of Innovation, "*The reality is that we are increasingly having a very big part to play in decisions relating to where PFR spends their fundamental money in kiwifruit. We now have a very strong relationship.*"

This change was an indicator of the high level of trust between the organization members of both firms, which helped reduce the uneasiness of collaborating with an external party initially felt by Zespri's organization members. The most apparent consequence of this change as described by the PFR Team Leader was the variation in Zespri organization members' approach to managing the activities of the relationship. He explained that as the relationship matured over the years, Zespri organization members reduced their level of monitoring. For instance, Zespri no longer sent someone to count the number of plants to ensure PFR was not cheating. Instead, as explained by Zespri's Innovation Leaders, they believed that PFR organization members were working ethically as both organizations were now working towards a common goal: advancing the kiwifruit industry in New Zealand to maintain and grow their global market share while earning good returns for the growers. As stated by the Innovation Manager:

> *"In the case of PFR we have the greater good perspective which we keep bringing to the table. It is not about extracting maximum money out of us, this is about New Zealand and us working together and make sure this is a fair process because every bit of money you suck out of us here we will not be able to spend doing other good things for the good of the industry. Our belief is that they certainly behave like that as well for the good of the industry*."

This change also impacted on the way Zespri organization members used formalized MCS, such as the formal review meetings, to manage these collaborative innovation projects. As explained by the Innovation Manager and corroborated by the PFR Team Leader, initially the review meetings were very diagnostic in nature with the points for discussion centred around the progress of the projects in relation to the pre-set performance targets. However, over the years the frequency and the way the formalized MCS were used changed. The PFR Team Leader explained that the meetings were now held on an ad hoc basis[65] and more interactive in nature, with discussions centring more on strategic uncertainties, resolution of potential problems and ideas that could be potential innovation projects.

Another concern of the project level organization members at the start of the collaborative relationship was leakage to competitors of information relating to new cultivars. Zespri had formalized rules around this concern with the innovation team required to get the plant variety rights (PVR), which are the plant version of patents for the new cultivars. As explained by the

[65] Compared to the regular review meetings as described on page 256.

Head of Innovation, "*without that protection we cannot be in control of the market of our own fruit and not just the market but more importantly the growing and the volume of the fruits produced.*" Therefore, Zespri's organization members were required to deploy a number of mechanisms when dealing with new partners to ensure that all confidential information was protected and the patent application was made at the correct time, preventing competitors from taking advantage of sensitive information that made its way into the public domain.

As explained by Zespri's Innovation Manager, these mechanisms were used with PFR as well at the start of their relationship. However, after working with PFR for a long time, Zespri organization members were comfortable that PFR organization members knew the PVR regulations really well and their knowledge of the systems and processes were consistent with Zespri's. Hence, at the time of this research Zespri's organization members did not use the same level of stringent rules and procedures they continued to use with the new partners to safeguard the sensitive information that they used to employ at the start of the relationship. As the Innovation Manager explained, "*Today all Zespri wants PFR to sign up to is that they will not sell their ideas and inventions to other competing kiwifruit companies*." However, as described above, Zespri places no restriction on PFR sharing its knowledge or work with other fruit industries. As stated by one of the Innovation Leaders:

> "*We are happy for the apple industry to piggy-back on the back of inventions developed by PFR for kiwifruit industry. These sorts of companies need scale. We need them to be able to sell to a global apple industry as that would drive the price of innovation down for us*."

In summary, as the collaborative relationship developed over the years, PFR became familiar with the systems and processes at Zespri. Consequently, Zespri's organization members developed a greater level of trust, reducing the need to invest large volumes of resources into communicating these systems and procedures to PFR. Also, Zespri realized it did not need to use strict diagnostic-style MCS to ensure that PFR was abiding by the prescribed systems because it knew that PFR was aware of what needed to be done and trusted that PFR would do it. Similarly, Zespri did not need to get PFR to sign a contract every time it embarked on a task for Zespri because the relationship had developed to an extent where that was no longer required. As stated by the Innovation Manager, "*At the end of the day a piece of paper is worthless but there are a bunch of principles and a bunch of formality that we can fall back on about how we can work together."*

Instead, now that Zespri organization members trusted PFR's organization members with confidential information, they included PFR personnel in their steering groups and other discussions around innovation. This allowed PFR to be directly involved with an entire project and all the different groups of people working on it, which ensured that PFR organization members had access to all the relevant information and could effectively debate on issues as required. The Zespri Innovation Leaders as well as the PFR Team Leader pointed out, the improvements in communication between the two organizations that allowed for issues to be resolved appropriately and promptly.

One of the other formalized MCS used by Zespri's organization members were the stop/go components in their innovation processes that helped take stock of what had been done and assess whether or not they were going in the right direction. As explained by one of the Innovation Leaders, "*This does not go down well with all external partners as the project they working on might be stopped, hence they lose the revenue that they would have otherwise got.*" This also used to be an issue with PFR organization members at the start of the collaborative relationship. Communication breakdowns used to occur because PFR organization members were not very forthcoming with the information because they feared negative consequences. However, as suggested by one of the Innovation Leaders, "*the relationship between Zespri and PFR is maturing to a point where we are getting better at this.*" At the time of this research, communication between the two parties was improving and relevant information was flowing on a timelier basis, allowing for appropriate action to be taken promptly, so speeding up the development process. A similar change had been observed with the exchange of financial information. For instance, Zespri had a system of paying external parties upon achievement of pre-determined milestones that were marked by tangible deliverables. As noted by the Innovation Coordinator:

> "*As PFR have come to know the system, they are now very good at providing invoices with a one-to-one ratio of here are the milestones and here is what we expect it to be. They are coding it very nicely which makes work on this side very easy.*"

Therefore, it can be argued that PFR has also altered some of its routines to bring them in line with Zespri's to improve the flow of information between the two organizations.

Hence, as shown in Figure 7-8, seven years after entering into the exclusivity agreement, the two organizations had aligned strategic objectives and routines, resulting in a reduction in the organization members' perceived level of risk, which was related to the corresponding increase in their perceived level of trust.

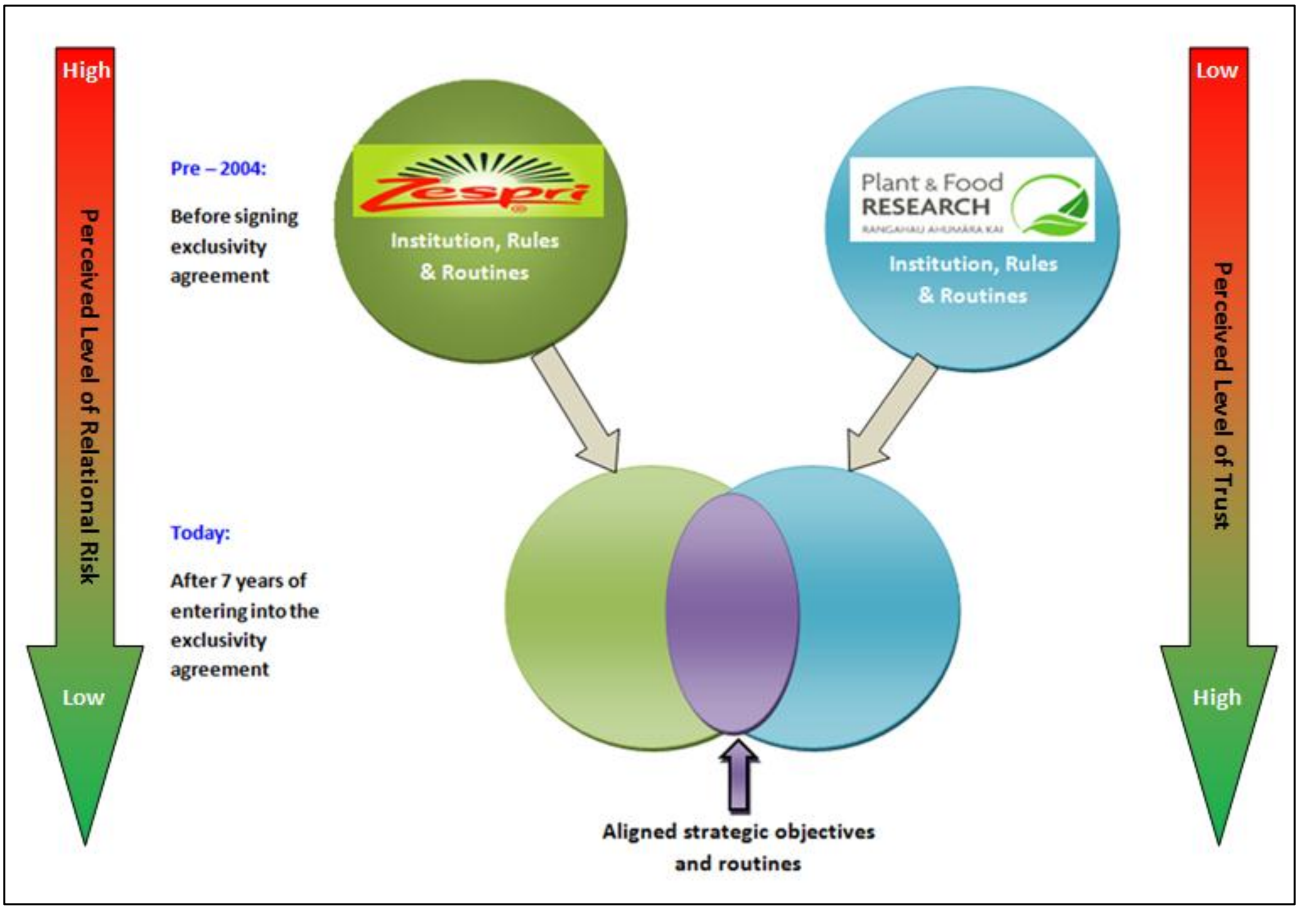

Figure 7-8: Changes over the life of the collaborative relationship between Zespri and PFR

