Managing Collaborative New Product Development

Edward C.C. Faber

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MANAGING COLLABORATIVE NEW PRODUCT DEVELOPMENT

A LONGITUDINAL CASE STUDY OF THE DEVELOPMENT OF COLLABORATION BETWEEN A DUTCH AND A MEXICAN DESIGN CENTRE IN TWO SOFTWARE DEVELOPMENT PROJECTS

PROEFSCHRIFT

ter verkrijging van
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te Nijmegen

Dit proefschrift is goedgekeurd door de promotoren
prof.dr.ir. O.A.M. Fisscher
prof.dr.ir. H. Boer

en de assistent-promotor
dr. P.M. Wognum

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PREFACE

Although doing PhD research is sometimes a lonely journey, it is not an individual project. Many people have contributed to this project. In fact, the research project is a good example of the topic of this thesis: 'collaborative NPD'. The product that has been developed is a thesis containing new insights on managing collaborative NPD. These insights did not reveal themselves, such as the Ten Commandments revealed themselves to Moses, but are the products of a learning process in which many people knowing and unknowingly collaborated over a period of 32 years. My parents, family, friends, and colleagues each in their own way played an important role in this learning process. Before the background, theory, practice, analysis and results of my research into managing collaborative NPD are presented I would like to acknowledge the role people played in this collaborative learning process. Some of them I would like to explicitly mention here.

I am grateful to my assistant promotor and daily supervisor Nel Wognum for her indispensable support and guidance during the research project. Nel, I really appreciated our informal talks about research and other matters while enjoying your herbal tea. You really helped me with sharpening the logic of my reasoning and improving the semantic of my various conceptual frameworks. If there is someone who knew from the start which direction this research should be heading it is my promotor Harry Boer. Right from the start he has been an indispensable personal mentor by motivating me to work out my tentative ideas and by providing me with the right input on the right time. Thank you, Harry, for your devotion and inspiring remarks. I am grateful to my promotor Olaf Fisscher for his guidance in the final stage of the research project. Olaf, despite your late involvement you were able to grasp the essence of the research very quickly and helped me with clarifying my line of thoughts, which were sometimes rather fuzzy.

This study could not have been performed without the co-operation of the employees of the two case companies. I am grateful to all employees that spent some time with me to reflect upon their daily work. Although many employees made invaluable contributions to this research, I would especially like to mention Arno de Kok, Lucien Bruins, Frank Peeze Binkhorst, Alfo Melisse, Leo van Berkom, Rob de Graaf, Antonio Hernandez for showing me what the practice of managing collaborative NPD is about. A special word of thanks goes out to Frank Peeze Binkhorst and my Mexican friend Francisco Castellanos, better known as Paco, who have introduced me to the wonders of Mexican kitchen, helped me to get over my "cultural shock", and showed me around in Mexico. Paco, I will bear my Mexican nickname with honour.

I am grateful to Marc van Kempen for improving the English in this thesis considerably. I thank Ingrid for putting her lovely mosaic at our disposal without granting any copyrights. I also would like to thank my

colleagues at the department of Technology and Organisation for making this research journey such a wonderful experience. I especially enjoyed our study tour to Ireland, the weekly research meetings, and the lively lunch breaks in which we occasionally pulled each other's leg. I am grateful to the various roommates for creating a pleasant working atmosphere. I thank Sander Rijnders for our inspiring discussions on ideas and problems inherent in doing research. A special word of thanks goes to my *paranimfen* and good friends Anita Brans, 'the Blonde', and Frans Ruffini, 'the Beautiful'. It is a great honour to have such special persons standing beside me in my 'hour of truth'.
I am grateful to my parents for showing me the importance of education, stimulating me to get the most out of life, and for their support in good and bad times. Jan and Ann, you did a more than a fine job. I am also grateful to Elly, who has become a second mother over the past years. To all family and closest friends that I have not mentioned here by name: thank you for always being there for me. Finally, I want to thank Sonja for distracting me when I was too focused on my research (sorry Frans), helping me formulating and fine tuning my *stellingen*, taking care of the cover design, and for her love and friendship. I am glad that this thesis never got between us and I am looking forward to the new stage in our relationship we are about to enter…

Edward Faber

Nijmegen, 9 July 2001

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COLLABORATIVE NPD

Letter from Mr Smith

"Now that I have been in Mexico for half a year, I thought it was about time to drop you a note and let you know how things are going. Unfortunately, 'Not good' is about the best I can say, though things didn't start off too badly. On my first day the finance manager, Mr. Gonzales, greeted me in English, and I found him very knowledgeable and friendly. [..] From my office I noticed that it was well past 9:00 A.M. before the office staff arrived, although working hours were 9:00 to 6:00. So I made a note to add "punctuality" to the agenda for the first staff meeting, which was scheduled for a little later in the morning. [..] During the next few weeks I was rather surprised to find myself bombarded with problems from my managers who, instead of solving the problems themselves, wanted my advice or, worse, wanted me to make their decisions for them. I didn't want to come down too hard on them since I'd just arrived, but I did want to make it clear that I would expect them to handle their responsibilities essentially by themselves in the future – which I did at a meeting called specifically for that purpose".

Eva S. Kras, 1989, 'Management in Two Cultures: Bridging the gap between U.S. and Mexican managers', p.11

1.1 Introduction

The fragment on the previous page provides just a sense of the problems that managers might run into when trying to manage work processes in a foreign culture. Suddenly, managerial practices that have proved to be effective in the past do not seem to work anymore. This is no exceptional situation. Nowadays it is a rather common situation for managers who are responsible for international New Product Development (NPD) projects.

In this thesis NPD is defined as the set of activities that transform new product ideas into new product designs (de Weerd-Nederhof, 1998). New products are increasingly being developed in alliances of different companies, which are not uncommonly located in different cultures and time zones. Managers of such alliances, are among other things, confronted with differences in cultural values, work routines, interpretation schemes, strategy and goals. Identifying and bridging these differences is a complex managerial issue. This thesis addresses this managerial issue by exploring the development of collaboration in two software development projects jointly executed by a Dutch and a Mexican local design centre within one multi-national company.

This chapter starts in section 1.2 by discussing the changes in markets and technology that created a new changed set of imperatives for NPD in many industries. This is followed by a discussion on the role of collaboration in NPD in section 1.3. It is concluded that NPD is increasingly conducted across boundaries of organisation, time and place, which is referred to as collaborative NPD in this thesis. This is followed by a discussion on the problems inherent to collaborative NPD in section 1.4. From a review of the collaboration literature in section 1.5 it is concluded that still little is known about the factors that contribute to the success and failure of collaborative NPD due to limited attention for the development of collaboration and the practice of collaborative NPD management. This brings us to the present research. The research problem and objectives are discussed in section 1.6. This chapter ends with an outline of this thesis in section 1.7.

1.2 Changes in markets and technology

Over the past decades, NPD has become a focal point of competition in many industries due to changes in markets and technologies. Wheelwright & Clark (1992:2) summarise these changes as:

- *Intense international competition*. International competition has intensified because an increasing number of companies are capable of competing at a world-class level. International markets have become more accessible due to removal of trade barriers and liberalisation of markets, which were formerly governed by state enterprises.

- *Fragmented and demanding markets*. At the same time customers have grown more sophisticated and demanding. Customers are more sensitive to nuances and differences in a product and are attracted to products that provide solutions to their particular problems and needs.
- *Diverse and rapidly changing technologies*. The growing breadth and depth of technological and scientific knowledge provides engineers and marketeers with more options to fulfil the needs of these more demanding and fragmented markets.

These changes in market and technologies have created a new set of imperatives for NPD in many industries. Wheelwright & Clark (1992) argue that speed, efficiency and quality are the main imperatives for today's NPD. To succeed, companies have to be fast and responsive to changing customer demands and moves of competitors. At the same time companies have to bring new products and processes to the market in an efficient way because the number of technologies have increased while at the same time product introduction rate has increased (Bayus, 1994). Moreover, companies have to attract and satisfy customers in a very competitive market, which increasingly means offering a product that is distinctive and innovative. In line with this Bolwijn & Kumpe (1989 and 1994) argue that from the 1990's onwards companies simultaneously have to meet the customer requirements of price, quality, diversity, delivery time and uniqueness. This implies that companies have to be cost efficient, quality oriented, flexible and innovative at the same time.

1.3 Collaboration in NPD

When developing new products, processes or services, collaboration both within and between organisations is needed to deal with the aforementioned changes in markets and technology.
Prompted by the more stringent market demands cross-functional collaboration has received considerable attention by practitioners and academia. Due to the complexity of NPD processes, each activity tends to be executed by a separate function (e.g. Marketing, Design and Manufacturing functions) within the company. Insufficient collaboration between these functions can lead to various problems such as (Paashuis, 1997): products not living up to customer expectations, poor manufacturability of products, re-work on products and slow information exchange between functions inducing long development lead times. Practitioners and academia have picked up these problems by looking for mechanisms that promote cross-functional collaboration. Wheelwright & Clark (1992) summarise these attempts as a transition from a serial and batch mode of interaction, which is characterised by sparse, infrequent, one-way and late communication, to a more integrated problem-solving

mode of interaction, which is characterised by rich, frequent, two-way, and early communication.
Besides cross-functional collaboration within companies, cross-organisational collaboration on NPD has become increasing fashionable in recent decades (Hagedoorn & Schakenraad, 1990). Companies have been re-organising their activities by concentrating on their core competencies and collaborating with companies, which possess complementary core competencies (Prahalad & Hamel, 1990). Cross-organisational collaboration allows companies to secure economies of scale and scope, to spread risks and high costs of NPD, to enhance effectiveness and efficiency of NPD processes through partnerships with customers and suppliers, and to gain access to markets and technology (Littler et al., 1993). Cross-organisational collaboration is not restricted to national borders. High-tech companies increasingly collaborate across borders of nation states, cultures, time and place (see Boutellier et al., 2000). Enabled by advanced information and communication technology (ICT) specialists of different companies are increasingly collaborating across boundaries of place and time. Moreover, to exploit rapidly changing market opportunities companies engage in flexible and temporary alliances, often referred to as virtual organisations. Rapid changes require such alliances to be formed quickly. Yet at the same time the development of collaborative relationships requires time. In order to cope with these opposing requirements companies are forming R&D networks encompassing organisations whose competencies might be beneficial in the future and whose collaborative nature has been assessed (Wildeman & Stoffelen, 1996).
In this study, NPD conducted across boundaries of organisation and possibly across cultures, time and place is referred to as collaborative NPD. Collaborative NPD poses new challenges for NPD managers. These challenges will be discussed in the next section.

1.4 Problems inherent in collaborative NPD

In this thesis collaborative NPD is defined as the product development activities that are jointly executed by two or more relatively independent organisations. Various studies (Levine & Byrne, 1986; Harrigan, 1988; Bleeke & Ernst, 1993; Wildeman & Kok, 1997) indicate that companies encounter serious difficulties in achieving the anticipated benefits from collaboration on NPD. These studies indicate that 40 to as many as 60 percent of all alliances[1] fail. Below important reasons for these high failure rates are discussed.
First and foremost, collaboration is a matter of people working together. This requires a close working relationship between people of different companies and organisational functions. Developing such a relationship

1 With alliances collaborative agreements between more or less independent organisations are meant. The concept of alliance is used rather generally and includes collaborative NPD projects, joint ventures, R&D consortia, strategic alliances, virtual organisations, etc.

is by no means a straightforward task. People may differ with respect to their educational, social and cultural backgrounds, which affects their terminology, cognitive schemes, values and work practices (Hambrick et al., 1998). Such diversity may be necessary for the development of new innovative products, yet at the same time this diversity may disrupt collaboration.

Secondly, partner organisations may pursue different strategic goals with the collaboration. For instance, it is not uncommon nowadays that competitors collaborate on the development of new technologies. Such collaboration requires partners to share information and give insight into their ways of working. However, strategic interest may induce partners to act against what is agreed upon, hide the truth or try to extract confidential information from their collaboration partners. Organisations may defend themselves by drawing up thick legal contracts and strictly monitoring partner's activities. However, these safeguards do not guarantee that partners will not act opportunistically. Trust between partners is thus an important condition for an open and constructive collaboration.

Thirdly, the success of collaboration is dependent on the commitment of all partners involved. As Ohmae (1989) puts it "alliances are like marriages – they only work when both partners do". Collaborative NPD gives rise to complex interdependencies between organisations because no single partner has formal authority over another partner. Every adjustment has to be discussed and jointly agreed upon (Klein-Woolthuis, 1999). Over time partners may lose interest in the collaboration, which may induce them to block important decisions and to renegotiate the collaboration. Hence ensuring and maintaining management commitment of both partners is a critical success factor in collaboration.

Finally, collaboration may be difficult due to the geographical dispersion of partners. Depending on the extent of geographical dispersion, partners may to some extent need to collaborate distantly, using advanced information and communication technology. However, time zone differences may limit the window of opportunity to schedule meetings with partners. Moreover, misunderstandings may arise due to the lack of richness of communication media, which is needed for effective problem solving (see Nohria & Eccles, 1992). For instance, e-mail messages may be misinterpreted and it may be difficult to follow who says what in videoconferences.

To conclude, collaborative NPD is a complex undertaking due to the diversity, interdependence and dispersion of the partners involved. The question that arises is how companies can increase the success of collaborative NPD. In the next section, therefore, collaboration literature will be reviewed.

1.5 Research on collaboration

In response to the low success rates of inter-firm collaboration several researchers have tried to identify success prescriptions for collaboration (see Littler et al., 1993 for an overview). However, the quest for managerial prescriptions is seriously hampered due to the following reasons.

Firstly, it is difficult to define what is meant by collaboration 'success'. Researchers have used different criteria to judge whether collaboration is successful, which makes it hard to compare findings of various studies. While some researchers have used collaboration duration to measure success others have used goal attainment or perception of collaboration to measure success.