Das and Teng (2001) suggest there are two types of risk in inter-firm relationships: relational risk and performance risk. They define relational risk as risk that is "*concerned with the probability and consequences that a partner firm does not commit itself to the alliance in the desired manner*" (Das & Teng, 2001, p. 6). For example, there could be a risk that the partner may act opportunistically and, hinder the firm's ability to achieve its strategic objectives. While performance risk refers to "*those factors that may jeopardize the achievement of strategic objectives, given that partners co-operate fully"* (Das & Teng, 2001, p. 6). In other words, despite the partner's best efforts, factors such as market uncertainty or technological problems may prevent the alliance from achieving the desired results.

In this case study, it was observed that as the relationship matured over the seven years, the organization members' perception of the relational risk reduced as they realized that both firms were working towards the same strategic objectives of creating value for the New Zealand kiwifruit industry and its growers. Similar to Das and Teng's (2001) observation, this case study also found that the perceived level of relational risk was closely related to the organization members' perception of trust. Consequently, as the perceived level of relational risk reduced, the perceived level of trust increased. In other words, this study found that the perceived level of relational risk and the perceived level of trust were inversely related.

This change in organization members' perceptions translated to a change in their routines and use of MCS. In summary, at the start of the relationship, when the perceived level of relational risk was high, the organization members used a strict diagnostic style of control to closely monitor the activities of the collaboration to ensure Zespri's ability to achieve its strategic objectives was not hindered by opportunistic or inefficient behaviour by PFR organization members. However, as the relationship matured and the organization members began to trust that PFR organization members were working towards the same strategic objectives as Zespri, they shifted the focus of their management from relational risk to performance risk which remained high given the nature of the activities of the collaborative relationship. That is, as the firms were working on R&D activities, there was a high chance that an innovation project would not succeed because of market or technological issues, despite the full commitment of both parties. Therefore, at the time of this research Zespri's organization members used more interactive style of MCS in the form of review meetings that focused on dealing with strategic uncertainties as opposed to the use of a diagnostic style of MCS (described on pages 256-258) they previously used to manage the relational risk.

The next section discusses the findings of this case study with reference to the research question.

7.5. DISCUSSION

Evidence from the first two case studies showed either a change in formalized MCS with routines remaining stable or a change in the routines with the formalized MCS remaining stable. However, evidence from the Zespri case study showed a change in both formalized MCS and the routines of organization members. These changes are summarized in Figure 7-9.

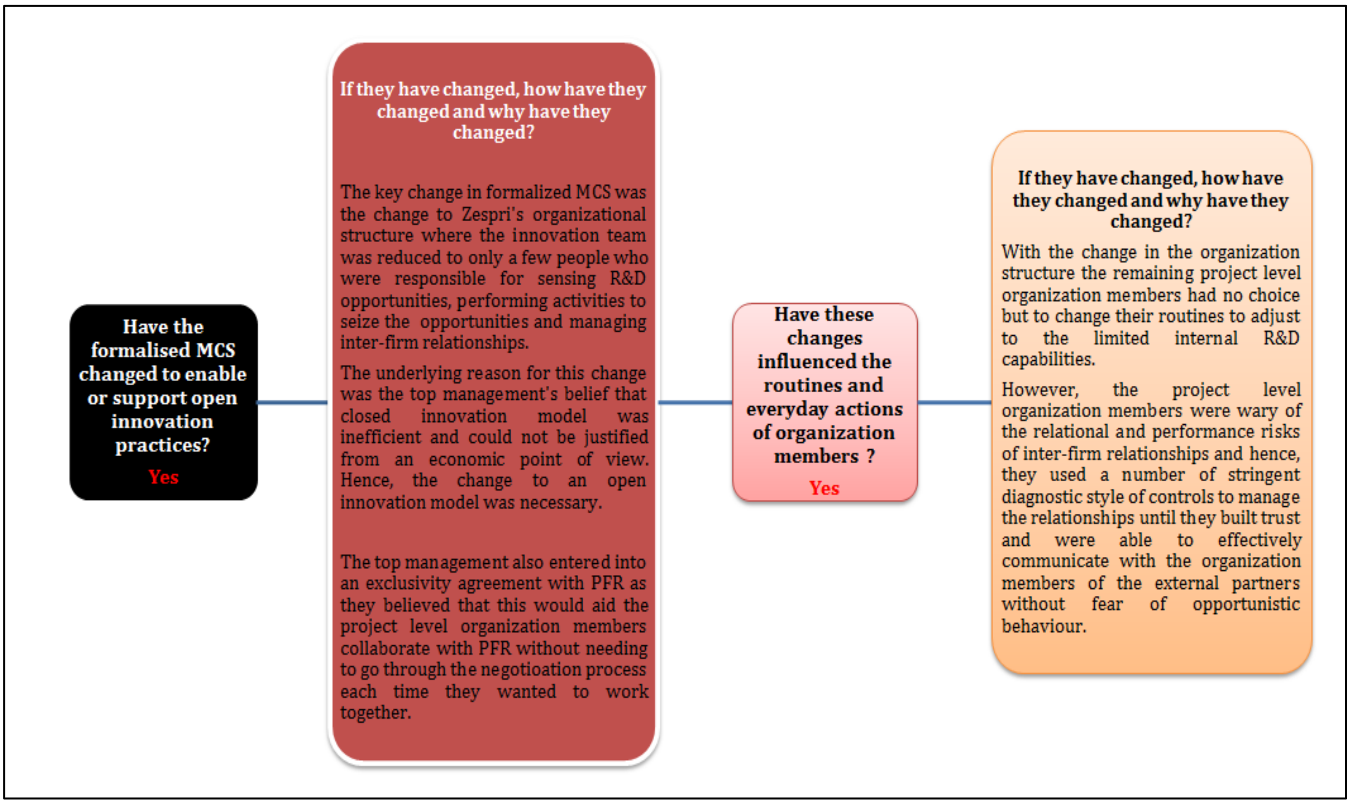

Figure 7-9: Responses for sub-research questions at Zespri

The change in the formalized MCS in the form of the new organizational structure of the firm was implemented because of top management's belief that the closed innovation model initially used by Zespri was inefficient and could not be justified from an economic point of view. Their logic was that the company, as well as the New Zealand kiwifruit industry, would benefit more from an open innovation model. The next sub-section discusses the influence of the formalized MCS on the use of open innovation practices in Zespri at the project level.

7.5.1. INFLUENCE OF FORMALIZED MCS

The new organizational structure coerced the project level organization members to change their routines to embrace the use of open innovation practices. As a result, the project level organization members' routines encoded the requirements of the open innovation model desired by top management as they reproduced the actions of seeking and incorporating external knowledge into Zespri's innovation projects, shown in Figure 7-10. Despite the shift to the open innovation model, the project level organization members remained wary of the risks associated with inter-firm relationships. These risks could have had an impact on their performance, as they were accountable for the R&D expenditure under their portfolios. Therefore, as exemplified by the PFR example previously discussed, the project level organization members' routines also included a diagnostic style of control, using a number of stringent operational rules to monitor and manage the collaborative innovation projects. However, as shown by the PFR example, these routines could hinder the development of collaborative relationships and could be counter-productive for the open innovation model.

Therefore, at Zespri top management played an active role in ensuring the use of open innovation practices was sustained by working closely with the innovation team and making necessary changes to the formalized MCS as required. These actions helped them to establish good collaborative relationships with key research partners. For instance, to save the collaborative relationship between Zespri and PFR, top management made further changes to the structure of the innovation team and implemented new performance measures to coerce the project level organization members to build and sustain the relationship.

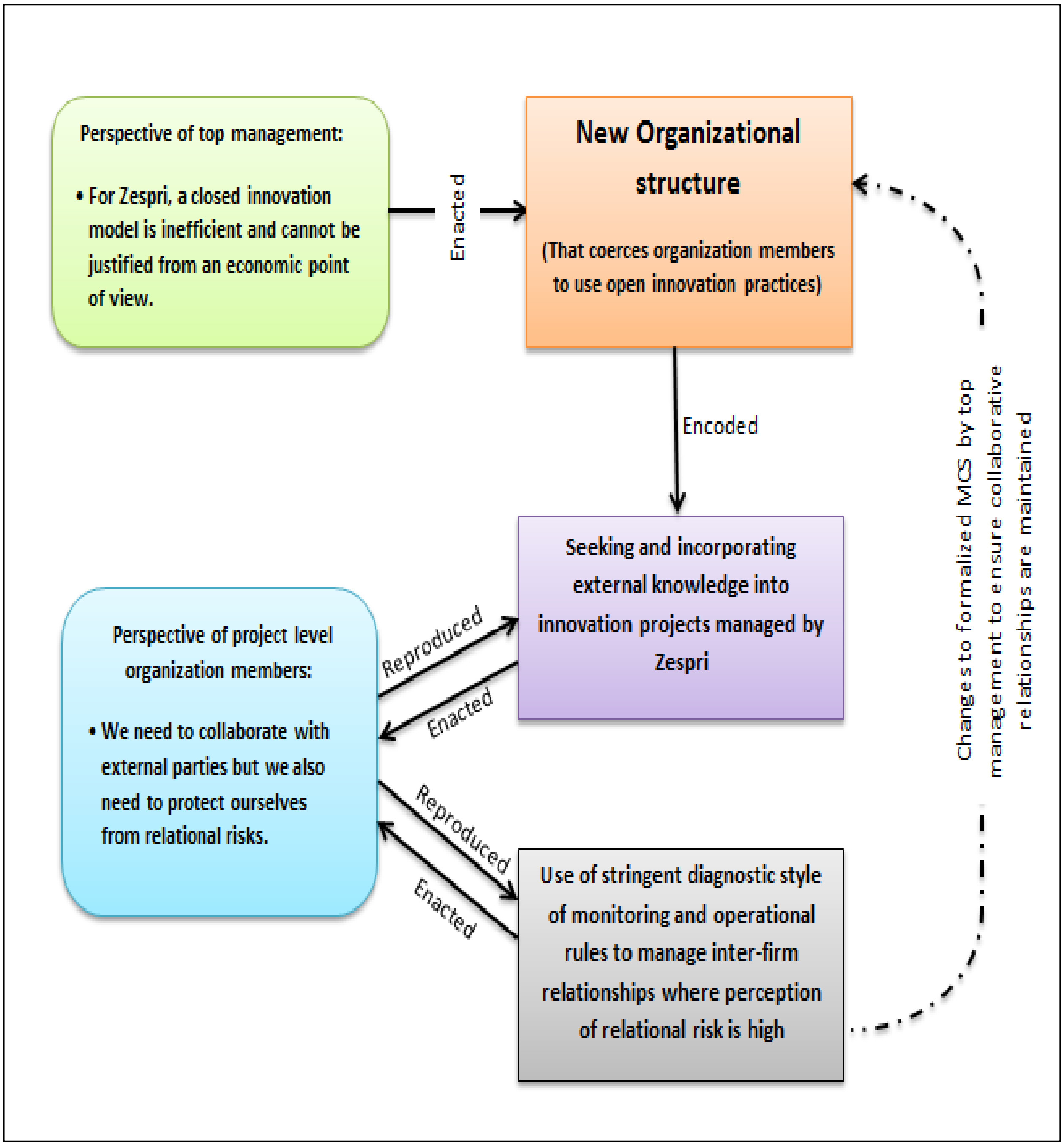

Figure 7-10: Perspectives behind changes to MCS and routines relating to Zespri's use of open innovation practices

Moreover, the analysis of Zespri's relationship with PFR showed that formalized MCS, such as formal project reviews, were used by Zespri's organization members to gather relevant information to help them manage the risks associated with the innovation projects. This is consistent with Davila's (2000) finding that MCS help to reduce uncertainty by gathering relevant information.

The following section concludes this chapter with a summary of the findings and a discussion of the contributions of this case study to the MCS literature.

7.6. CONCLUSION

This chapter described and analysed the changes in Zespri that enabled it to sustain the use of open innovation practices. The evidence from this study showed that a change to the open innovation model was initiated by top management through changes to the formalized MCS, mainly in the form of changes to the company's organizational structure. The new formalized MCS coerced the project level organization members into changing their routines to enable them to seek and incorporate external knowledge into their innovation projects to be able to undertake their responsibilities with a skeleton innovation team.

Similar to the previous two case studies, evidence from this case study also supported the assumptions of the extended theoretical framework, as it showed that the perspectives of top management were reflected in their actions which were enacted in the formalized MCS. Where these formalized MCS were coercive in nature, they dictated the actions of the organization members. The continued reproductions of these actions established them as routines of the organization. However, this case study also showed that decoupled routines arose if the formalized MCS did not address the logic of the project level organization members. These decoupled routines had the potential to threaten the sustainability of the practices desired by top management. This situation was different to that observed in FPH, where the decoupled routines instigated better performance and so the top management believed changes to the formalized MCS were not necessary. Zespri's top management believed that continued use of the decoupled routines was counter-productive and where necessary they responded with changes to the formalized MCS to help sustain the use of open innovation practices in the firm.

Therefore, this study found that formalized MCS can influence the use of open innovation practices in a firm if they are coercive in nature.

Moreover, as discussed above, the retrospective analysis of the development of Zespri's collaborative relationship with PFR showed that as the organization members' perception of the relational risks decreased, their perceived level of trust increased. As a result, over time as a collaborative relationship developed, the organization members became familiar with each other's processes, their beliefs, and boundary systems. This led to shared visions and aligned strategic objectives. Aligned objectives meant PFR organization members were working towards Zespri's goals. Hence, the perceived level of relational risk decreased and the firm's organization members began to increasingly trust their counter-parts in the external firm.

With this change in the organization members' perspectives, their style of use of MCS also changed from diagnostic controls to interactive controls. This change in the style of use of MCS was symbolic of the change in the role of MCS in the inter-firm relationship. That is, at the start of the relationship when the perceived level of relational risk was high and the perceived level of trust was low, the role of MCS was goal congruence. In other words, the function of the MCS was to ensure that the objectives of the inter-firm relationship were achieved. When the relationship matured and the perceived level of trust was high, the MCS took on an information role (Davila, 2000) that helped the organizations manage uncertainties and performance risks.

Hence, the findings of this study contribute to MCS literature examining the role of MCS in the R&D context (Akroyd & Maguire, 2011; Akroyd et al., 2009; Bisbe & Otley, 2004; Davila, 2000; Davila et al., 2006; Davila, Foster, & Li, 2005; Davila, Foster, & Li, 2009) by examining the role of MCS in a collaborative R&D context and providing additional insights on how the formalized MCS influenced the changes in the firm in regards to the use of open innovation practices. It also contributes to this literature by showing how the role of formalized MCS changed following changes in the perceived levels of trust and relational risk.

The next chapter concludes this thesis with a discussion on the research findings from the three case studies as they relate to the underlying research question and the theoretical framework.

CHAPTER 8. DISCUSSION AND CONCLUSION

8.1. INTRODUCTION

As outlined in Chapter 1, the objective of this thesis is to provide empirical insights into the influence of formalized MCS on organizations' use of open innovation practices through an understanding of organization members' actions leading to a change in or continuation of the organization's innovation practices following changes in the field from closed to open innovation as discussed in Chapter 2. This thesis reports on the analysis of the data from the three case studies that were used to address the underlying research question:

Can formalized MCS influence the use of open innovation practices in a firm?

The individual case analysis of the three case studies: FPH, Coloplast and Zespri are documented in Chapters 4, 5 and 7 respectively. A cross-case analysis was also performed for FPH and Coloplast, which is documented in Chapter 6.

This chapter summarizes the findings from the three case studies and outlines the contributions this thesis makes to the literature. It also reflects on the research process used for this study. Therefore, the remainder of the chapter is structured as follows. Section 8.2 provides a summary of the findings from the three case studies and the cross-case analysis of FPH and Coloplast. Section 8.3 discusses the findings with reference to the underlying research question and the extended theoretical framework. Section 8.4 concludes this chapter by outlining the contributions of this thesis, stating the limitations of the study, and suggesting areas for future research.

8.2. SUMMARY OF STUDY AND FINDINGS

In line with the interpretative methodology described in Chapter 3 (Section 3.2.1), where it is assumed that all human action is intentional and the human intentions are identified by studying actors in their everyday world (Chua, 1986), this study addressed the research question by using case studies to gain an understanding of the innovation practices of the firms.

Three firms that had different approaches to the use of open innovation practices and the use of formalized MCS for these practices were selected for this study. Firstly, FPH had been using open innovation practices at the project level for years, where the project level organization members frequently sought and incorporated knowledge from end-users, medical professionals, and local vendors into their innovation projects. However, FPH did not have specific formalized MCS that were intended to enable and support the use of open innovation practices, except for the belief system that highlighted the importance of understanding the needs of end-users. Secondly, Coloplast had formalized the open innovation process in the firm with top management implementing a number of specific formalized MCS to enable and support the use of open innovation practices. However, the use of these practices by Coloplast's project level organization members was limited as they preferred to keep R&D activities in-house. Thirdly, Zespri had formalized MCS that promoted the use of open innovation practices, which were reflected in the routines of the firm as the use of open innovation practices was second nature for the project level organization members.