Secondly, the "hard" methodological approaches advanced by many researchers are not likely to capture the "soft behavioural" aspects of collaboration such as trust and commitment (see for a similar argument Parkhe, 1993). Yet these soft behavioural aspects are frequently reported as critical success factors for inter-firm collaboration (see Wildeman & Stoffelen, 1996; Wildeman & Kok, 1997 and Zaheer et al., 1998). Still relatively few researchers employ qualitative research designs to study collaboration, which may deepen our understanding of the socio-dynamic aspects of collaboration. Indeed as Bettis (1991, cited in Parkhe, 1993) observed "current norms of the field seem strongly biased towards large sample multivariate statistical studies."

Thirdly, collaboration is a highly evolutionary process but rarely studied as such (notable exceptions are Ring & Van de Ven, 1994; Doz, 1996; and Ariño & de la Torre, 1998). By relying on static research designs, many researchers have explored how differences in initial conditions relate to the collaboration outcomes. Although process descriptors such as trust and commitment are sometimes included in research designs, there is little attention for the process of collaboration. Consequently, there is still limited understanding of how initial conditions influence the process of collaboration, how these conditions are being changed over time and help shape collaboration outcomes.

Fourthly, researchers have predominantly concentrated upon the strategic management issues surrounding collaboration (see Contractor & Lorange, 1988; Powell, 1990; Ciborra, 1991; Hagedoorn, 1993). Typically researchers have focused on explaining alliance formation patterns (see Geringer, 1991). These studies have improved our insight into why firms collaborate, but have little to say about the factors that contribute to the success and failure of collaboration. Consequently, there is still limited insight into the operational management of collaboration. This induced Spekman et al. in a recent overview article to call for research that focuses on the practice of alliance management.

To conclude, there is still limited understanding in the factors that contribute to the success and failure of collaboration. This brings us to the present research.

1.6 Present research

In this section the research problem and objectives are discussed. Furthermore, the research design is briefly discussed.

1.6.1 Research problem and objectives

To sum up the arguments presented so far: in this chapter the importance of collaboration for today's NPD was emphasised. NPD was defined as the set of activities that transform new product ideas into new product designs (de Weerd-Nederhof, 1998). Collaborative NPD was defined as NPD that is jointly executed by two or more organisations, possibly across boundaries of cultures, time and place. It was argued that managing collaborative NPD is complex due to the interdependence, differentiation and geographical dispersion of the partner organisations involved. Research indicates that 40-60% of all alliances fails. The factors contributing to the success and failure of collaboration are studied extensively. However, there is still limited understanding of these factors. There are two important reasons for this. Firstly, researchers have paid little attention to the dynamics of collaboration. Most researchers have concentrated on explaining performance from initial conditions without considering the mediating processes. Secondly, little attention has been paid to the practice of collaborative NPD management. Most researchers have concentrated on strategic management issues such as: in which situations do firms collaborate and with whom (partner selection)? Very few researchers have focused on the operational management of partnerships. From these observations the conclusion was drawn that if we want to improve our understanding of what contributes to collaboration success and failure, we need to look at the development of collaboration from a managerial perspective. The research problem was therefore formulated as:

> *How do initial conditions influence the development of collaboration in NPD and which role do management interventions play in this process?*

Initial conditions refer to the structural properties of a partnership and its constituting partners that influence the collaboration. With collaboration the working together of two or more relatively independent organisations is meant. Management interventions refer to the efforts of managers to influence collaborative NPD processes. These concepts will be worked out more thoroughly in chapter 3. Furthermore, in order to address the research problem, research questions will be formulated in chapter 3. In answering the research problem two objectives will be pursued:

1. Contribute to the current knowledge on factors influencing the success and failure of collaborative NPD by gaining deeper insight into the practice of collaborative NPD management;
2. Contribute to the further development of process research on organisational change by developing a descriptive process framework for studying the development of collaborative NPD projects.

The research can be characterised as explorative theory-developing research. The aim is to develop theory on the factors that contribute to the success and failure of collaborative NPD. The insights that are generated in this research will be summarised in propositions, which can be used to guide further research. The research strategy is not purely inductive as promoted by Glaser & Strauss (1967). Instead a more informed inductive research strategy has been used. In order to focus the research and to reduce the risk of data overload a descriptive process framework and research questions have been developed prior to the fieldwork. However, to include emerging insights the descriptive conceptual framework and research questions have been refined during fieldwork.
In order to address the research problem a research design has been developed, which is briefly discussed in the next section and discussed more extensively in chapter 4.

1.6.2 Research design

Major steps in designing the present research have been the decisions on the research strategy, selection of cases, and focus of data collection. These decisions will be outlined here and discussed in more detail in chapter 4.
The research strategy can be characterised as longitudinal case study research. Case study research is an empirical inquiry that investigates a phenomenon within its real-life context (Yin, 1994). The decision to use this particular research strategy has, among others things, been based on the following considerations. Firstly, the research problem is explorative by nature. As noted in section 1.5 there is still limited understanding of the development of collaboration. Case study research is a suitable research strategy to study such unexplored areas (Van der Zwaan, 1992). Secondly, case study research can offer in-depth understanding of the process of collaboration and offers the possibility go beyond the relationships found between initial conditions and collaboration outcomes that are found in mainstream collaboration research. Thirdly, case study research allows researchers to study the unfolding of incidents, actions and activities in real life contexts (Pettigrew, 1997). Case study research allows researchers to grasp the contextual and processual aspects of collaboration, which is regarded as an important condition to advance theory building on collaboration (see Parkhe, 1993).

It was decided to study two collaborative NPD projects jointly executed by a Mexican and a Dutch local design centre within one multi-national company. Studying the development of collaboration between two local design centres within one multi-national company has the advantage that it reduces the complexity of the research design. Given the time constraints and labour intensity of conducting longitudinal case study research it was decided to study just two cases. The cases have been selected because they represent typical cases of companies starting to collaborate for the first time (or with little experience) across borders of time, place and organisation. Moreover, the cases fill theoretical categories with respect to how they were organised (subcontracting versus insourcing) and managed (local versus expatriate project manager). The two collaborative NPD projects have been studied over their entire life cycle for a period of approximately one year.
Finally, given the limited attention that has been paid to the practice of collaborative NPD management it has been decided to study the development of collaboration as much as possible from the perspective of the involved managers. Therefore the data collection focused on the interaction between project managers and steering group managers and between project managers and project workers. Thus the present research stays close to the problems that managers encounter when having to manage a collaborative NPD project.

1.7 Outline of thesis

The present thesis is structured as follows (see Figure 1). Since the practice of collaborative NPD management has receive little attention in the collaboration literature, chapter 2 focuses on perspectives on collaborative NPD management. The collaboration, NPD and (project) management literature is reviewed in search of building blocks of collaborative NPD management. In chapter 3, these building blocks are used to develop a descriptive process framework for studying the development of collaboration in NPD. In chapter 4, the research design and operationalisation of the descriptive process framework are discussed. Subsequently, in chapter 5,6 and 7 the case study findings are presented. Chapter 8 discusses the similarities and differences between the cases. The findings are confronted with theory and based on these findings propositions are developed. Finally, in chapter 9 the conclusions are presented, the research is evaluated and directions for further research are stipulated.

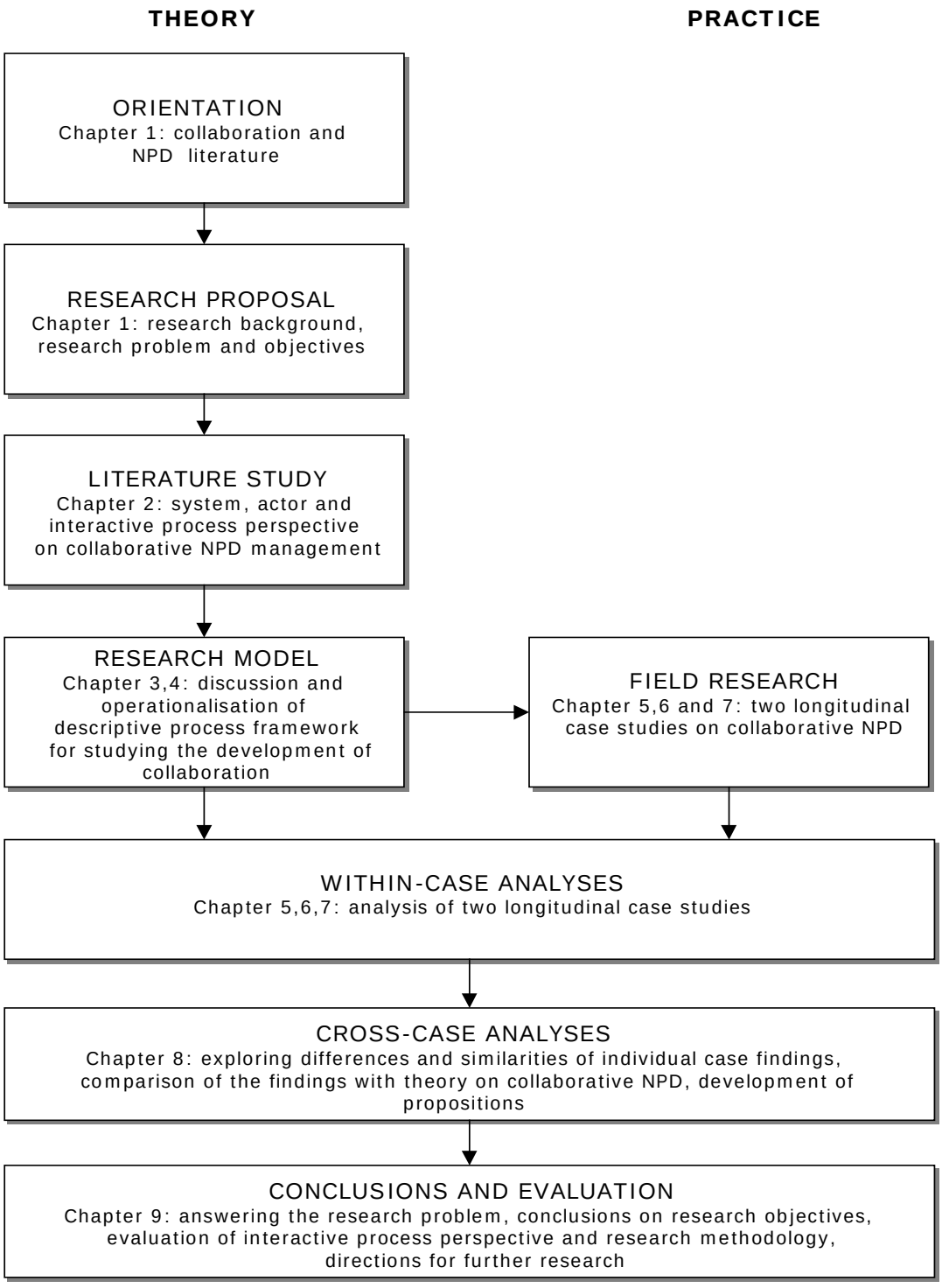

Figure 1: Outline of thesis

2

PERSPECTIVES ON COLLABORATIVE NPD MANAGEMENT

Letter from Sr. González

"When Mr. Smith first arrived here, he had absolutely no knowledge of Mexico or our customs. He assumed that U.S. methods could be introduced directly, without modifications, and that efficiency would result if sufficiently pressure were exerted in order to achieve conformity. He did not realize that he was asking us to change customs which have existed for hundreds of years and are deeply embedded in all Mexicans. People can't just suddenly change the way they have been doing things all their lives. [..] As an example of Mr. Smith's attempt to turn us all into robots, let me explain his views about time. To him, time is top priority in every aspect of our working life. He once said, 'Time is money,' so we shouldn't waste any of it. Therefore, he has endeavored to enforce strict regulations on punctuality, rest periods, and hours of work. On the other hand he gives little or not recognition to those of us who work late without complaint, nor does he have any patience for staff members who have legitimate problems of punctuality, such as erratic public transportation."

Eva S. Kras, 1989, 'Management in Two Cultures: Bridging the gap between U.S. and Mexican managers', p.18

2.1 Introduction

In the previous chapter it was argued, based on a review of collaboration literature, that there is still limited understanding of the factors (mechanisms) that contribute to the success and failure of collaborative NPD. Furthermore, it was argued that in collaboration literature little attention has been paid to the practice of collaborative NPD management. In this chapter, therefore, theories that might improve our understanding of collaborative NPD management will be reviewed. The focus here is on collaboration, NPD and (project) management literature. These bodies of thought can be viewed as the building blocks of collaborative NPD management as depicted in Figure 2 below.

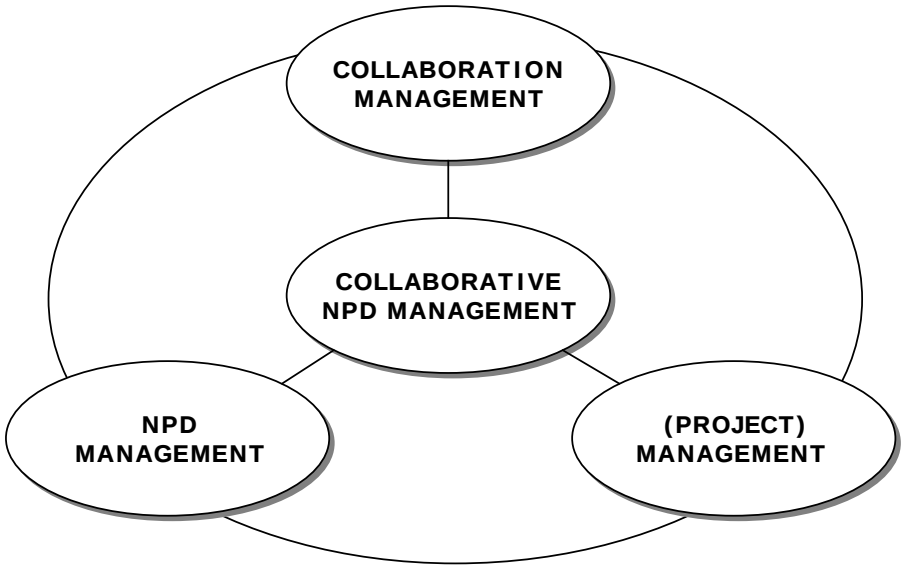

Figure 2: Collaborative NPD management

Organisation theory is characterised by a tremendous fragmentation. Therefore, in section 2.2 the differentiation in organisation theory is discussed. From this discussion it is concluded that two perspectives prevail in organisation theory: the system perspective and the actor perspective. In section 2.3 system-oriented theories on collaborative NPD management are discussed. In section 2.4 actor-oriented theories on collaborative NPD management are discussed. From the discussion of the system-oriented and actor-oriented theories it is concluded that both provide a partial yet complementary view on collaborative NPD management. The interactive process perspective is introduced in section 2.5 as an alternative for the system and actor perspective. This chapter ends in section 2.6 with concluding remarks.