The findings from each of these case studies in relation to the underlying research question are summarized in the following sub-sections.

8.2.1. FISHER & PAYKEL HEALTHCARE

As discussed in Chapter 4, project level organization members at FPH were successfully reproducing the practice of seeking and incorporating external knowledge into their innovation process at both the consumer and supplier ends of the supply chain. Evidence from the project level organization members showed that this collaborative culture in the firm, which was contrary to the findings of previous studies that identified internal resistance as a key challenge to using open innovation practices (Chesbrough & Crowther, 2006; van de Vrande et al., 2009; van der Meer, 2007; West & Gallagher, 2006), was created as a result of top management's actions to formalize a belief that understanding the needs of the end-users was critical for their innovation endeavours. As described in section 4.4.1, this belief system encouraged organization members to routinely visit hospitals to interact with end-users and medical professionals. This practice instilled confidence in the project level organization members, which also meant they were comfortable collaborating with other external partners such as local vendors.

However, this practice of collaborating with external parties other than end-users and medical professionals was not part of the formalized MCS of the firm; instead the project level organization members' view was that the formalized MCS (boundary systems) such as the rules around IP ownership were a hindrance for external collaborations. Therefore, where they believed it was appropriate, the project level organization members by-passed the formalized MCS. An analysis of the project level organization members' explanations of their actions suggests that they repeatedly collaborated with local vendors with the expertise they needed for their innovation projects because they believed that these practices saved time. They also believed that because the external partners they collaborated with had commercial motivation to work with FPH, the level of relational risk they faced was minimal. Therefore, they saw the requirements of the boundary system as being unnecessary and time consuming resulting in their decision to by-pass the formalized MCS. However, where the project level organization members believed that the relational risk was high; the project level organization members encoded the formalized MCS in their actions, to protect the firm from operational threats and complexities.

Despite the successful use of open innovation practices by project level organization members, as described in section 4.6.2, FPH's top management did not change the formalized MCS to reflect these practices because their underlying thinking was that keeping R&D activities in-house reduced the risks relating to new product introductions, such as complexities around IP ownership. Therefore, the top management insisted on maintaining the existing formalized MCS to deter the project level organization members from engaging in collaborations that could create operational issues for FPH. Moreover, they believed that the current mix of the formalized MCS and the decoupled routines were working effectively. Hence, they did not perceive the need for a formal open innovation process as they believed it may destabilize the routines that at the time were delivering better-than-desired results.

In conclusion, an analysis of the evidence from FPH showed that the perspectives of top management were reflected in those manager's actions, which were enacted in the firm's formalized MCS. At FPH, these formalized MCS created a culture in the firm where project level organization members were comfortable seeking and incorporating external knowledge into their innovation process. Moreover, the formalized MCS created a boundary, regulating the selection of appropriate partners to protect the firm from operational threats and complexities. However, as summarized in Table 8-1, the evidence from FPH showed that the routines of the firm only encoded formalized MCS where the project level organization members' perspectives were consistent with the perspectives of top management. Where the perspectives of the two groups of organization members were different, decoupled routines existed, as the perspectives of the project level organization members were reflected in their actions, which were reproduced and became part of the firm's routines.

	Top management believe risk of external collaborations is high and hence enact formalized MCS to deter the use of open innovation practices	Top management believe the use of external knowledge would benefit the firm and hence enact formalized MCS to support the use of open innovation practices
Perspective of Project level organization members	**Formalized MCS are a hindrance to use of open innovation practices**	**Formalized MCS supports the use of open innovation practices**
Project level organization members perceive the use of open innovation practices is efficient as relational risk is low.	Decoupled routines depicting the use of open innovation practices	Routines encoding formalized MCS that depict the use of open innovation practices

Table 8-1: Summary of Findings at FPH

This finding is consistent with the findings at Coloplast, despite the variation between the two firms' approaches to the use of open innovation practices, which are summarized in the next sub-section.

8.2.2. COLOPLAST

As discussed in Chapter 5, Coloplast's top management formally implemented an open innovation strategy in 2007 following a recommendation from a consulting firm. Consistent with the findings of previous studies (Chesbrough & Crowther, 2006; van de Vrande et al., 2009; van der Meer, 2007; West & Gallagher, 2006), this change faced high internal resistance from the project level organization members. Top management responded to this resistance by implementing a number of formalized MCS that were designed to enable and support external collaborations. These formalized MCS were implemented to play the following two roles. Firstly, the formalized MCS's role was to deal with the internal resistance to change by showing the organization members the benefits of collaborating with others. Secondly, the MCS's role was to act as the information infrastructure that would reduce uncertainty and manage the risks of inter-firm relationships. These changes in the formalized MCS portrayed the perspectives of the top management that with appropriate measures Coloplast could benefit from the incorporation of external knowledge into their innovation processes and that knowledge could help the project teams speed up their development time.

As described in Section 5.4, the evidence gathered from Coloplast's organization members showed that these changes led to a number of changes in Coloplast's internal innovation activities, increasing performance and reducing the time it took for project teams to take an idea to the market. However, these changes did not significantly change the routines of project level organization members in relation to the use of open innovation practices. Although there appeared to be some change in the internal culture of the firm, with organization members becoming more open to the idea of collaborations and beginning to seek input from external partners using the infrastructure that top management had set up, there were still very few projects that had proceeded to the stage of incorporating the external information into their innovation projects. The evidence suggested that the reason behind the stability of the closed innovation routines was the perspectives of project level organization members. This perspective was that the risks associated with external collaborations were extremely high. Hence, they believed it took less time and effort to develop products internally rather than going through the process of reducing the risks to enable external collaborations.

In combination, the findings from Coloplast and FPH, as depicted in Table 8-2, show that where the perspectives of top management and the project level organization members were consistent, the routines of the firm encoded the formalized MCS. However, where they were different, decoupled or loosely coupled routines emerged.

	Top management believe risk of external collaborations is high and hence enact formalized MCS to deter the use of open innovation practices	Top management believe the use of external knowledge would benefit the firm and hence enact formalized MCS to support the use of open innovation practices
Perspective of Project level organization members	**Formalized MCS are a hindrance to use of open innovation practices**	**Formalized MCS to enable and support the use of open innovation practices**
Project level organization members perceive the use of open innovation practices is **effective** as **relational risk is low.**	**Decoupled routines** *depicting the use of open innovation practices* **FPH**	**Routines encode the formalized MCS** *depicting the use of open innovation practices* **FPH/Coloplast**
Project level organization members perceive the use of open innovation practices is **ineffective** as **relational risk is high.**	**Routines encode the formalized MCS** *depicting the use of closed innovation practices where R&D activities are kept in-house* **FPH**	**Decoupled routines** *depicting the use of closed innovation practices where R&D activities are kept in-house* **Coloplast**

Table 8-2: Summary of combined findings from Coloplast and FPH

In other words, the findings from these two case studies show that formalized MCS play the role of enacting the logic of top management and communicating to the rest of the organization the managers' perspectives on the use of open innovation practices. However, the evidence suggests that these formalized MCS do not instigate a change in the routines of a firm unless the formalized MCS were coercive in nature. For instance, where the formalized MCS forced the project level organization members to take certain actions (such as the 'meet the end-user programme' where organization members had to have an end-user friend that they met on a regular basis), routines emerged that did not necessarily reflect the perspectives of project level organization members, but supported the use of open innovation practices. This is also apparent in the third case study, which is summarized in the next sub-section.

8.2.3. ZESPRI

In 2004, Zespri's top management enacted their logic that the closed innovation model was inefficient for Zespri and could not be justified from an economic point of view by introducing formalized MCS that supported an open innovation model. These changes to the formalized MCS (e.g., changes to the organizational structure) were such that the project level organization members were coerced into changing their routines, bringing them in line with the intended open innovation model. The consequence of this change was that Zespri needed to maintain good inter-firm relationships with key research providers to accomplish their innovation endeavours. This case study analysed the development of one of these relationships (with PFR) to examine how formalized MCS influenced the use of open innovation practices by enabling and supporting the inter-firm relationship.

The analysis of the development of this relationship with PFR showed that Zespri's top management enacted their perspective, that having an umbrella agreement with this research partner would make the collaboration process more efficient, by entering into a formal exclusivity agreement with PFR. However, this change faced resistance from project level organization members who perceived the relational risk of collaborating with this partner to be high. The project level organization members' perspective led to the emergence of routines relating to the management of inter-firm relationships that were threatening the sustainability of the use of open innovation practices in the firm. This observation was in line with the findings of the other two case studies; where the project level organization members' perspectives were not consistent with the perspectives of top management, thus causing decoupled routines to emerge. However, evidence from this case study also showed that top management recognized the impact of these routines on the use of open innovation practices in the firm and responded by making further changes to the formalized MCS, which coerced the project level organization members to act in a way that was in line with the perspective of top management.

Thus, as summarized in Table 8-3, despite the project level organization members' perception that the relational risk was high, they changed their actions to make the relationship work. The retrospective analysis of the development of the relationship showed that with continued interactions with the external partner, the project level organization members' perception of the relational risk changed. As they began to work with the external partner, the level of relational risk decreased. This triggered a change in the routines of the organization members, bringing them further in line with the expectations of top management. This change in routine was evident in the project level organization members' use of MCS to manage the collaborative innovation projects.

For instance, as described in section 7.4.2, initially when the relational risk was perceived to be high, the way the MCS were used was diagnostic in nature and the role of the MCS was goal congruence. However, when the relational risk was perceived to be low, the way the MCS were used was more interactive in nature and the role of the MCS was to gather information to deal with strategic uncertainties such as market and technological changes.

Therefore, the findings of this case study suggest that the perspectives of the project level organization members in relation to the use of open innovation practices, reflected in their actions (when they were not coerced to act otherwise by formalized MCS). This was driven by their perception of their ability to trust the external partners. This finding is also corroborated by the findings from the cross-case analysis, which is summarized in the next sub-section.

	Top management believe risk of external collaborations is high and hence enact formalized MCS to deter the use of open innovation practices.	Top management believe the use of external knowledge would benefit the firm and hence enact formalized MCS to support the use of open innovation practices.	Top management believe the continued use of the decoupled routines would hinder the continued use of open innovation practices in the firm.
Perspective of Project level organization members	**Formalized MCS are a hindrance to use of open innovation practices**	**Formalized MCS to enable and support the use of open innovation practices**	**Formalized MCS to coerce routines that ensure efficient use and sustainability of open innovation practices**
Project level organization members perceive the use of open innovation practices is **effective** as **relational risk is low.**	**Decoupled routines** *depicting the use of open innovation practices* **FPH**	**Routines encode the formalized MCS** *depicting the use of open innovation practices* **FPH/ Coloplast**	**Continued use of open innovation practices in the firm** **Zespri**
Project level organization members perceive the use of open innovation practices is **ineffective** as **relational risk is high.**	**Routines encode the formalized MCS** *depicting the use of closed innovation practices where R&D activities are kept in-house* **FPH**	**Decoupled routines** *depicting the use of closed innovation practices where R&D activities are kept in-house* **Coloplast**	**Routines encode the formalized MCS** *Depicting the continued use of open innovation practices* **Coloplast / Zespri**

Table 8-3: Summary of findings from the three case studies

8.2.4. CROSS-CASE ANALYSIS

The purpose of the cross-case analysis of FPH and Coloplast was to understand the reason behind the variations in their practices in using open innovation. Recognizing that the use of open innovation practices in each firm reflected the perspectives of the project level organization members, this analysis focused on the reasons they held those perspectives.

In line with the findings in the Zespri case study, the results of the cross-case analysis showed that the key reason for the variation related to the project level organization members' ability to trust the potential external partners. Furthermore, the analysis suggested that the organization members' ability to trust was influenced by the physical location and the competitive environment of the firm. For instance, FPH was operating in New Zealand without any large direct competitors and the local vendors had commercial motivation to collaborate with FPH. Hence, the project level organization members perceived their ability to trust the local vendors to be high, as the relational risk was perceived to be low. On the other hand, Coloplast was operating in Denmark, surrounded by competitors. Hence, the project level organization members perceived their ability to trust external partners to be low, as there was a high possibility that the external partners had some links with Coloplast's competitors.

Therefore, the findings from the cross-case analysis combined with the findings from the Zespri case study suggest that trust is an important factor influencing the use of open innovation practices in a firm. This finding is consistent with Cooper & Slagmulder's (2004) argument that trust is a necessary condition for the adoption of some control practices. As summarized in Table 8-4, formalized MCS promoting the use of open innovation practices are only encoded in the routines of the project level organization members where trust was perceived to be high. In cases where trust was low, the formalized MCS implemented to enable and support open innovation practices were by-passed, resulting in routines that were dominated by closed innovation practices. On one hand, where trust was perceived to be high and the formalized MCS were implemented to deter the use of open innovation practices, the routines of project level organization members still involved frequent use of these practices. On the other hand, where these formalized MCS existed and trust was perceived to be low, the routines of the firm were dominated by the use of closed innovation practices.

Perspective of Project level organization members	Formalized MCS are a hindrance to use of open innovation practices	Formalized MCS to enable and support the use of open innovation practices
Ability to trust is high	**Decoupled routines** *Frequent use of open innovation practices*	**Routines encode the formalized MCS** *Frequent use of open innovation practices*
Ability to trust is low	**Routines encode the formalized MCS** *use of closed innovation practices where R&D activities are kept in-house*	**Decoupled routines** *use of closed innovation practices where R&D activities are kept in-house*

Table 8-4: The role of trust in the use of open innovation practices

In relation to the role of trust, the findings of this study also supports the argument of Seal et al. (1999) that the existence of effective control systems can help build trust. For instance, the MCS that coerced Zespri organization members to sustain the relationship with PFR resulted in an increase in their level of trust in the PFR organization members, which improved the relationship and allowed for more efficient management of the collaborative innovation projects.

The next section discusses the findings from the three case studies and the cross-case analysis in relation to the research question and extended theoretical framework.

8.3. DISCUSSION OF FINDINGS

Combining the findings from the three case studies and the cross-case analysis, this study came to the conclusion that formalized MCS can influence a firm's use of open innovation practices in a number of ways. However, how the formalized MCS influences the use of open innovation practices is dependent on the situation. This is discussed in more detail in the next sub-section.

8.3.1. INFLUENCE OF FORMALIZED MCS

As discussed in Chapter 2, there are three key bodies of literature highlighting the role of MCS that are relevant in the context addressed in this study. Firstly, the literature examining the relationship between formalized MCS and innovation has found that MCS facilitates communication which reduces uncertainty and promotes goal congruence in a setting where new information requires quick reactions (Akroyd & Maguire, 2011; Davila, 2000; Davila, Foster, & Oyon, 2009). Secondly, the literature examining MCS in an inter-firm relationship suggests that MCS help with the management of inter-firm relationships by dealing with apparent cooperation, coordination, and appropriation problems (Caglio & Ditillo, 2008; Dekker, 2004; Langfield-Smith, 2008). Finally, the MCS change literature suggests that MCS support organizational transformations by influencing the behaviour of organization members and creating an environment for change (Chenhall & Euske, 2007; Dambrin et al., 2007; Ezzamel & Bourn, 1990; Ezzamel et al., 2004; Henri, 2006; Kurunmäki, 1999) .

The current study found support for all these arguments within the three case studies. For instance, at FPH the formalized MCS in the form of project reviews helped ensure that innovation projects were on track to achieve the project goals. This was also observed in Coloplast and Zespri. Moreover, evidence from FPH and Zespri in particular also showed that MCS were helpful in managing inter-firm relationships, as it allowed the organization members to monitor the collaborative activities and ensure they were in line with the expectations of the project managers. They also allowed effective communication between the organization members of both firms, allowing them to deal with any issues in a timely manner. MCS were also used as internal information infrastructure in all the case studies, providing information to the decision makers, enabling them to make relevant and timely decisions, and to deal with strategic uncertainties such as market and technological changes. At the same time, MCS such as the rules around IP helped the organization members select appropriate external partners, reducing the risks relating to inter-firm relationships such as cooperation, coordination and misappropriation issues. Finally, as evident in Zespri, MCS were used to transform organizational practices to support the implementation of the open innovation model by top management. Similarly, evidence from FPH showed how MCS helped create a culture that was conducive to the use of open innovation practices.

Combining the findings from the three case studies and the cross-case analysis, this study comes to the conclusion that where project level organization members have options to choose their actions based on what they think is appropriate, the influence of formalized MCS is contingent on whether the perspectives of the organization members at the project level are consistent with those perspectives of top management that have been enacted in the formalized MCS. For instance, even though the formalized MCS at Coloplast were designed to support the use of open innovation practices, these MCS did not have any significant impact on the activities of the project level organization members in terms of the use of external knowledge in their innovation projects. Thus, the use of open innovation practices at Coloplast continued to be low because the project level organization members' perspective was that the level of relational risk they faced was high, making it too risky to collaborate with external parties. In other words, the formalized MCS did not help the firm transform its organizational practices because the routines of the organization members remained stable. Similarly, the formalized MCS designed to deter the organization members from using open innovation practices did not succeed in stopping the use of these practices at FPH; the project level organization members believed it was more efficient to seek external knowledge than to keep all R&D activities in-house.