2.2 Differentiation in organisation theory

Organisation theory is characterised by a tremendous fragmentation, which is partly a reflection of the complexity of organisations and partly

a reflection of the interests of researchers. Any researcher, no matter how inductive in approach, uses some kind of conceptual model to interpret and analyse phenomena. Each of such models greatly influences what we tend to see and not see when doing empirical research.

Several researchers have put forward schemes to structure theoretical perspectives prevalent in organisation theory (see Burrel & Morgan, 1979; Astley & Van de Ven, 1983) by identifying the underlying worldviews. For instance, by distinguishing between assumptions about the nature of social science and society Burrel & Morgan (1979) arrive at four world views or paradigms in organisation theory: the functionalist, interpretative, radical humanism and radical structuralism paradigm.

An alternative way to organise theoretical perspectives is to look at the assumptions about the nature and direction of causal structure. According to Markus & Robey (1988), differences in causal structure of theoretical models can be identified along three dimensions: causal agency, logical structure and level of analysis. Causal agency refers to the assumptions researchers make about the nature of causality: whether external forces cause change, whether people act purposively to accomplish intended objectives, or whether changes emerge relatively unpredictably from human conduct and events. Logical structure (see Mohr, 1982) refers to the time span of theory (static versus dynamic) and to the hypothesised relationships between antecedents and outcomes (variance versus process theories). Variance theories focus on co-variations between certain inputs (independent variable) and certain outputs (dependent variables). Processes are treated as a black box. Furthermore, causes are positioned as necessary and sufficient for outcomes to happen. In contrast, process theories focus on the process of change. Activities, actions and events shape outcomes, which are understood as states. In process theories causes are not positioned as necessary and sufficient for outcomes to happen. Instead, process theories assert that outcomes may happen under certain conditions, but that this outcome may also fail to happen, for instance due to random events. Finally, level of analysis refers to the entities about which the theory poses concepts and relationships (individuals, organisations and/or societies).

Based on differences in causal agency and level of analysis we have distinguished two perspectives in the collaborative NPD literature: the system and the actor perspective (see for a comparable distinction Slappendel, 1996). The main characteristics of these perspectives are summarised in Table 1 below. System-oriented theories tend to explain the success and failure of collaboration, NPD and projects by referring to structural properties of organisations and groups. These theories tend to conceptualise organisations as open systems composed of interdependent parts or subsystems. Despite the dynamic conceptualisation of organisations, most system-oriented theories tend to

have a static outlook on organisations. Stoelhorst (1997) argues that two developments seem to explain the drifting away from the original focus on dynamics to the eventual preoccupation with statics. The first development is the tendency of researchers to study organisations as closed systems[2]. The second development is the adoption of quantitative methods to measure social structures. Both induce researchers to focus on the relatively enduring and measurable structural characteristics of organisations as opposed to the more processual aspects of organisations[3]. Finally, system-oriented theories tend to view organisations as wholes and are therefore said to be holistic. However, by focusing on wholes they tend to ignore the role of purposive actions of actors.

Actor-oriented theories tend to explain the success and failure of collaboration, NPD and projects by referring to the properties of individual actors and their actions. These theories tend to view organisations as the product of interacting actors. System-oriented theories are criticised for viewing organisations as systems without reference to the motivations and interpretations of people in them (see Silverman, 1970). Despite the dynamic conceptualisation of organisations actor-oriented theories not necessarily need to have a dynamic outlook on organisations. Depending on researchers' preferences and assumptions, actor-oriented theories may have a dynamic or static outlook. Hence both process and variance theories can be observed. Actors and interactions are the main levels of analysis in actor-oriented theories. The main differences between system and actor-oriented theories are summarised below.

Table 1: Dominant perspectives in organisation theory

Causal structure	System perspective	Actor perspective
Causal agency	Predominantly the properties of organisations and groups	Predominantly the properties of individual actors and their (inter-)actions
Logical structure	Primarily static outlooks Variance theory	Dynamic and static outlooks Variance and process theory
Level of analysis	Organisations and groups	Actor and (inter-)actions

[2] Burrel & Morgan (1979: 160) explain why: "As a heuristic device the dynamic essence of the systems concept can be maintained as events are conceptualised in terms of an open field of continuous action. At an empirical level, however, the issue of boundary definition almost inevitably leads to an attempt to identify relatively static system parts. Open system theory, when put into practice at an empirical level, often ends up as an abstracted form of empiricism which defies the processual nature of the systems concept."

[3] Burrel & Morgan (1979:180) doubt the usefulness of this approach: " [A system] expresses itself in a partial manner through various 'structural' characteristics [..] It is these temporal structural manifestations of a more fundamental and ongoing process which organisational researchers tend to seize upon for the purpose of empirical research. The organisation is often equated with these structural characteristics while the processual aspects of systems are ignored [..] The incongruence between theory and method which this reflects is a fundamental problem facing social system theorists in general. The processual nature of 'system' does not lend itself to meaningful study through the use of quantitative snapshots of objectified social structure."

To conclude, on the basis of differences in causal structure we have distinguished the system from the actor perspective on collaborative NPD management. The risk of these schemes is that one oversimplifies the rich variety of theoretical approaches in literature. There are always exceptions to this scheme. However, mainstream research on collaborative NPD management can be captured reasonably well with this scheme. Meaningful differences were found between system and actor-oriented theories. As we will see a growing number of researchers have adopted an alternative perspective labelled the interactive process perspective, which will be discussed in section 2.5. Firstly, the system and actor perspective on collaborative NPD will be discussed in section 2.3 and 2.4 respectively.

2.3 The system perspective on collaborative NPD management

In this section system-oriented theories related to collaborative NPD management are discussed. In section 2.3.1 collaboration literature is reviewed. In section 2.3.2 NPD literature is reviewed. In section 2.3.3 project management literature is reviewed. Finally, in section 2.3.4 conclusions are drawn on the system perspective on managing collaborative NPD.

2.3.1 Collaboration literature

In collaboration literature the system perspective has been most clearly expressed in those studies that use the concepts of strategic, cultural and organisational fit to explain collaboration success and failure. Below this body of thought is reviewed for clues on how to manage collaborative NPD.

The main argument of these studies (see Harrigan, 1985; Barkema et al., 1996; Douma, 1997; Saxton, 1997; Van Oudenhoven et al., 1998) is that organisations should strive to collaborate with partners that have complementary strategic interests and compatible cultural values and practices. These studies primarily focus on the formative stages of collaboration. The underlying assumption is that careful partner selection is of utmost importance to collaboration success.

The studies have produced contradictory findings. For instance, whereas Harrigan's (1985) findings suggest that cultural similarity influences alliance success positively, Saxton's (1997) findings indicate that cultural similarity has a negative impact on alliance success. Moreover, the findings are difficult to compare due to various conceptualisations of collaboration performance. Some researchers have adopted subjective measures of collaboration success such as manager's judgements of satisfaction. However, these measures may be biased by the interest of managers in the outcomes (Yan & Gray, 1995). Other researchers have adopted more "objective" measures such as partnership duration and termination (see Harrigan, 1988). These measures are also problematic because duration and termination of collaboration can both signal

success and failure. Indeed, as Hellan et al. (1992, cited in Littler et al., 1993) note collaborations may have a specific objective and are dissolved when this is achieved.
Another flaw of these studies is that they tend to neglect the dynamics of strategic and cultural fit. Most studies assume that if strategic and cultural fit exist at the start of a collaborative venture, collaboration will proceed successfully. However, strategic and cultural differences may not reveal themselves until the collaboration is implemented and the strategic interests of partners may change over time (see case study findings). Moreover, partners may learn to overcome cultural differences during their collaboration. This is supported by studies that include the history of collaboration as a control variable. Prior experience has been found to moderate the impact of cultural differences (see Van Oudenhoven et al., 1998).
To conclude, in system-oriented theories on collaboration collaborative NPD management is mainly viewed as partner selection issue. Managers need to assess differences in partner's strategic and cultural context and select partners with complementary strategic interests and compatible cultures. Little attention is paid to how managers can ensure strategic and cultural fit over time.

2.3.2 NPD literature

In NPD literature the system perspective has been most clearly expressed in research streams which Brown & Eisenhardt (1995) in an overview article have labelled "NPD as rational plan" and "NPD as disciplined problem solving". Below both research streams[4] are reviewed for clues on how to manage collaborative NPD.
Rational plan research focuses on a very broad range of determinants of financial performance. Brown & Eisenhardt regard the studies of Cooper (1979), Cooper & Kleinschmidt (1987) and Gupta & Wilemon (1990) as hallmarking rational plan studies. According to Brown & Eisenhardt (1995) this stream of research emphasises that successful NPD is primarily about (1) careful planning of a superior product, which fits with market demands, and (2) execution of this plan by competent and well co-ordinated cross-functional teams that (3) receive the support of senior management. Typically these researchers have used questionnaires in which informants were asked to explain why a product succeeded or failed using a wide variety of factors. Relationships have been found between factors such as cross-functional teams, cross-functional communication, planning, senior management support, early customer involvement and financial performance. Brown & Eisenhardt (1995) mention several shortcomings of these studies among which a lack of theoretical foundation and too much reliance on single informants and retrospective sense making. However, despite these criticisms the studies

[4] Here we will primarily draw on Brown & Eisenhardt (1995)

provide a broad range of factors that contribute to NPD success and failure.
Disciplined problem solving research is focused on how product and NPD organisation influence process performance in terms of speed and productivity. Brown & Eisenhardt regard the studies of Imai et al. (1985), Clark & Fujimoto (1991) and Wheelwright & Clark (1992) as hallmarking disciplined problem-solving studies. Brown & Eisenhardt (1995: 359) typify this research stream as follows "Successful product development is seen as a balancing act between relatively autonomous problem solving by the project team and the discipline of a heavyweight leader, strong top management, and an overarching product vision". Most studies agree that cross-functional teamwork, heavyweight project leaders and high internal communication enhance NPD performance (see Imai et al., 1985 and Wheelwright & Clark, 1992). However, there is little appreciation of the socio-dynamic aspects of managing product development teams. For instance, how should project managers raise commitment of project members and stimulate teamwork? Furthermore, indeed as Brown & Eisenhardt (1995) argue, heavyweight project managers almost seem "superhuman" in their skills and duties. More recent studies within this stream stress the importance of more experimental design strategies through frequent iterations, frequent milestones and intensive testing to speed up NPD in uncertain and rapid changing environments (see Eisenhardt & Tabrizi, 1995 and Verganti et al., 2000). The findings are interesting because they depart from the dominant view of speeding up NPD by extensive planning and creating overlap.
To conclude, the view on collaborative NPD management that emerges from the research streams discussed, with the exception of recent studies on rapid NPD (see Eisenhardt & Tabrizi, 1995), is mainly one of careful design, planning and control of NPD projects. The structural aspects of managing NPD are emphasised and the socio-dynamic aspects of managing collaborative NPD tend to be neglected.

2.3.3 Project management literature

Project management literature is a clear example of the system perspective on management. Below this body of thought is reviewed for clues on how to manage collaborative NPD.
Project management, as a craft, probably dates back to the rise of our civil society. Constructing pyramids, discovering overseas worlds and military operations all can be seen as projects. As a profession, project management is a more contemporary phenomenon. The term 'project' was used for the first time in the Second World War to denote military operations (Frame, 1989). Nowadays the term 'project' is often used to denote the temporary and once-only configuration of interdependent activities that are executed with a predefined result and start and end-date (Van Aken, 1997). Given the pulse-like (unique, temporary and reciprocally interdependent) characteristics of NPD activities (Verganti,

1994) it is not surprising that NPD activities are often conducted in projects. As a scientific research area project management is a fairly new and rapidly expanding phenomenon.

Project management literature predominantly focuses on instruments for project planning and control (Van Aken, 1997). Many publications focus on project planning techniques (see Kliem, 1986) and project planning software (see Levine, 1988). The underlying assumption of many planning techniques is that project tasks are clearly and unambiguously defined (Packendorf, 1995). The role of project managers is to define the project task and to identify the activities (or work packages) that need to be performed to fulfil this project task. However, many projects are difficult to analyse completely in advance and seem to require a more experimental approach (see Lindkvist et al., 1998).

Others try to develop a systematic project management approach. For instance, Wijnen et al. (1984) have developed a project management model comprising three parallel processes: phasing, deciding and controlling. Projects are structured in six phases, using five decision-making documents, which are related to five control aspects (time, costs, quality, information and organisation). Bos & Harting (1998) have developed a similar model. Besides time, costs, quality, information and organisation they add communication as sixth control aspect. Compared to Wijnen et al. (1984) they pay more attention to the socio-dynamic aspects of project management such as leadership. However, their attention to leadership remains marginal. Only one variant of leadership theory (situational leadership theory) is discussed. More or less the same applies for Groote et al. (1990). They do pay attention to social competencies such as team management, creativity and conflict resolution, but they give few directions with respect to leadership. Finally, Hendriks et al. (1997) have developed a project management approach based on eight activities, which can be observed more or less in every project. The main strength of their approach is the process view on project management. They acknowledge that projects cannot be captured in linear plans and incorporate feedback loops into their activity models. However, a weakness is that the authors do not address the issue of leadership in their project management approach.