Therefore, the findings from the case studies suggest that the influence of formalized MCS on the use of open innovation practices in a firm is dependent on two key factors:

1. Whether the formalized MCS are coercive in nature, forcing the project level organization members to act as prescribed by top management through the formalized MCS: or whether the formalized MCS allow the project level organization members to act according to their own understanding of the situation.
2. Whether the perspectives of project level organization members in relation to the use of open innovation practices are consistent with the perspectives of top management.

The evidence from the case studies demonstrates that formalized MCS help transform the routines of the organization members in relation to the use of open innovation practices where the formalized MCS coerce the project level organization members to act as prescribed by top management. Moreover, it shows that the formalized MCS help support the use of open innovation practices, or alternatively deter the use of these practices where, the project level organization members encoded the formalized MCS into their routines because their perspectives were consistent with those perspectives of the top management which were reflected in the formalized MCS.

Alternatively, where the perspectives of the two groups of organization members were inconsistent, the routines of the project level organization members tended to be decoupled from the formalized MCS because the project level organization members acted according to their beliefs about what was most appropriate. As seen at FPH, these decoupled routines may improve performance in the firm. However, top management may decide not to change the formalized MCS accordingly because changing the formalized MCS may destabilize the routines and create inefficiencies. On the other hand, as seen in Zespri, these decoupled routines may be seen to be counter-productive by top management. In which case, top management may coerce the project level organization members to act differently using coercive formalized MCS. These MCS restrict the available action choices for the project level organization members.

Hence, using Burns and Scapens (2000, p. 6) definitions of rules and routines, the evidence from this study supports their conceptualization that the formalized MCS are part of the rules of the firm that tell the organization members *the way things should be done.* However, *the way things are actually done*, that is, the routines of the firm in relation to the use of open innovation practices, might be different as evident in FPH and Coloplast. Therefore, the findings also support calls from studies to separate the rules from the routines for analytical purposes to reflect this peculiar feature of the management accounting phenomenon, that is, the formalized MCS being different from actual practice (Lukka, 2007; Sawabe & Ushio, 2009). This is discussed further in the next sub-section.

8.3.2. EXTENDED THEORETICAL FRAMEWORK

This study extends the Burns and Scapens (2000) framework in line with suggestions from studies highlighting the decoupling phenomenon in the management accounting literature (Lukka, 2007; Nor-Aziah & Scapens, 2007; Sawabe & Ushio, 2009; van der Steen, 2009). This extended framework, described in Section 3.4, separates the rules from the routines of project level organization members based on there being two dominant groups of organization members: top management, who are responsible for the overall management of the firm, and the project level organization members, who carry out the day-to-day activities of the firm. However, this framework differs from the Sawabe and Ushio (2009) framework on the grounds that formalized MCS are not entirely independent of human agents. Instead, the extended framework suggests that top management have the capacity to change the formalized MCS as it sees fit, however, its capacity to change routines in the firm are limited.

Hence, unlike the previous institutional theoretical frameworks taking a processual view of change (e.g. Burns & Scapens, 2000; Seo & Creed, 2002; Sharma & Lawrence, 2008) as discussed in Chapter 3 that have combined rules and routines, the extended framework recognizes that there is a power difference between the two groups in respect of their capacity to change the formalized MCS and the routines of the firm. In other words, the framework recognizes that while the top management have the ability to change the formalized MCS, this does not automatically translate to a change in the organizational practices. For this change to take place, the project level organization members need to change their routines.

As shown in Figure 8-1, the assumption behind this extended theoretical framework, which the evidence from the case studies confirms, is that the actions of the two groups of organization members reflect their perspectives that may be different. In other words, the perspectives of top management in relation to the use of open innovation practices are reflected in their actions, which they enact as the formalized MCS. The perspectives of the project level organization members in relation to the use of open innovation practices are reflected in their actions, which they enact and reproduce as the firm's routines. In other words, the firm's use of open innovation practices can be explained with reference to actions of the organization members.

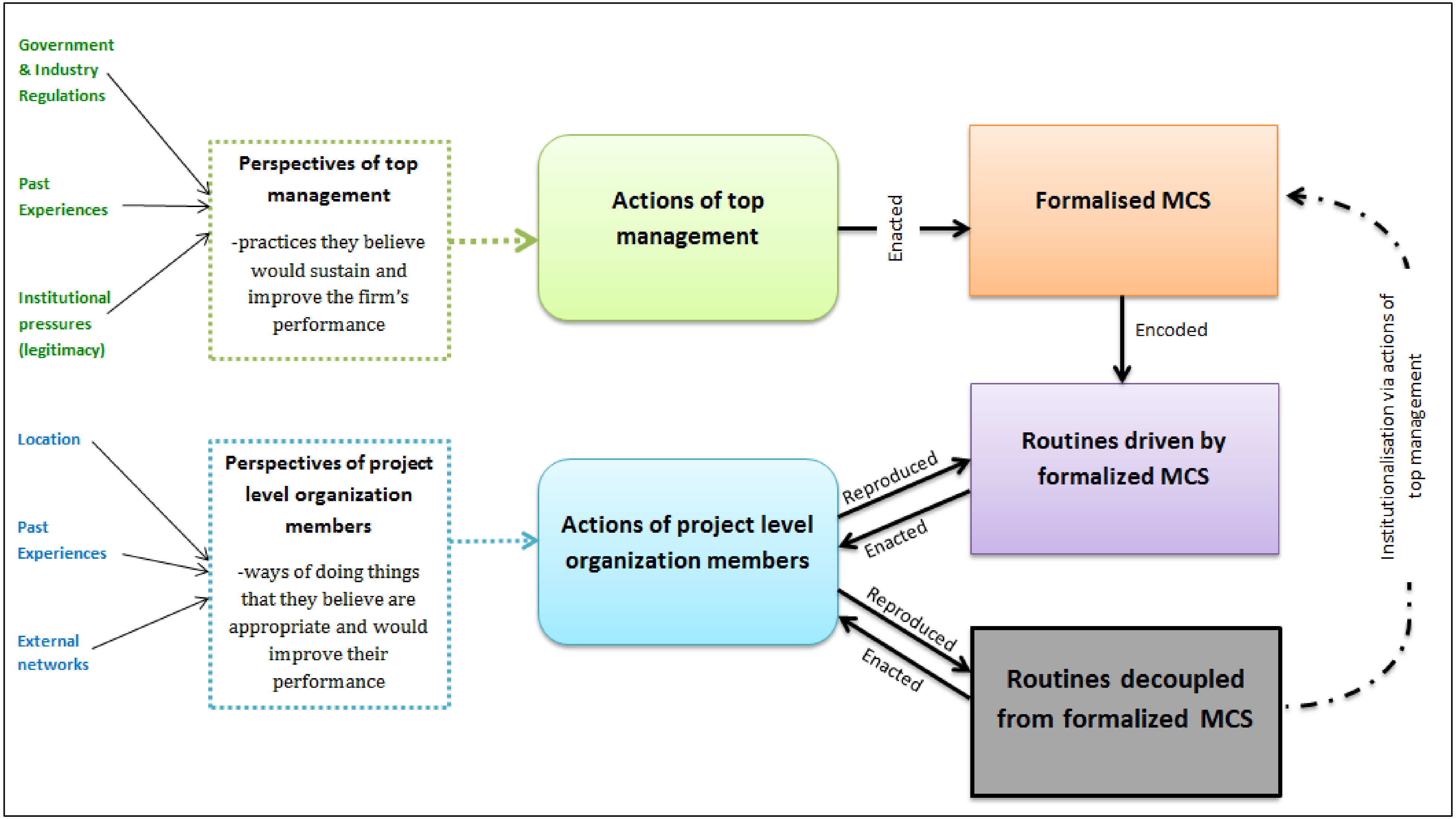

Figure 8-1: Discussion of the extended theoretical framework

Observations from the case studies suggest that the perspectives of top management generally relate to practices that they believe would help sustain and improve the firm's performance. This perspective may be influenced by factors like government and industry regulations, top management's past experiences or legitimacy pressures to conform to common practices used in that industry.

On the other hand, project level organization members tend to relate to ways of doing things that they believe are appropriate and would improve their performance. As observed in the case studies examined in this thesis, this may be influenced by the location of the firm as location impacts on their ability to trust external partners. It may also be influenced by factors such as their past experiences and their external networks. The aim of this study was not to examine all the factors influencing the perspectives of the two groups of organization members, but this could be an area for future research.

Moreover, this extended framework reflects the findings of this study in that when the project level organization members' perspectives are different from the perspectives of the top management, where possible the project level organization members act according to their thinking, leading to the emergence of decoupled routines. These decoupled routines might later trigger changes by top management to the formalized MCS.

As suggested in Section 6.4.2 using this extended theoretical framework, where formalized MCS were analysed separately from routines, enabled this study to focus on the reasons behind the existence of the formalized MCS and routines. It also helped focus on the reasons for the decoupled routines. Therefore, this study was able to identify the different logics and perspectives of the organization members. This in turn explained the variation in the practices of the different firms. Hence, the extended theoretical framework has been a useful tool for this study by helping structure the data analysis process and helping with understanding of the reasons behind both changes in and continuation of formalized MCS and routines.

The next section concludes this thesis by outlining the contributions of this study, its limitations and, areas for future research.

8.4. CONCLUSION

Motivated by a shift in the innovation field from closed to open innovation (Chesbrough, 2003b; Chiaroni et al., 2011; Gassmann, 2006), the objective of this study was to provide empirical insights into the influence of formalized MCS on an organization's use of open innovation practices. While the findings of the case studies are discussed in Section 8.3, the overall lesson learnt from this study is that the influence of formalized MCS on the routines or organizational practices of a firm are dependent on two key factors:

1. The nature of the formalized MCS. That is, whether the formalized MCS are coercive in nature, forcing the project level organization members to act as prescribed by top management through the formalized MCS; or whether the formalized MCS allow the project level organization members to act according to their own understanding of the situation.

2. Whether the perspectives of project level organization members in relation to the organizational practices are consistent with the perspectives of top management.

This study shows that actions of top management and organization members depict their perspectives and due to the power difference between top management and the project level organization members in respect of their capacity to change the formalized MCS and the routines of the firm, decoupled routines may emerge. Therefore, difference in perspectives of organization members combined with the recognition of the power difference could help explain some of the practice variations in firms.

The remainder of this section discusses the contributions of this study, outlines the limitations and finally suggests some areas for future research.

8.4.1. CONTRIBUTIONS

A review of the MCS literature showed that there was a lack of studies examining the influence of formalized MCS for managing inter-firm relationships in an innovation setting as discussed in Chapter 2. Therefore this study, using the open innovation context, which involves the management of inter-firm relationships in an innovation setting, contributes to this literature by showing how formalized MCS influenced the use of open innovation practices in a firm. It found that formalized MCS influenced the use of open innovation practices by creating a culture that was conducive to external collaborations. It also showed that formalized MCS facilitated effective communication between the organization members of the partnering firms and allowed the exchange of information on a regular basis so the project teams could deal with issues in a timely manner.

More importantly, this study contributes to the MCS literature by showing that the influence of formalized MCS is contingent on the nature of their use and whether the perspectives of the project level organization members, who perform the day-to-day activities of the firm, are consistent with the perspectives of top management, who enact the formalized MCS. As discussed above, where the actions of the project level organization members were not restricted by formalized MCS (i.e., they were not coercive in nature), the routines of the firm could be explained with reference to the thinking of the project level organization members. Where the perspectives of the project level organization members were consistent with the perspectives of top management, the routines of the project level organization members encoded the formalized MCS. However, where the perspectives of the two groups of organization members were not consistent, the effects of the formalized MCS was limited to communicating the perspectives of the top management to the rest of the organization and they did not necessarily transform the routines of the organization (as desired by top management).

The results of this study, therefore, demonstrate how the different perspectives of these two groups of organization members can lead to the emergence of decoupled routines. This decoupling of routines explains why changes in a firm's formalized MCS, for example as seen in Coloplast, does not lead to a change in the routines of the project level organization members in the firm. It also explains why routines exist in a firm, as seen in FPH, when the formalized MCS are designed to deter the existence of those routines. This ability of project level organization members to deviate from the expected behaviour, allows them to use their skill sets and make decisions that are appropriate for the situation they are facing at the time. In an innovation setting where quick reactions to new information are required (Davila, Foster, & Oyon, 2009), this flexibility would be expected. Otherwise, the formalized MCS may hinder innovation, as found by previous studies examining the relationship between MCS and innovation (Abernethy & Stoelwinder, 1991; Amabile, 1998; Dougherty & Hardy, 1996; Verona, 1999).

Hence, this study supports Sawabe and Ushio's (2009) call to separate formalized MCS from the routines for analytical purposes to reflect the peculiar feature of management accounting phenomenon, that is, formalized MCS being different from the actual practice carried out by organization members. This study adds to the existing literature by suggesting that to understand micro-processes and organizational change, researchers should focus separately on the perspectives of different groups of individuals who have the power to choose the actions they take in their day-to-day activities. This separate focus would enable researchers to identify the reasons for organization members behaving in ways that are different from what is expected.

This argument is presented in the context of the extended theoretical framework developed in this study, which builds on previous studies that used institutional theory to explain the process of change (Burns & Scapens, 2000; Lounsbury & Crumley, 2007; Lukka, 2007; Sawabe & Ushio, 2009; Sharma et al., 2010). Applying the extended framework to three different case studies shows how future studies can use the framework to explicate both change and stability of routines in a firm. For instance, the Zespri case study shows how the theoretical framework can be used in a dynamic setting where both the formalized MCS and the routines of the firm changed over time. At the other extreme, the FPH case study shows how the framework can be used in a stable setting where both the formalized MCS and the routines remained stable over time. Alternatively, the Coloplast case study shows how the framework can be used in a setting where the formalized MCS changed but the routines remained stable.

In addition, the evidence from this study contributes to our understanding of the processual view of change, where a change to formalized MCS does not always constitute a corresponding change in the practices of other organization members as expected by those initiating the change. For instance, in Coloplast, the top management implemented formalized MCS supporting open innovation practices with the expectation that project level organization members would change their approach to external collaborations and embrace the open innovation model. However, a change in actual innovation practices was not observed except for where the organization members were coerced to carry out activities in line with the changes implemented by top management. However, the changes led to other improvements in the firm that were not initially intended. The evidence presented in this thesis is in line with the findings from previous studies (Busco et al., 2007; Mouritsen, 2005; Quattrone & Hopper, 2001) that suggests that organizational changes are non-linear. Hence, to understand the process of change requires research to look at how the formalized MCS have changed as well as how the formalized MCS change actual organizational practices. In other words, this thesis draws attention to the phenomenon that MCS may be systematically changed, however, that does not always transpire into a change in organizational practices as routines of the organization may remain stable resulting in the decoupling or loose coupling of routines from rules. Therefore, the implication of this research for academics is that it entices them to think differently about MCS change by incorporating the power differences between top management and project level organization members in respect of their capacity to change the formalized MCS. In doing so, the intuition underpinning the relationship between the MCS associated rules and routines provide a mechanism for focused examination of the decoupling or loose coupling of routines from rules.

Finally, this study contributes to the open innovation literature by firstly showing how firms can use formalized MCS to implement the use of open innovation practices, and secondly, it provides an explanation for the variations in the use of open innovation practices in different firms. The implications of the three case studies is that they highlight to practitioners the different approaches by top management to open innovation adoption resulting in different routine behaviours of project level organization members. This would encourage them to think about the role of MCS in the change process and circumstances where decoupling may occur requiring actions to be taken by management if they want to achieve a particular outcome. Additionally, the improved evidence in respect of the inverse relationship between relational risk and trust with regard to external collaborations such as those associated with open innovation projects would highlight the value of trust to the practitioners as an alternative or complementary control mechanism.

The next sub-section outlines the limitations of the study.

8.4.2. LIMITATIONS OF THE STUDY

This study adopted a case study method and, as case studies are representations of the researcher's interpretations of the social reality (Humphrey & Scapens, 1996), this method of research has limitations regarding the generalizability of its results. However, in using multiple case studies it is argued that generalization with respect to the institutional theoretical framework used is possible. Moreover, the evidence from the case studies has identified factors that can be tested in future studies.

In addition, it is important to acknowledge the limitations of the research process used in this study because of problems encountered at the different case sites. Firstly, at FPH, the study encountered access limitations. As a result, the evidentiary data for this study was collected only from the respiratory and acute care division of FPH. However, as this division made up over 50% of FPH and the activities of the different divisions were similar, this study infers that this limitation in the data collection process did not alter the results. Secondly, due to the timing of this study, the observations at Coloplast are limited to the changes that had already taken effect. However, a future study has the potential to observe changes in the use of open innovation practices over a longer period in time, which could identify other contributory factors to the way in which open innovation has been implemented, as well as other changes that may take place to ensure the sustainability of open innovation practices in Coloplast.

Another limitation of this study is that it is reliant on limited interview data and analysis of archival documents. A real-time longitudinal case study of a company entering into a collaborative relationship could provide additional insights into other changes that take place; for example, does the continued use of external collaborations impact the number of R&D employees and the roles of employees. This could be one possible area for future research. The following section discusses other areas.

8.4.3. AREAS FOR FUTURE RESEARCH

Future research could test the findings of this study using different research methods to generalize the results. One such method could be the use of laboratory style experiments (Hunton & Rose, 2011); for instance, an experiment could be set up to test how top management and project level organization members behave given particular situations. For example, a group of project level organization members could be contacted and presented with a hypothetical situation. Half of the group would be given a situation where relational risk is high, and the other half given a situation where the relational risk is low. Then, both groups would be asked the same question: "would you use open innovation practices in this situation?" Additionally, asking the participants to explain the reason for their decisions could provide additional insights into the cause of the variations in the use of open innovation practices. A similar study could be done with top management, where they are asked whether they would change the formalized MCS to enable and support open innovation practices. This study could provide additional insights into the perspectives of top management in relation to their decisions to formalize open innovation processes. Moreover, as suggested above, future studies can also examine the factors that influence the perspectives of top management and project level organization members.