On the whole there is surprisingly little attention for leadership issues in project management literature. Very often project management handbooks do not mention or only refer to one particular leadership theory. The emphasis is put on planning and control. Project management approaches are presented as universal instruments that can be applied in any project, although they are often not well founded scientifically. For instance, the project management approaches often do not account for differences in task complexity and team composition.

To conclude, within project management literature management is predominantly conceived of as a matter of systematic planning and control. The assumption is that when project managers carefully

'engineer' their project, success will follow. Various kinds of normative project management approaches are presented to support project managers. However, these approaches are often based on experiences of practitioners and not on thorough scientific research.

2.3.4 Conclusion

System-oriented theories of collaboration, NPD and project management are characterised by a focus on system-structural aspects such as partner selection, team composition, phasing of projects and the planning and control of project work. The theories reviewed stress the rational and goal-directed behaviour of actors. The assumption is that when project managers carefully 'engineer' their projects, success will follow. Consequently, there is considerable optimism about the possibilities of influencing human behaviour.

2.4 The actor perspective on collaborative NPD management

In this section actor-oriented theories related to collaborative NPD management are discussed. In section 2.4.1 collaboration literature is reviewed. In section 2.4.2 NPD literature is reviewed. In section 2.4.3 general management literature is reviewed. Finally, in section 2.4.4 conclusions are drawn on the system perspective on managing collaborative NPD.

2.4.1 Collaboration literature

In collaboration literature the actor perspective has been most clearly expressed in those studies, that put forward actor and relational concepts such as trust to explain collaboration success and failure. Below this research stream is reviewed for clues on how to manage collaborative NPD.

Trust is frequently mentioned as an important, and sometimes even as *the* most, critical success factor in collaboration literature (see Wildeman & Stoffelen, 1996). Motivated by the narrow rational economic reasoning of transaction cost theory (see Williamson, 1975) several researchers (see Zaheer & Venkatraman, 1995; Nooteboom, 1996 and Klein-Woolthuis, 1999) have examined the role of trust in collaboration. Trust is seen as an alternative to the governance mechanisms promoted by transaction cost economics (contracts, control and integration), which are needed to reduce the risk of opportunistic behaviour of partners. Trust is seen as a lubricant for collaboration relationships. For instance, Anderson & Narus (1990) argue that trust leads to functional rather than destructive conflict. Zaheer & Venkatraman's (1995) findings indicate that trust reduces opportunism, making safeguards unnecessary and collaboration relationships more efficient. Finally, Klein-Woolthuis (1999) has found that affection-based trust increases the chance of technological success by stimulating openness and joint problem solving, and by reducing the perceived need for monitoring, opportunism and conflict. The main

strength of these studies is that they have forcefully demonstrated the importance of trust for the process and outcomes of collaboration. However, these studies largely leave the question of how managers can create trust unanswered.
To conclude, actor-oriented theories have stressed the importance of trust for collaboration, yet leave managers with few clues on how to establish and manage trust.

2.4.2 NPD literature

In NPD literature the actor perspective has been most clearly expressed in what Brown & Eisenhardt (1995) have labelled communication web research. Below this research stream[5] is reviewed for clues on how to manage collaborative NPD.
Communication web research is narrowly focused on internal and external communication and its effects on group performance. Brown & Eisenhardt regard the work of Allen (1971 and 1977), Ancona & Caldwell (1990) and Dougherty (1990 & 1992) as hallmarking communication web studies. Typically, these researchers have studied communication by asking professionals to keep track of their communications for a period of time.
Early studies of Allen (1971 and 1977) were focused on the flow of information in R&D groups. The results of these studies demonstrate the importance of external communication to group effectiveness. Especially the presence of gatekeepers – highly competent and communicative individuals who communicated with people outside their speciality – has been found to enhance performance. Building on these early studies on communication, Ancona & Caldwell (1990) studied the content of external communication. They developed a typology of external communication, which they refer to as boundary spanning behaviours. They distinguish between ambassador, task co-ordination, scouting and guard behaviours. Ambassador behaviours refer to political activities such as lobbying for support and resources, as well as buffering the team from outside pressure. Task co-ordination refers to the co-ordination of technical issues. Scouting consists of general scanning for useful information and guarding refers to the avoidance of external release of information. Interestingly enough they have found that the frequency of external communication is not a significant predictor of group effectiveness. Instead the most successful product development teams engaged in a more comprehensive communication strategy, combining ambassador and task co-ordination behaviours. In contrast, less successful product development teams used communication strategies characterised by fewer types of boundary spanning behaviours and less overall external communication.

[5] Here we primarily drawn on Brown and Eisenhardt (1995)

Dougherty (1990 and 1992) has studied internal communication of cross-functional project teams. She has found that various functional departments did have different thought worlds or systems of meaning, which form a barrier for cross-functional communication. Successful development projects are characterised by interactive and iterative combining of systems of meanings. In contrast, failed projects are characterised by sequential attention by functional groups in such a way that each departmental view dominated a certain project phase.
The main strength of these studies is that they shown the importance of communication and how teams communicate both internally and with their environment. A major shortcoming is that these studies tend to neglect the organisational context of communication.
To conclude, facilitating internal and external communication and overcoming communication barriers is seen as an important management task in this stream of research. Communication needs to be planned in terms of team composition (e.g. having gatekeepers) and supported during NPD in terms of ambassador (e.g. lobbying for resources), co-ordination and scouting activities (Ancona & Caldwell, 1990).

2.4.3 Management literature

In management literature the actor perspective has been most clearly expressed in leadership theory. Below this body of thought is reviewed for clues on how to manage collaborative NPD.
Leadership refers to the behaviour of supervisors when trying to influence the activities of subordinates to the realisation of a particular goal or set of goals (Van der Vlist, 1991). Probably one of the first to articulate a leadership theory was Machiavelli (1468-1527), who described certain tactics to influence and exert power over people. As several excellent overviews of the streams in and results of leadership theory exist (see Van der Vlist, 1991 for an overview), we will not provide one here. Instead the focus is on contemporary leadership theories.
Leadership theory aims at understanding the relationship between leadership behaviour or styles and the effectiveness of work groups. Several variants of leadership theory exist, each of which has different assumptions on when particular leadership styles are effective. For instance, *stage theories of leadership* (see Van Amelsvoort & Scholtes, 1994) assert that every group development stage calls for a different leadership style. It asserts that in the start-up stage a more directive form of leadership is called for whereas in later stages a more participative or coaching leadership is effective. In contrast, *situational leadership theory* (Hersey & Blanchard, 1977) asserts that leadership styles need to be adapted to the maturity level of subordinates. According to this normative theory leaders need to balance task-oriented and relationship-oriented behaviour depending on the subordinate's

willingness and ability to take responsibility for performing tasks[6]. *Path-goal theories of leadership* (House, 1973) assert that leadership styles should be adapted to the context[7] in which superiors and subordinates are working. In concordance with these contextual characteristics, superiors should either be directive, considerate, participative or result-oriented. Finally, leadership is also intensively investigated in cross-cultural settings. *Cross-cultural leadership theories* assert that managerial attitudes, values and behaviours differ across national cultures (see Bass et al., 1979 and Hofstede, 1980b). For instance, Hofstede (1980b) found that in high power distance cultures (e.g. Mexico) subordinates expect superiors to act autocratically, whereas in low power distance cultures (e.g. the Netherlands) subordinates expect superiors to consult them. The findings suggest that in general directive or autocratic leadership styles are preferred in high power distance cultures, whereas more consultative leadership styles are preferred in low power distance cultures.

Although these studies often link leadership behaviour to the organisation of work, they tend to ignore the impact of organisational factors such as senior management commitment and feasibility of project goals, rules and procedures on group effectiveness. However, within leadership theory there seems to be a move towards the development of more context-specific leadership models (see Van der Vlist, 1991). Finally, there is considerable optimism about the ability of leaders to adapt their leadership style to various conditions.

To conclude, the focus of leadership theories is how to influence the behaviours of subordinates. The main assumption is that appropriate leadership styles greatly enhance group effectiveness. What most studies on leadership tend to ignore is that leadership is just one of the factors that influence group effectiveness. Although it is recognised that different situations call for different leadership styles little attention is paid to how the organisational context influences group effectiveness.

2.4.4 Conclusion

Actor-oriented theories on collaboration, NPD and leadership are characterised by the attention for the effects of relational attributes such as trust and communication and individual attributes such as leadership style on group performance. These theories seem to usefully complement the system-oriented theories on collaboration discussed in section 2.3. The question that arises is whether and how these insights can be integrated into one single theoretical framework. This question will be addressed in the next section.

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[6] Limited motivation and ability requires high task and low relationship behaviour of superiors (*directive leadership*). Sufficient motivation and low ability requires high task and high relationship behaviour of superiors (*coaching leadership*). Limited motivation and sufficient ability requires low task and high relationship behaviour (*supporting leadership*). Finally, sufficient motivation and ability of subordinates requires low task and low relationship behaviour of superiors (*delegating leadership*).

[7] This context comprises task, work group and individual characteristics.

2.5 The interactive process perspective on collaborative NPD management

System-oriented theories and actor-oriented theories on collaboration, NPD and (project) management each seem to provide just one side of the empirical phenomenon central to this study: managing collaborative NPD. System-oriented theories stress the system-structural aspects of collaborative NPD management by drawing attention to issues such as organisational design, careful planning and control of project work. Actor-oriented theories stress the socio-dynamics aspects of collaborative NPD management by drawing attention to issues such as trust, communication and leadership. Both theoretical perspectives seem to provide a partial, yet complementary view on managing collaborative NPD. Individually these theories cannot sufficiently explain the success and failure of collaborative NPD. Too often, however, system-structural aspects have been studied without reference to the socio-dynamic aspects and vice versa. The challenge as we see it is to develop a view which more accurately captures the complex practice of collaborative NPD and incorporates both system-structural and socio-dynamic aspects.

The kind of research envisaged is similar to the interactive process perspective as promoted by Slappendel (1996) for studying innovation processes. This perspective can be distinguished from the theoretical perspectives discussed above by its explicit focus on the interconnections between structure and action over time. The interactive process perspective has been most clearly expressed in longitudinal studies on innovation and organisational change processes (see Pettigrew, 1985 and Van de Ven et al., 1989). In collaboration literature the process studies of Ring & Van de Ven (1994) and Doz (1996) can be seen as examples of the interactive process perspective. This research builds on the work of these authors. In the next chapter the ideas of these authors will be used to build a descriptive process framework for studying the development of collaboration. Before doing this we first will discuss the theoretical and methodological implications of adopting an interactive process perspective.

2.5.1 Theoretical implications

Incorporating structure and action in one coherent theory has not been without problems in social and organisation theory. Poole & Van de Ven (1989) argue that this stems from the opposing assumptions about action and structure which lie underneath both theories.

System-oriented theories start their analysis with the organisation as a whole and locate individual action according to its place and function within the system. Moreover, individual action tends to be seen as being determined by structural constraints. Actor-oriented theories, on the other hand, start their analysis with the individual and proceed to find the systems only as the aggregated outcome of individual actions.

Moreover, individual action tends to be seen as being purposive and unfolding free of any structural constraints (voluntarism). These assumptions regarding action and structure form a paradox, which has been difficult to incorporate in one single coherent theory (see Giddens, 1984). Poole & Van de Ven (1989) refer to this as the structure - action paradox and suggest four ways to deal with its problems.

Method 1: accept the paradox and use it constructively

One method to address the paradox is to acknowledge the existence of both views and advance a research in which both views are used to study the same phenomenon. For instance, Hassard (1991) studied a fire department from the four paradigms distinguished by Burrell & Morgan (1979). However, Hassard observed that it is difficult to compare the findings of the different organisation analyses because each perspective tends to answer different research questions.

Method 2: clarify connections between organisational levels

A second method to address the paradox is by spelling out the various levels of analysis in the opposing propositions and clarifying the connections between them. According to Poole & Van de Ven (1989) theories of social action by Arrow (1970) and Coleman (1973) are attempts to apply this strategy. Poole & Van de Ven (1989: 571) summarise their strategy as follows: "Basically their approach assumes individuals can act and organizations cannot. They attempt to specify models by which individual actions can combine to create collective outcomes". However, according to Van de Ven & Poole (1989) this approach tends to overemphasise action and under-emphasise structure since it stresses that only actors have purposes and can act.

Method 3: use time to relate structure and action

A third method to address the paradox is to use time to link action and structure. According to Poole & Van de Ven (1989) Archer's (1982) theory of morphogenesis is an attempt to apply this strategy. Archer (1982) proposes that action and structure influence each other, but in alternating cycles over time. She distinguishes three periods. Firstly, a period in which pre-existing structures dominate behaviour. Secondly, a period when new structural arrangements emerge out of action. Thirdly, a period of structural elaboration, in which changes in structures are institutionalised. According to Poole & Van de Ven (1989) such a model tends to reflect a bias for structure because structure is more easily observed than individual motives and behaviour.

Method 4: advance a new conception of the structure-action relationship

Finally, a fourth method to address the paradox is to develop new theories of the structure – action relationship, which dissolve the opposite assumptions. Structuration theory as developed by Giddens (1979, 1984) provides such a theory. Structuration refers to the process of production and reproduction of social systems via members'

application of rules and resources. Structure refers to the rules and resources people apply in social interaction. A system is the outcome of the application of rules and resources, the observable patterns of interactions between people and groups. Giddens' main argument is that structures have a dual nature: they are both the medium and outcome of action. Hence structures make action and the existence of social systems possible. Nevertheless, structures only exist as they are produced and reproduced in human action and interaction. Giddens assumes that the reciprocal relationship between structure and action is mediated by modalities of structuration, which represents the actor's individual appropriation of structure for use in a particular context (Poole & Van de Ven, 1989). A number of organisational theorists have adopted and used structuration theory (e.g. Ranson, Hinnings & Greenwood, 1980; Barley, 1986; Willmott, 1987; Poole & DeSanctis, 1992; Orlikowski, 1992; Meeus, 1994) to study organisational behaviour.
Tempted by the ideas of structuration theory, the author's ambition was to use structuration theory to conceptualise the structure–action relationships prevalent in collaborative NPD. However, after several attempts to apply structuration theory (see Faber et al., 1999) to the domain of study, it was decided to use the duality of structure notion solely as a sensitising concept. That is, the notion that action presupposes structure and that structures are reproduced through action has been adopted. However, it has been decided not to use Giddens' specific elaboration of this relationship and his specific conceptualisation of structure as rules and resources for the following reasons:

- The unclear conceptual status of structuration modalities, which are understood as the interpretative schemes, facilities and norms people apply in human action and interaction. Considerable effort is needed to translate these concepts to empirical research (see Meeus, 1994).