Future research could also use other theoretical frameworks, for example, Actor Network Theory, Ethnography, or Action Research to analyse a firm's shift from a closed to an open innovation model and gain a theoretical understanding of the role of different actors in ensuring the success of open innovation practices.

Finally, the extended theoretical framework developed in this thesis could be used to explicate the process of change or stability of routines in firms in different contexts, for example, firms' shifts to more sustainable work environments, paper-less offices, automated manufacturing, and outsourcing of non-essential services.

APPENDIX 1: DATA SOURCES

A1.1 DATA SOURCES FOR FPH

Research Activities	Case Site contact	Date	Hours
Introductory meeting	Product development manager	29/10/2009	2 hours
Site visit and product demonstration	Product development manager	14/12/2009	1 hour
Group Discussions	8 Project leaders	18/02/2010	3 hours
	7 Product development managers	18/03/2010	2 hours
One-on-one interviews	Product leader	18/03/2010	1 hour
	Product development manager	18/02/2010	3 hours
	Group manager	23/06/2010	2 hours
	CEO	16/02/2011	1 hour

Analysis of Documented Information:

Documents reviewed	• FPH Business plans for projects • FPH Vision and Values statement • FPH Code of conduct • FPH Performance evaluation policy • FPH Remuneration policy • FPH Risk management policy • FPH Investor fact sheet • FPH Industries Ltd Annual Reports for 2000 and 2001 (2 documents) • FPH information memorandum 2001 • FPH Corporation Annual reports from 2003 to 2011 (9 documents) • FPH Corporation Interim reports from 2003 to 2011 (9 documents) • Defying Gravity (Book on History of Fisher & Paykel by Keith Davies, 2004)
Presentations reviewed	• Presentation to New Zealand Society of Investment Analysts (21/11/2001) • Macquarie Equities 2003 emerging leaders conference (09/05/2003) • UBS Australasian Healthcare Conference (26/10/2004) • NZX SciTech Seminars 1 & 3 August 2006 (01/08/2006) • F&P Healthcare Presentation at Macquarie Securities Technology and Innovation Day (04/10/2010)
Websites reviewed	• FPH Company website – http://www.fphcare.com/ • NZTE Medical technologies industry profile - http://business.newzealand.com/common/files/Medical-technologies-industry-in-New-Zealand.pdf

A1.2 DATA SOURCES FOR COLOPLAST

Research Activities	Case Site contact	Date	Hours
Introductory meeting, Site visit and product demonstration	Technology Scouting Group Director	12/05/2010	1 hour
One-on-one interviews	Product development (Project) manager	12/05/2010	1 hour
	Vice President for Technology	12/05/2010	1 hour
	Technology Scouting Group Director	12/05/2010	1 hour
	Innovation Financial (R&D) Controller	12/05/2010	2 hours

<u>Analysis of Documented Information:</u>

Documents reviewed	• Mission statement for Coloplast • Corporate structure document • Enterprise risk management policy for Coloplast • Coloplast Annual reports from 1998 to 2010 (13 documents) • News articles on changes in Coloplast's innovation approach (7 news articles from February 2007 to December 2010) • Re-organizing statement from CEO (21/02/2007) • Report from Corporate Executive Board on Theme-based Innovation Pipeline • Medico Industrien report - Medtech facts and figure: Danish industry statistics 2007 • Innovation centre Denmark report on Danish Medtech cluster • Coloplast's innovation process guidelines • Coloplast's organizational chart
Presentations reviewed	• Goldman Sachs Medtech Conference – London (7-8/09/2005) • Handelsbanken conference "investment ideas in Denmark" – London (01/12/2005) • Capital Market Day Presentation (11-12/06/2006) • CFA-Denmark – Company Day Presentation (24/05/2007) • Capital Market Day Presentation (30/09/2008) • Handelsbanken's 4th Annual Danish Medtech Field Trip (25/11/2009) • Morgan Stanley European MedTech and Services Conference
Websites reviewed	• Coloplast's company website - http://www.coloplast.com • Coloplast's STOMA website - http://www.stoma-innovation.com

A1.3 DATA SOURCES FOR ZESPRI

Research Activities	Case Site contact	Date	Hours
Introductory meeting	Innovation Leader	25/11/2009	2 hour
Group Discussions	3 Innovation Leaders and Innovation Manager	23/03/2010	1 hour
One-on-one interviews	Innovation Manager	13/07/2010	2 hour
	Head of Innovation (Executive)	13/07/2010	1 ½ hours
	Innovation Coordinator	13/07/2010	1 hour
One-on-one interviews with representative of collaborative partners	Plant and Food Research	24/11/2010	2 hours
	Fonterra	10/08/2010	3 hours

Analysis of Documented Information:

Documents reviewed	• Zespri Vision statement • Zespri Mission statement • Zespri Innovation Project Description for projects discussed during interviews • Key performance indicators for Innovation leaders • Zespri Innovation Strategy for 2010 • Zespri Innovation Plan for 2010 • Zespri Gold 3 year Outlook • Zespri Annual Reviews from 2009 to 2011 (3 documents) • Zespri Annual Reports from 2004 to 2011 (8 documents) • Zespri® System documentation • Zespri Supply Chain • Zespri Production Cycle • Zespri Group Ltd Prospectus 2001 • Zespri Innovation Company Ltd Portfolio Report 2002 – 2004 • New Zealand Kiwifruit Journals 2000 – 2010 (11 books) • HortReserch annual report 2004 • Plant and Food Research report titled 'Discover, Innovate, Grow' 2010 and 2011 (2 reports)
Websites reviewed	• Zespri's company website - www.zespri.com • Plant and Food Research website - www.plantandfood.co.nz/ • New Zealand horticulture facts & figures website - www.freshfacts.co.nz

APPENDIX 2: EXAMPLE INTERVIEW QUESTIONS

GENERAL QUESTIONS

1. Can you please tell me a little about your background and your role in this company?
    - How long you have been here and what does your position in the company involve?

2. In your words, how would you define innovation and how would you define open innovation?
    - Could you please discuss some of your experiences of open innovation projects?
    - Is it common practice at this company?
    - What do you think could be the reason for this?

3. What do you think is this company's top management's perspective on the use of open innovation practices?
    - Do you think the perspectives of project level organization members are different?
    - What do you think could be the reason for this?

4. Do you have management control systems that support and enable the use of open innovation practices?
    - When did these MCS come into existence?
    - Could you explain the reason behind the initiation of these MCS?
    - How were they implemented?
    - Are these MCS frequently used in the firm?

- Why or why not?
- What role do you think these MCS play?

5. Can you explain the routines of the firm in relation to the innovation function?
    - How are project ideas generated?
    - How are they approved for further investigations?
    - What processes do you go through during the innovation process?
    - Do the routines vary?
    - In your opinion, what's the thinking behind the routines?

6. Is there anything else you believe is influencing the use of open innovation practices in your firm?

PROJECT ANALYSIS QUESTIONS

Descriptions:

- Length of the project (how was this measured?)
- No. of people directly involved (were people dedicated to the project full time?)
- Total value of the projects
- What (Who) initiated the project? What was the objective of the project? What factors were considered?
- Was there a budget? Timeframe? Any issues that needed particular attention?
- What steps followed the initiation? Who were involved or who were the stakeholders? Apart from the people directly involved who else in the company were consulted?
- When were meetings held and what was discussed?

- What resources were used for the project? Did the use of resources need to be approved and accounted for? Who controls these resources and decides on how it gets allocated?
- What were the main constraints for this project? How did these constraints impact on the project?
- What information was shared during the innovation process? Shared with who? Why? What means are used?
- Was a proposal prepared?

Project Evaluation:

- Was the project evaluated at different stages of the innovation process?
- What issues were raised?
- Were any metrics used?
- Were there any time frames set?

Team Dynamics:

- Who were involved? What divisions/functions were they from?
- What roles did they play?

Co-ordination:

- What mechanisms were used to co-ordinate between the team, inside the company and with external party?

Decisions:

- What decisions were made? Who made the decisions? What information was used? How was this information obtained?

Risk:

- What risks were involved?
- How were these risks dealt with?

Knowledge:

- How does knowledge get recorded?

Performance:

- How would you measure the performance (evaluate) a project?
- What would you consider to be a successful project?

Recording/Reporting:

- How were the costs recorded?
- Were there any IPs created? Were there any resulting assets? How and when were these recorded?

External Party:

- At what stage was it decided that an external party would be used?
- How was the external party identified? What factors were considered?
- What were the key issues discussed with the external parties?
- What risk factors were evaluated?
- How was the remuneration for the external party determined?
- At what stage did cash exchange hands?
- How do you keep track of the progress of the project?

Major Events:

- Were there any major/ unexpected events?
- How were they resolved or dealt with?
- Were there any significant lessons learnt from this incident?

Success:

- Was the project considered a success? On what basis?

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