- Giddens' notion of the duality of structure is difficult to study empirically. As Archer (1982) has argued Giddens seems to conflate structure with action. Conflation concerns the problem of reducing structure to action or vice versa (Barley & Tolbert, 1997). Archer (1982) argues that Giddens is unwilling to examine the interplay between structure and action because he assumes that the two presuppose one another. Structure and action are not seen as two independently given sets of phenomena, *a dualism*, but as two faces of the same phenomena, *a duality*. Structuration theory is, therefore, not immediately susceptible to empirical research. One needs to treat structure and action as a dualism in order to study their interplay empirically. Thus in empirical research it is difficult to hold on to the duality of structure notion. Therefore researchers building on

structuration theory have separated structure and action analytically (see Barley, 1986).

- The difficulty of using existing structuration research strategies for studying the development of collaboration in NPD. This can be illustrated by considering the first two steps of the research strategy proposed by Barley & Tolbert (1997) for studying structuration processes.

  - The first step of their strategy is to define an institution at risk of change. For instance, Barley (1986) studied the institution of professional dominance of radiologists over technicians in hospitals. This institution was at risk of change due to the introduction of a new imaging device. In the case of collaborative NPD one can think of the forming of a shared project culture, which neutralises differences in national, organisational and professional culture (see David, 1996). Charting the development of a project culture would require researchers to observe the interaction between project workers and between project workers and project manager. This was difficult to realise in this study due to the dispersion of project members and the possibilities of observations.

  - The second step is to map out flows of actions and to derive scripts (modalities) of particular periods of time. For instance, Barley (1986) mapped out the interactions between radiologists and technicians when conducting CT scans. In order to avoid data overload Barley focused on specific interaction situations. In this research this was difficult to realise due to the changes in team composition, the multitude of interaction settings and the possibilities of observations.

To conclude, making structuration theory applicable for studying collaborative NPD would be a PhD research on its own. The researcher preferred studying the empirical phenomenon of collaborative NPD management to developing means to study collaborative NPD management. Therefore, it was decided not to use structuration theory.

The method used in this research

In this research the idea of structure being both the medium and outcome of action was used as a sensitising concept. The strategy adopted in this research is to explain collaborative NPD outcomes by analysing the reciprocal relationship of collaboration conditions and management interventions over time. In the spirit of Giddens' idea of

methodological bracketing[8] equal status is attributed to the analysis of actions of project members, referred to as process analysis in this research, and the analysis of collaboration conditions, referred to as context analysis in this research. The paradoxical relationship between action and structure will be addressed by assuming that structure logically predates the action, which transform it (see Barley & Tolbert, 1997). This is in line with the third method discussed above.

2.5.2 Methodological implications

Adopting an interactive process perspective requires a methodological re-orientation. Cross-sectional research designs, which dominate in articles published in highly rated research journals such as Administrative Science Quarterly and Academy of Management Review, are not capable of capturing the dynamics of organisational change processes. Instead, researchers need to advance longitudinal research designs. Researchers are required to search beyond correlated variables (variance research) and explore what factors and mechanisms drive these organisational change processes and their outcomes (process research). Process research is fundamental to understand the dynamics of organisational processes and to develop and test theories of organisational change. According to Pettigrew (1990: 269-270) important requirements for process research are:

- *Embeddedness*: researchers should study processes across a number of levels of analysis. Processes are embedded in contexts and can only be studied as such. In other words, Pettigrew advocates multi-level research designs.

- *Temporal interconnectedness:* researchers should study processes in past, present and future time. Pettigrew argues that understanding the sequence and flow of events over time is a crucial requirement for the process scholar. He concludes "history should not be regarded as just an event in the past but is alive in the present and may shape the future".

- *Structure and action:* researchers should study the interplay between structure and action. In line with Giddens (1984), Pettigrew argues that structures or context should not be seen as just process constraints. In fact processes are both constrained by structures and shape (maintain or modify) structures.

[8] With methodological bracketing the distinction between the two principle ways structural properties of social systems may be studied are meant. Giddens distinguishes, for analytical purposes, between institutional analysis and analysis of strategic conduct. Institutional analysis brackets the strategic conduct of actors and treats structural properties as "chronically reproduced rules and resources" (Giddens, 1984:375). Analysis of strategic conduct brackets institutions as socially reproduced and concentrates upon "how actors reflexively monitor what they do; how they draw upon rules and resources in the constitution of interaction" (Giddens, 1984:378).

- *Holism*: a search for holistic rather than linear explanations of process. Pettigrew warns for what he calls "the myth of the singular or grand theory of social or organisational change". According to Pettigrew it is very unlikely that single variables can explain organisational change. Rather researchers should attempt to theorise about constellations of causal forces that shape the process and its outcomes (Pettigrew, 1997).

- *Explain process outcomes*: researchers should link process analysis to the explanation of outcomes. For Pettigrew the purpose of processual analysis is to account for and explain the 'what', 'why' and 'how' of links between context, processes and outcomes.

These normative requirements have been used to shape the present research. The development of collaboration has been studied across multiple levels of analysis (embeddedness) over time (temporal interconnectedness). The focus here has been on the interaction between structure (collaboration conditions) and action (management interventions) over time. Finally, the present research aims to explain the outcomes of collaborative NPD by analysing the relationships between initial conditions, management interventions and outcomes.

2.6 Concluding remarks

In this chapter system-oriented and actor-oriented theories on collaboration, NPD and (project) management have been reviewed. From this literature review it has been concluded that both theoretical perspectives provide a partial, yet complementary view on managing collaborative NPD. The interactive process perspective has been introduced as a perspective that could provide a more encompassing view on managing collaborative NPD. What sets this perspective apart from the other theoretical perspectives is that it explicitly focuses on the interconnections between system-structural and actors-processual aspects over time. Adopting an interactive process perspective requires researchers to address the paradoxical relationship between structure and action. Structuration theory provides a highly abstract framework for conceptualising the structure-action relationship. However, the notions of structural theory proved to be too vague to be of use for this research. Therefore a more pragmatic approach has been taken. The duality of structure has been treated as a sensitising concept guiding the research. The strategy adopted in this research is to explain collaborative NPD outcomes by analysing the reciprocal relationship of collaboration conditions and management interventions over time. In the spirit of Giddens' idea of methodological bracketing, equal status has been attributed to the analysis of actions of project members, referred to as process analysis in this research, and the analysis of collaboration conditions, referred to as context analysis in this research. Adopting an

interactive process perspective also has important methodological consequences. It requires researchers to advance process research using longitudinal research designs. Based on the insights of the actor-oriented and system-oriented theories and in line with the interactive process perspective as discussed in this chapter, a descriptive process framework for studying the development of collaboration in NPD is developed in the next chapter.

3

TOWARDS A DESCRIPTIVE PROCESS FRAMEWORK

Letter from Mr. Smith

After three months in Mexico, I decided to try a different tactic with the managers in our regular meeting, so I announced that we would have a more U.S. –style meeting. You know strictly informal, loosen-the-tie and feet-up-on-the-desk type. But instead of relaxing and enjoying the informality, the managers appeared embarrassed, though they didn't comment. [..]Anyway, following a short pause, the meeting turned to business topics. The big push was still productivity, and we proceeded to lay down the basic outline for a new, integrated procedural program. [..] About two weeks later each manager presented me with a beautifully laid-out document which contained all the basic concepts we had discussed previously. It was an impressive presentation and they all received well-deserved compliments for a fine job. The details of practical implementation were not discussed because I wanted to leave that up to them. Finally I felt I was on the right track. Three weeks later I decided to check on their progress but, Bob, in only one section had the manager even attempted to implement the new program –can you believe it!"

Eva S. Kras, 1989, 'Management in Two Cultures: Bridging the gap between U.S. and Mexican managers', p.18

3.1 Introduction

In chapter 1 the research problem has been formulated. The first step in addressing this research question will be made in this chapter. The purpose of this chapter is to develop a descriptive process framework for studying the development of collaboration in NPD. In section 3.2 the structure of the descriptive process framework is discussed. Pettigrew's (1985 and 1990) contextual process framework is used to structure the descriptive process framework into a context, process and content of change. These elements are subsequently discussed in more detail in sections 3.3, 3.4 and 3.5. Subsequently the descriptive process framework is summarised in section 3.6. On the basis of the descriptive process framework empirical research questions are formulated in section 3.7. This chapter ends in 3.8 with concluding remarks.

3.2 Structure of the model

In this section the general structure underneath the descriptive process framework is discussed. The structure of the descriptive process framework is based on Pettigrew's (1985 and 1990) contextual process framework for studying organisational change processes for the following reasons. Firstly, the framework provides a set of concepts that are targeted at longitudinal process studies on organisational change. Secondly, the theoretical assumptions underneath this framework comply with those of the interactive process perspective. Pettigrew (1990) argues that researchers interested in studying organisational change should explore the context, content and process of change (see Figure 3). Change processes are embedded in contexts and should be studied as such.

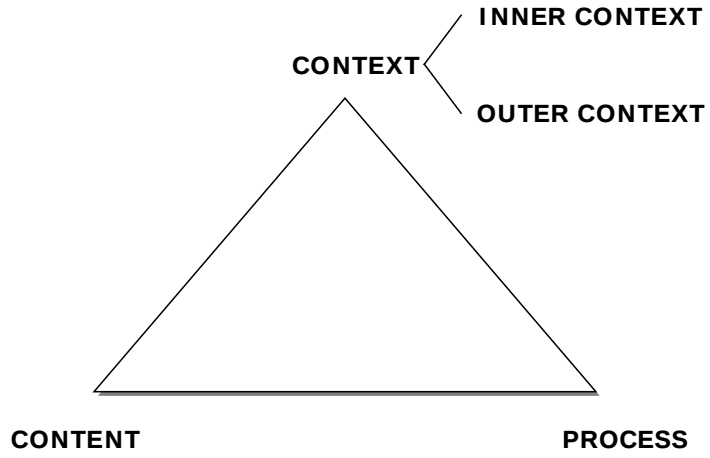

Figure 3: Contextualist process framework (Pettigrew, 1985)

The context is divided into an inner and an outer context. The inner context refers to the antecedent conditions of change, and the structural, cultural, and political environment through which the ideas of change

proceed. The outer context refers to features of the economic, political and sectoral environment in which an organisation is located. Using the structuration theory, Pettigrew regards the context of change as both the medium and outcome of organisation processes. The content refers to the particular area of change under examination. Finally, the process of change refers to the actions, reactions, and interactions of the various parties that seek to move the organisation from its present to its future state.
In the next sections the context, process and content of change are worked out in more detail.

3.3 Content of change

In this section the content of change is discussed. In this research the content of change refers to the project organisation that is set up to facilitate the collaboration between the partners. In order to conceptualise project organisations we need to have a conceptualisation of organisations. In section 3.3.1 the process-based model of organisations is discussed. With this conceptualisation in mind project organisations are conceptualised in section 3.3.2.

3.3.1 Process-based model of organisations

Different conceptualisations of organisations can be found in literature. The focus of these conceptualisations is closely connected to the paradigmatic assumptions and the research interests of the researcher. For instance, Pfeffer (1978), being interested in the internal politics of an organisation, conceptualised organisations as coalitions of powerful constituents and political systems. Galbraith (1977), being interested in organisation design requirements stemming from information uncertainty, conceptualised organisations as information processing units. In a series of studies conducted by the Technology & Organisation research group of the University of Twente, the emphasis was put on the transformation processes that are performed in an organisation. Consequently the following conceptualisation of organisations has been used (see Boer & Krabbendam, 1993):

> An organisation is seen as a purposeful system of people and means, which together perform certain activities or processes necessary to transform inputs into outputs that are useful for its environment, in order to achieve its objectives.

This conceptualisation of organisations has been used to develop a Process-based Model of Organisations (PMO). Hulshof (1976) developed the first generation of PMO, which has been further developed by Krabbendam (1988), Boer (1991), and Boer & Krabbendam (1993). Recently, Schuring (1997) has extended the model to incorporate dynamics. PMO has been used to study innovation processes (During,

1986), manufacturing systems (Krabbendam, 1988; Boer, 1991; Draaijer, 1993; Ruffini, 1999 and Megens, 1999), NPD systems (Fisscher, 1991, Paashuis, 1997; de Weerd-Nederhof, 1998 and Wognum & Faber, 2001), continuous improvement teams (de Lange-Ros, 1999) and quality systems (Koeleman, 1995). These research projects have not only benefited from the use of the model but also contributed to its development. In this study the PMO will be used to conceptualise organisations. By doing so it has been possible to build on the research tradition and established insights.

PMO regards organisations as open systems, which are dependent upon their *environment* for their inputs and outputs. The environment consists of suppliers, customers, competitors, governments, labour markets etc.

To transform inputs into outputs, activities are performed. A set of transformation activities is called a *process*. Processes are divided into primary, support and management processes. *Primary processes* are the activities that are directly aimed at the transformation of inputs into outputs desired by customers within the environment of the organisation. External and internal changes or interrupts create disturbances in the primary processes of an organisation and influence its effectiveness and efficiency. In order to cope with these disturbances organisations have maintenance and management processes. These can both be used pro-actively or re-actively to cope with internal and external changes. *Maintenance processes* are aimed at supplying other processes with, both quantitatively and qualitatively, sufficient people and resources to perform the transformations. Management processes are concerned with directing and intervening in both the primary and maintenance processes. *Management processes* are subdivided into three different categories of processes; strategic, adaptive and operational management processes, which are often executed at different levels in an organisation. Strategic management refers to the decision-making process regarding the customers an organisation wants to serve and products or services it wants to produce. Adaptive management refers to measures aimed at changing the structural properties of organisations. Finally, operational management refers to measures aimed at influencing the course of processes by monitoring and controlling the day-to-day activities without being aimed at changing the structural properties of organisations. Thus in contrast to adaptive management both the organisation and the environment are regarded as given and left untouched.

People and *means* perform these processes. People need knowledge to perform these processes. The knowledge embodied in people (e.g. experience and skills) and means (e.g. methods and techniques) is labelled *technology*. People perform activities in the pursuit of various personal and organisational *goals*. PMO recognises that people and groups within an organisation may pursue different and sometimes opposing goals. However, not all people and groups possess the same

power to enforce their goals on others. The dominant coalition in organisation decides what goals will be pursued.
Processes, people and means are co-ordinated by means of organisational arrangements. *Organisational arrangements* are defined as the more or less, durable, formal and informal, mechanisms to divide and co-ordinate the constituent activities of the distinct processes. Organisational arrangements can be divided into structural and cultural arrangements. Structural arrangements refer to the directives (e.g. rules and procedures) that result from the agreements made within an organisation (cf. Schuring, 1997). Whereas structural arrangement can be designed for cultural arrangements can only be developed. Cultural arrangements are defined as (Schein, 1985 and 1996):

> "a pattern of basic assumptions – invented, discovered or developed by a given group as its learn to cope with its problems of external adaptation and internal integration – that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems".

3.3.2 Project organisation

Following PMO, as discussed in the previous section, organisations can be described in terms of goals, people, means, processes and organisational arrangements. This research focuses on collaborative NPD projects. These projects can be regarded as temporary organisations composed of two or more partner organisations, which collaborate on NPD for a limit period of time as depicted in Figure 4.

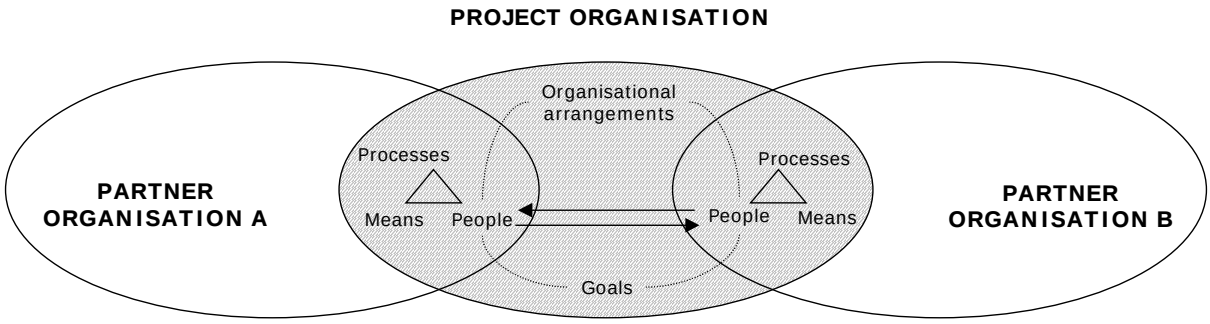

Figure 4: Project organisation

People perform processes using various means within a context of organisational arrangements and goals of the project organisation and within the context of the participating partner organisations. In order to accomplish the project goals people need to collaborate and hence communicate with each other (depicted as arrows in Figure 5).
Project organisations have characteristics that distinguish them from permanent organisations. Firstly, project organisations are temporary with a distinct start and finish date. Time is limited from the start and handling time is even more important than in normal organisations (Lundin & Sőderholm, 1995). Secondly, project organisations cut

through organisational boundaries. Members of project organisations are often derived from different functional departments and different partner organisations. Hence, project members usually have two bosses: their project manager and their functional boss. Depending on the project organisation (functional, lightweight, heavyweight or autonomous team structure) functional and project managers may exert more or less power (Wheelwright & Clark, 1992). Moreover, project members are often only partly involved in a project and their involvement may change over time. Hence, the organisational boundaries of project organisations are rather dynamic. Project members may come and go depending on the priority setting of NPD managers.
Building on the PMO project organisations are defined as temporary and dynamic networks of *people*, who collaborate and perform *processes* using various *means* to achieve individual and shared *goals*, and in which the work is divided and co-ordinated by a variety of *organisational (structural and cultural) arrangements*.

3.4 The context of change

In this section the context of change is discussed. As it is impossible to describe the context of change in all its details, researchers have to focus on specific aspects or dimensions of this context. As stated in chapter 1 collaborative NPD is complex due to the differentiation of the involved partners. These differences may be necessary for technology development but at same time may disrupt the collaboration between people. As such these differences between partners constitute an important context for collaborative NPD. The strategic and cultural context of partners are frequently mentioned in collaboration literature as causing problems in partnerships (see Harrigan, 1985; Barkema et al., 1996; Douma, 1997; Saxton, 1997 and Van Oudenhoven et al., 1998). Therefore it has been decided to conceptualise the context of change as the strategic and cultural context of collaboration.
Each partner brings both a strategic and a cultural context to the collaboration, which may enable and disrupt their collaboration as depicted in Figure 5.

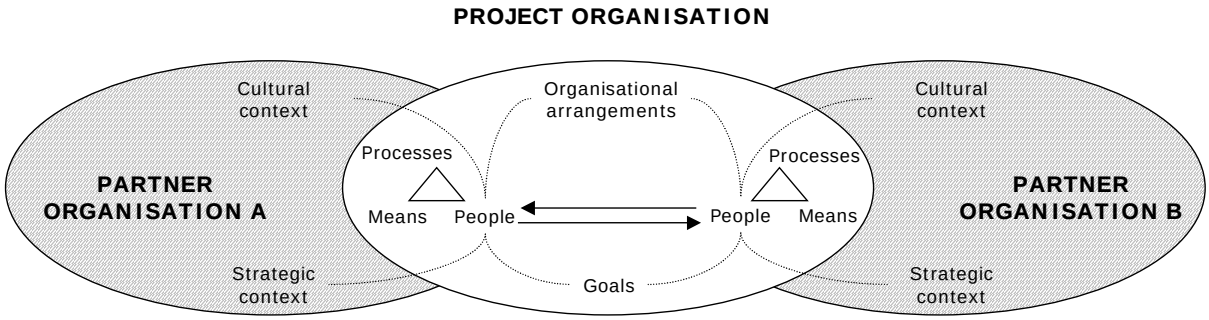

Figure 5: project organisation and the context of change

In section 3.4.1 the strategic context and in section 3.4.2 the cultural context of partners is discussed in more detail.

3.4.1 Strategic context

Doz & Hamel (1998) argue that the strategic context allows, or prevents partners' wholehearted commitment to the collaboration (1) by shaping the strategic significance and scope partners assign to the collaboration, (2) by setting the tone of the relationship, and (3) by setting partners' expectations about the outcomes. In this study the strategic context refers to the strategic goals partners hope to accomplish with the collaboration, the importance partners attach to the collaboration and the dependency on other partners. Strategic goals refer to the ambitions that partners hope to reach with the collaboration. For instance, partners may collaborate in order to develop new competencies or to gain access to new markets. Strategic importance refers to the priority partners attach to the collaboration. This greatly influences the commitment of partners to help each other and allocate resources (people and means) to a project when NPD activities are behind schedule. Finally, dependency refers to the extent to which partners feel that they are dependent on other partners to accomplish their tasks and to reach goals.

3.4.2 Cultural context

Besides a strategic context partners also bring a cultural context to the collaboration. The cultural context is defined as the collective programming of the mind that distinguishes the members of one group or category of people from another (Hofstede, 1994).
Culture manifests itself in different ways ranging from implicit to explicit manifestations. In Figure 6 these are depicted, as the layers of an onion, indicating that symbols are the most explicit and values as the most implicit manifestations of culture.

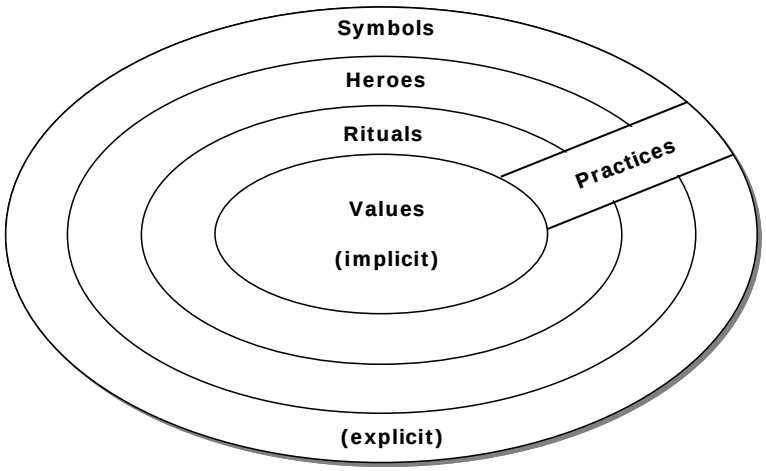

Figure 6: The 'onion diagram': manifestations of culture at different levels of depth (Hofstede, 1994)

On the surface layer culture manifest itself as symbols such as words, gestures, pictures and artefacts. Hofstede defines heroes as people, alive or dead, real or imaginary, who possess characteristics which are highly appreciated in a culture and who serve as role models. Rituals are defined as collective activities, technically superfluous in reaching desired ends, but which are considered as socially essential. Examples of rituals are ways of greeting and paying respect to others. Together, rituals, heroes and symbols are referred to as practices. On the deepest layer culture manifests itself as values. Values are defined as broad tendencies to prefer certain state of affairs to others. Values are invisible, except in their influence on people's behaviour. In contrast to practices, values are difficult to observe and change. Moreover, although people may share similar practices, they may differ with respect to the value attached to these practices, which may give rise to misunderstandings.

Culture also manifests itself at different levels. At the highest level the culture of a nation or regional society is found. The shared meanings ascribed to in a specific organisation are often referred to as corporate or organisational culture. Finally, particular functions within organisations: marketing, R&D, production, etc. tend to share certain professional orientations. These shared orientations are commonly referred to as professional culture. There is considerable debate among researchers about the extent to which these different types of cultures influence organisational behaviour. Some researchers argue that national culture is rarely present in companies (see Maurice et al., 1980) or that it is overpowered by organisational culture (see Ivanier, 1992 cited in Meschi & Roger, 1994). Others have argued that national culture is predominant when compared with organisational culture (Hofstede, 1980a , Laurant, 1983, and Meschi & Roger, 1994).

Based on first-hand experience in a European R&D project (see Wognum & Faber, 2001) and insights gained from a pilot case study (Faber & Wognum, 1997) we decided to focus on the impact of national culture on collaboration. Differences in national culture were found to cause all kinds of misunderstandings and conflicts in collaboration. In the research design we therefore tried to minimise the influences of organisational and professional culture and to highlight the influence of national culture differences, by selecting two software development projects jointly conducted by a Dutch and a Mexican design centre within one single multinational company.

National cultural differences can be described in terms of dimensions (see Hofstede, 1980a and 1994). The main idea behind these dimensional approaches is that every culture distinguishes itself from others by the specific solution it chooses for coping with problems common to all societies. Hofstede (1994:13-14) found differences with respect to how countries deal with:

- Social inequality in relation to authority, which he refers to as the *power distance dimension;*
- Dealing with uncertainty, which he refers to as the *uncertainty avoidance dimension;*
- The relationship between the individual and the group, which he refers to as the *individualism – collectivism dimension*;
- The implications of being born a boy or a girl, which he refers to as the *masculinity – femininity dimension*.

In this research we are interested in cultural differences with respect to how people manage time (time pacing) and exchange information (communication) for reasons discussed below.

Time pacing

Time pacing refers to people's way of managing time in order to finish work by deadlines (cf. Gersick, 1988). Time is increasingly viewed as a resource that organisations must manage (e.g. time to customer and just in time). Projects are per definition temporary. In the context of NPD short lead times have become increasingly important over the past few decades (see Vesey, 1991). Consequently much research attention has been devoted to how to speed up NPD (see Gupta & Wilemon, 1990; Clark & Fuijmoto, 1991; Eisenhardt & Tabrizi, 1995). In time-critical NPD projects it is therefore of utmost importance that people have a "sense of urgency". However, research indicates that people from different nations (see Lewis, 1996 and Trompenaars & Hampden-Turner, 1998) differ with respect to how they manage time. For instance, Lewis (1996) regards Mexicans as multi-active people who are not very interested in schedules or punctuality. In contrast, he regards the Dutch as linear-active people who stick to schedules and are punctual. This research, therefore, explores how cultural differences in time pacing will affect collaborative NPD and how managers cope with these differences.

Communication

Communication refers to people's way of exchanging information with other people. In NPD management literature (see Allen, 1971 and 1977; Katz, 1982 and Pinto & Pinto, 1990) internal and external project communication is frequently mentioned as a critical success factor for NPD. However, research indicates that communication across borders of cultures is far from unproblematic (see Hofstede, 1980a and 1994 and Hambrick et al., 1998). For instance, Hofstede found differences among cultures with respect to how superiors and subordinates communicate with each other. In high power distance cultures such as Mexico management directives are seen as indisputable orders, whereas in low power distance cultures such as The Netherlands managers need to convince their subordinates. This motivated us to focus on the impact of cultural differences in communication on collaborative NPD and how managers cope with these differences.

3.5 The process of change

In this section the conceptualisation of the process of change is discussed. In this study the process of change refers to the development of collaboration in NPD. As stated in the first chapter studies dealing with the processual aspects of collaborative NPD are scarce. Two important exceptions are the studies of Doz (1996) and Ring & Van de Ven (1994). Both are discussed below.

Doz (1996) conceptualised the evolution of collaboration in collaborative NPD as a learning process. He found that successful projects were highly evolutionary and went through a sequence of interactive cycles of learning, evaluation and adjustment. Initial conditions were observed to facilitate or hamper partner's learning about the environment, how to work together, their respective skills, and each other's goals. The initial conditions were understood as comprising a task definition, a set of action routines borrowed from the organisational context of each partner, an interface design between partners, and a series of expectations about the performance and behaviour of one's partner. Learning allowed partners to re-evaluate the collaboration in terms of efficiency, equity and adaptability. Evaluation in turn induced adjustments of the initial conditions.

Ring & Van de Ven (1994) conceptualised the development of Inter-Organisational Relationships (IORs) as a repetitive sequence of negotiation, commitment, and execution stages, each of which is assessed in terms of efficiency and equity. These stages may overlap or occur almost simultaneously for simple transactions. Ring & Van de Ven identify four important factors that drive the development of IORs. The first factor is uncertainty with respect to the environment and whether the partners can rely on trust. The second factor is the assessment of the relationship based on efficiency and equity (fair dealing). The third factor is the internal resolution of disputes. The fourth factor is the clarity of role relationships.

Both models stress the emergent (e.g. learning to work together and the resolution of conflicts) and goal-oriented (e.g. task definition and commitments) character of collaboration. Furthermore, both models describe the development of collaboration as logically going through stages. For instance, negotiation necessarily precedes commitment in the model of Ring & Van de Ven (1994) and evaluation necessarily precedes adjustment in the model of Doz (1966). The models of Doz and Ring & Van de Ven can be seen as complementary models as has been recognised by Ariño & De La Torre (1998). Initial conditions can be seen as the outcome of negotiation and commitment stages. Furthermore, as commitments are executed, learning processes unfold that result in a re-evaluation of those initial conditions. This in turn induces new negotiation and commitment stages that may lead to the adjustment of initial conditions.

The development of collaboration can thus be conceptualised as repetitive sequences of (1) execution (including learning), (2) evaluation and (3) adjustment (including negotiation and commitment) stages. As the focus of this research is on collaborative NPD management, the execution stage is replaced by a steering stage. Moreover, the concept of stage is replaced by the concept of incident to denote the observable and temporary character of steering, evaluation and adjustment. These incidents are discussed in more detail in sections 3.5.1, 3.5.2, 3.5.3, respectively.

3.5.1 Steering incidents

Steering incidents are defined as the moments in which managers deliberately attempt to influence the course of project activities, without being aimed at changing the characteristics of the project organisation (cf. Schuring, 1997). Managers may influence the course of project activities through planning, control and leadership. Planning refers to the scheduling of activities in time and the allocation of these activities to subordinates. Control refers to the monitoring of progress, problems and actions. Leadership refers to the behaviour of superiors when trying to influence the activities of subordinates for the realisation of a particular goal or set of goals (Van der Vlist, 1991).

3.5.2 Evaluation incidents

Evaluation incidents are moments in which actors reflect upon goal attainment and collaboration in the project. Goals are defined as a desired state of affairs that organisational members attempt to reach (Daft, 1995). Goals are defined as the measurable targets that are set for the project with respect to lead-time, costs and quality. Collaboration refers to the working together of partners to accomplish a goal of common interest (cf. Pinto & Pinto, 1990).

3.5.3 Adjustment incidents

Adjustment incidents are defined as the moments in which the structural properties of the project organisation are changed. In line with the conceptualisation of the project organisation adjustments, can refer to the characteristics of goals, people, means, processes and organisational arrangements.

3.6 Overview of descriptive process framework

From the conceptualisation of the context, process and content of change a descriptive process framework can be constructed as depicted in Figure 7. The different model elements are summarised below.

Context of change

The context of change is divided into a strategic and a cultural context, which are regarded as both medium and outcome (Giddens, 1984) of the process of change.

- The *strategic context* of collaboration refers to the differences (and similarities) in partners' strategies and goals.

- The *cultural context* of collaboration refers to the differences (and similarities) in partners' cultural values and norms with respect to communication and time pacing.

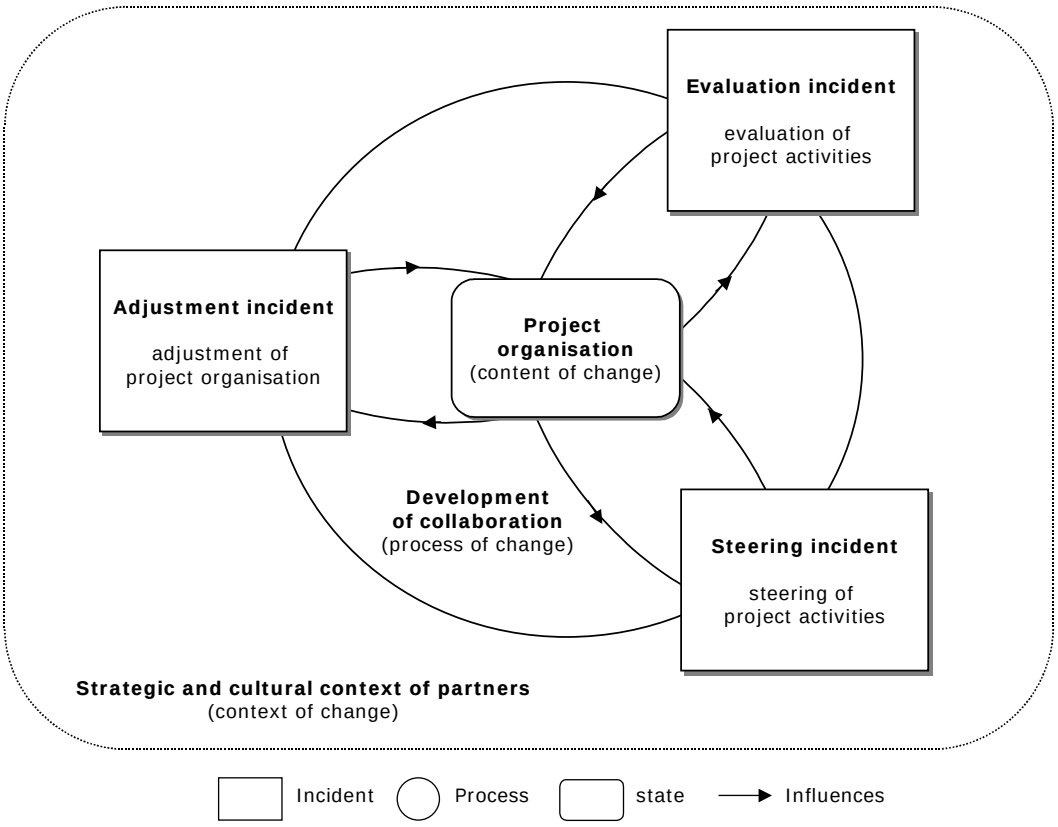

Figure 7: Descriptive process framework for studying the development of collaboration in NPD

Process of change

The process of change refers to the development of collaboration. This process is conceptualised as sequences of management, evaluation and adjustment incidents[9]. Evaluation incidents trigger management and adjustment incidents but are also an outcome of these incidents.

[9] Please note that thoughout this thesis the term process is used in two different ways. With respect to the development of collaboration the term process is used to denote a sequence of incidents. With respect to management, NPD and support processes the term process is used to denote a set of activities.

- *Evaluation incidents* are moments in which actors reflect upon goal attainment and collaboration in the project.

- *Steering incidents* are defined as the moments in which managers deliberately attempt to influence the course of project activities without being aimed at changing the characteristics of the project organisation (cf. Schuring, 1997). Managers may influence the course of project activities through planning, control and leadership.

- *Adjustment incidents* are defined as the occasions in which managers deliberately change the structural properties of the project organisation.

Content of change

The content of change refers to the project organisation that is set up to facilitate collaborative NPD.

- A *project organisation* is defined as a temporary (and dynamic) network of people, who collaborate and perform activities using various means to achieve a goal of common interest, and in which the work is divided and co-ordinated by a variety of organisational (structural and cultural) arrangements.

3.7 Research questions

In the first chapter, the research problem of the present research was formulated. In order to answer the research problem we will now formulate research questions. In line with the descriptive process framework as presented in the previous section, the research questions are divided into context and process questions. These questions themselves do not answer the research problem, but the answers to these questions provide the information that will enable the researcher to answer the research problem. In the spirit of the interactive process perspective (see section 2.5) the research questions are divided into context and process related questions. The context questions refer to the relationship between collaboration conditions and the process and outcomes of collaborative NPD. The process question refers to the relationship between management interventions and the process and outcomes of collaborative NPD.

Context questions

1. How do the strategic and cultural context of partners influence the process and outcomes of collaborative NPD?
2. How does the project organisation influence the process and outcomes of collaborative NPD?

Process question

3. How do management interventions influence the process and outcomes of collaborative NPD?

These research questions will be used to structure the data analysis (see section 4.3.4). In the next chapter the methods used to answer these questions are discussed.

3.8 Concluding remarks

In this chapter a descriptive process framework for studying the development of collaboration was built. Pettigrew's contextual process framework was used as basic structure for the process model. This model is composed of three elements: the content, context and process of change. These elements were filled in for the focus of the present research. The next chapter discusses the research design and the operationalisation of the descriptive process framework.

4

RESEARCH DESIGN

Letter from Sr. González

"On the whole, it appears Mr. Smith has little sensitivity to the human relations aspects of management. Perhaps this would not be compatible with his objective to turn us into robots. Yet, how can you take the human element out of the work place? Surely he must know that productivity depends on motivated and happy people! Mr. Smith is obviously missing the point if he regards us as machines to be manipulated rather than human beings to be respected and motivated. Another thing we don't understand (or like!) is his approach to the delegation of authority. He apparently assumes that we are all equally accustomed to accepting complete responsibility for our own areas, to the point where any mistakes or shortcomings on the part of any staff member result in his criticizing us severely, even in front of staff and colleagues."

Eva S. Kras, 1989, 'Management in Two Cultures: Bridging the gap between U.S. and Mexican managers', p.11

4.1 Introduction

In chapter 1 the research problem and research objectives were formulated. In chapter 2 management and organisation theory was studied to find conceptual building blocks for collaborative NPD management. These building blocks were used in chapter 2 to build a descriptive process framework for studying the development of collaboration on NPD. The purpose of this chapter is to clarify the research orientation, to choose a research methodology, and connected to this, to further operationalise the descriptive process framework presented in chapter 3. Combined this is referred to as the research design. The research design is the logical sequence that connects the empirical research questions to a study's initial research questions and, ultimately, to its conclusions (Yin, 1989). The first step in the research design is to consider what research orientation the researcher prefers. This is described in section 4.2. The next step is to develop a research methodology. This requires researchers to decide on the research strategy, case definition, selection of cases, data collection and data analysis. This is discussed in section 4.3. Finally, the elements of the descriptive process framework of chapter 3 need to operationalised. The operationalisation of the different model elements is discussed in section 4.4.

4.2 Research orientation

In line with Miles & Huberman (1994) we think it is good medicine for researchers to make their research preferences clear. Each researcher has his/her personal perception of the world, which exerts a significant influence on research activities. In order to position one's personal worldview, the worldviews that underpin organisation theories are discussed in this section. Burrell & Morgan (1979) argue that organisation theories can be conceived of in terms of in terms of four key paradigms, according to the assumptions these theories make about the nature of social science and the nature of society. Their argument can be summarised as follows.

Assumptions about the nature of social science can be seen as either objective or subjective in kind. Theories, which are underpinned by objective assumptions, will perceive social reality as having a hard and objective existence, external to the observer. These theories will be aimed at seeking patterns and causal relationships in the social world (positivist epistemology). Human behaviour will be seen as being determined by external conditions (determinism). The testing of hypotheses and quantitative analyses will be the preferred methods for acquiring knowledge (nomothetic methodology). In contrast, theories, which are underpinned by subjective assumptions, will be aimed at

seeking knowledge by understanding the point of view of the people involved in the social construction of reality (anti positivist epistemology). Human behaviour is seen as voluntaristic since human beings will be seen to possess free will. Finally, getting as close as possible to the subject under investigation will be the preferred method of acquiring knowledge (ideographic methodology).
Assumptions about the nature of society emphasise either regulation or radical change. The sociology of regulation focuses on understanding social order in social systems. Society is seen as being characterised by consensus. In contrast, the sociology of radical change focuses on understanding radical change in social systems. Society is seen as being characterised by structural contradictions and conflict.
By classifying organisation theories along the dichotomies of objective – subjective and regulation – radical change, Burrell & Morgan (1979) produced a matrix of four organisation paradigms as depicted Figure 8.

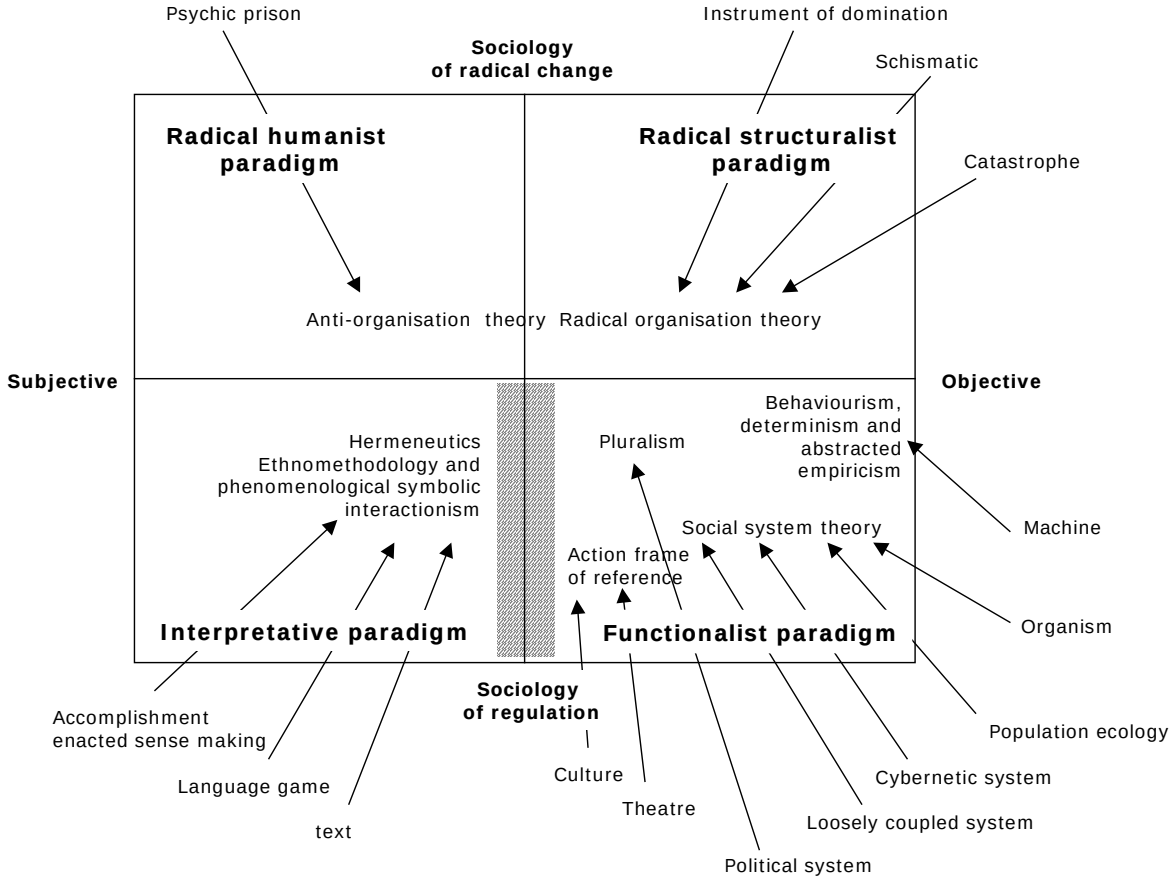

Figure 8: Paradigms, metaphors, and related schools of organisation analysis (derived from Morgan, 1980)

These four paradigms are labelled the functionalist, interpretative, radical humanist and radical structuralist paradigm. According to Burrell & Morgan (1979) these paradigms are based on mutually exclusive views about the nature of social science and social reality. The

differences between these paradigms can be described as follows (see Morgan, 1980; Gioia & Pitre, 1990):

- The *Functionalist paradigm* is based on the view that reality has a concrete and real existence. The functionalist researchers search for and test regularities and relationships in order to predict and control organisational behaviour.

- The *Interpretative paradigm* is based on the view that people socially construct and maintain their own organisational realities. Therefore the goal of theory building is to describe and explain events in order to understand organisational behaviour.

- The *Radical humanist paradigm*, like the interpretative paradigm, is based on the view that reality is socially constructed and sustained but it has a more critical or ideological stance. The goal of theory development is to free organisational members from sources of domination, alienation and exploitation by criticising social structures such as capitalism.

- The *Radical structuralist paradigm*, like that of the radical humanist, is based on the view of reality as a potential dominating force. However, it is tied to the believe that reality has a concrete and real existence. The purpose of theory building is to understand, explain, criticise, and act on the structural mechanisms that exist in organisations.

When comparing the interactive process perspective adopted in this research (see section 2.5) with these paradigms, the following can be noted.
Firstly, the interactive process perspective seems to cut through the interpretative and functionalist paradigm. With the interactive process perspective we try to account for both the role of collaboration conditions (structure) and people's interpretations and managerial interventions (action) in shaping collaborative NPD outcomes. The role of structure is the main focus of functionalist researchers whereas the role of action is the main focus of interpretative researchers. Thus both the functionalist and interpretative paradigm in its purest form do not accurately describe how the empirical phenomenon has been approached in this research.
Secondly, the interactive process perspective has been used in this research to understand the development process of collaboration in order to build knowledge to support managers in organising and managing collaborative NPD. Thus, both the radical humanist and radical structuralist do not accurately describe my view on collaborative NPD.
Thus I would position myself in the transition zone between the functionalist and interpretative paradigm as indicated by the grey area in

Figure 8. Insights will be borrowed from both the functionalist and interpretative paradigm. The risk of adopting such multi-paradigmatic view is that one might incorportate opposing assumptions in the theory to be developed. However, as Gioia & Pitre (1990) have argued, the transition zones between paradigms are often not so clear-cut. This allows researchers to construct bridges between apparently disparate concepts. Individually the functionalist and interpretative paradigm provide just a partial view on collaborative NPD. The challenge is to develop a more comprehensive view on collaborative NPD by drawing on the theoretical insights provided and research methodologies advanced by both paradigms. In the spirit of the functionalist paradigm the impact of collaboration conditions will be analysed (context analysis) in terms of causal relationships and in the spirit of the interpretative paradigm the development of collaboration will be described in terms of incidents seen as much as possible 'through the eyes' of organisational participants (process analysis).

4.3 Research methodology

In this section the research methodology that is used in this research is discussed. The first step in developing an adequate research methodology is the selection of a research strategy. This step is described in section 4.3.1. Since it is often not possible to study every single element of the research population elements need to be sampled from the research population. This sample is referred to as the research domain. The process of sampling elements from the research population is described in section 4.3.2. The next step is to decide on what information, how, where and when will be collected. The decisions with respect to data collection place limits on the conclusions and the quality of the conclusions that can be drawn (cf. Miles & Huberman, 1994). In section 4.3.3 the main decisions with respect to data collection are discussed. Finally, to be able to draw conclusions the collected data needs to be analysed. This is by no means a straightforward task. The main steps in the data analysis are discussed in section 4.3.4.

4.3.1 Research strategy

Several research strategies can be used to address the research problem. According to Yin (1994) three factors determine which research strategy is adequate: (a) the form of the research question, (b) the extent of control the researcher has over behavioural incidents and (c) the degree of focus on either contemporary or historical incidents. Depending on the answers on these questions researchers may arrive at five major research strategies: the experiment, the survey, the archival analysis, the history and the case study.

Table 2: Relevant situations for different research strategies (source: Yin, 1994)

Research Strategy	Form of research question	Requires control over behavioural incidents?	Focus on contemporary incidents?
Experiment	How, why	Yes	Yes
Survey	Who, what, where, how many, how much	No	Yes
Archival analysis	Who, what, where, how many, how much	No	Yes/no
History	How, why	No	No
Case study	How, why	No	Yes

The nature of the research question addressed in the present thesis is a how and why question. The present research attempts to understand why some collaborative NPD projects fail and others succeed by exploring the development of collaboration in NPD. There is no need to have control over behavioural incidents and the research question focuses on contemporary incidents. Therefore case study research has been selected as the most appropriate research strategy.

Another factor influencing the selection of the research strategy is the nature of the research. The case study strategy is often applied in research of an explorative nature (Van der Zwaan, 1992). In the first chapter we have concluded that in collaboration literature little attention has been paid to the development of collaboration NPD. The choice of conducting case study research thus also fits in with the explorative nature of the research.

In order to explore the how and why of adaptive processes in collaborative NPD it was decided to conduct longitudinal case study research. However, there are some disadvantages to this type of research (Van de Ven & Scott-Poole, 1990; Van de Ven & Huber, 1990; Van der Zwaan, 1992). Firstly, while case studies allow close indwelling with research objects, considerable time may be required in gaining access to companies willing to participate. Secondly, collecting longitudinal data is a very labour-intensive operation and the bulk of data that is normally gathered limits a researcher's capabilities to study more than a few cases at a time (Van de Ven & Huber, 1990). Thirdly, although longitudinal case study research is particularly suitable of finding causal relationships, due to the limited amount of cases findings are difficult to generalise across a population. However, it is possible to generalise to findings into some broader theory. Yin (1994) calls this line of thought analytical generalisation. In other words, generalisation in case study research is about theoretical propositions not about populations. Finally, the mobilisation of ongoing support and participation in a longitudinal field research may present researchers with problems (Van de Ven & Scott-Poole, 1990).

However, considering the problem and objectives of the present research the advantages of longitudinal case study research outweigh the disadvantages (Pettigrew, 1990 and 1997; Hartley, 1994). Firstly, longitudinal case study research allows researchers to study the unfolding of incidents, actions and activities in a real-life context (Pettigrew, 1997). It is particularly suitable for capturing the dynamics of human conduct in organisational settings. Secondly, longitudinal observations provide a rich and in-depth description of the complexities of organisational processes, which can be considered as the backbone of developing and testing theories of poorly understood areas such as collaboration. It can lead to a greater understanding of day-to-day organisational practices, which may not be revealed in brief contacts. For instance, it takes time to understand the jargon being used in meetings. Moreover, over time trust may develop between researcher and organisational members, which may induce organisational members to share (confidential) background information with the researcher (Hartley, 1994).

4.3.2 Research domain and case selection

Before being able to sample cases from our research domain we have to decide what our case is. A case can be defined as a phenomenon of some sort occurring in a bounded context (Miles & Huberman, 1994). The case defines what will be the main focus of the study. Cases can be defined in several ways. Cases may be defined as individuals, groups, departments or organisations in a specific context. In this research we focus on collaborative NPD projects. Projects are temporary and once-only configurations of interdependent activities that are executed with a predefined result and start and end-date, using people and means (Van Aken, 1997). Based on this definition collaborative NPD projects can be defined as temporary and once-only configurations of interdependent NPD activities that are executed with a predefined result and start and end-date, using people and means from two or more companies.

From our case definition it follows that our research domain consists of collaborative NPD projects. Sampling cases from this research domain is crucial for later analysis. Sampling choices such as whom to look at or talk with, where, when, about what, and why all place limits on the type of conclusions researchers can draw (Miles & Huberman, 1994).

Basically two different sampling strategies can be discerned: theoretical and statistical sampling. In qualitative analysis samples tend to be chosen for theoretical reasons and not so much for statistical reasons (e.g. random selection out of a population). This is because qualitative researchers often strive to generalise for a broader theory (analytical generalisation) and not so much for a population (statistical generalisation). Furthermore, with small numbers of cases, random sampling can deal you a biased hand (Miles & Huberman, 1994). Given our qualitative research design and our objective to generalise for

theoretical reasons a theoretical sampling strategy has been adopted in this research.
In general two types of theoretical sampling can be discerned: across and within case sampling. Across case sampling concerns the selection of cases from a research domain. Within case sampling concerns the selection of which activities, processes, incidents, times, locations and role partners will be chosen to be studied within a case (Miles & Huberman, 1994). Both types of sampling will be discussed below.

Across case sampling

In order to reduce the complexity of our research design we decided to restrict ourselves to collaborative NPD projects executed within one single multi-national telecommunication company, referred to as Telco in this research. The advantage of selecting cases within one single company was that the organisational context is more or less the same for the cases studied. Within Telco we have focused on two collaborative NPD projects, the SINAP and the ISPV project, which were jointly executed by Telco TNL/RG[10] located the Netherlands and Telco TMX/MI[11] located Mexico. These projects have been selected for the following reasons (see Table 3).
Firstly, the projects were expected to provide *typical cases* with respect to what managers can expect when executing NPD projects across borders of cultures, organisations, time and place for the first time. Both projects involved two relatively independent organisations that are located in different cultures, locations and time zones. Moreover, both projects were among the first projects within which both design centres collaborated. Research on national cultural differences (Hofstede, 1980a and 1994; Lewis, 1996) suggests that the Dutch and Mexican culture are quite different with respect to how power distance, uncertainty avoidance and time are valued. Given the limited collaboration history of the design centres and the differences in cultural values among the partners we expected considerable triggers for the development of collaboration.
Secondly, we expected that the projects would *fill within theoretical categories* with respect to the organisation of collaboration. The SINAP project was organised as a sub-contracting project with TNL acting as main contractor and TMX acting as sub-contractor. It was executed at TMX with a Mexican project manager and predominantly Mexican project workers. In contrast the ISPV project was initially organised as an internal TNL project with project workers being insourced from TMX and executed at two sites: TMX and TNL. The project manager was Dutch and the project workers were predominantly Mexican. Given the differences in project organisation we expected differences in the process and outcomes of collaborative NPD. Firstly, we expected that insourcing would allow TNL managers to enforce adjustments more easily than

[10] Hereafter referred to as TNL
[11] Hereafter referred to as TMX

would be the case for subcontracting because TNL has no formal authority over TMX. Secondly, we expected fewer collaboration problems in the SINAP project than in the ISPV project because of the geographical dispersion of the project members. Thirdly, we expected that the local project manager would have fewer problems with leading his project team than the Dutch project manager due to the cultural differences between the project manager and his project workers.

Table 3: Sampling parameters

Sampling parameters	SINAP project	ISPV project
Context of collaboration	Partners are part of the same multi-national company Partners are located in different cultures, locations and time zones. Partners have a limited collaboration history	
Organisation of collaboration	Sub-contracting Single site Mexican project manager	Insourcing Multi-site Dutch project manager

Within case sampling

As stated in chapter 1 little attention has been paid to the operational management of partnerships. Therefore we decided to explicitly focus on superior – subordinate interactions in both cases. Basically three levels could be discerned in the cases: the project execution, project management and project steering level as depicted in Figure 9 below.

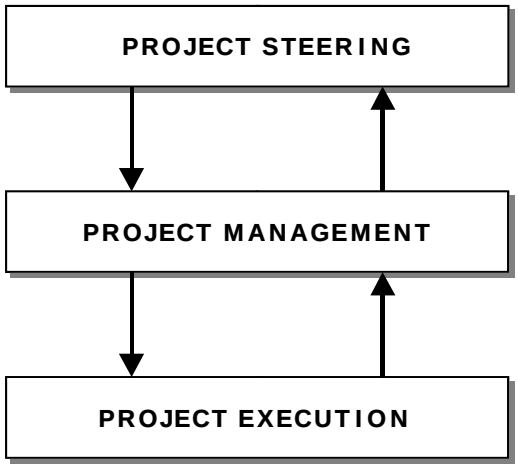

Figure 9: Superior-subordinate interactions in cases

Hence superior – subordinate interactions refer to the interactions between project workers (subordinates) involved in project execution on the one hand and the project manager (superior) on the other hand, and between the project manager (as subordinate) on the one hand and project steering members (superiors) on the other hand. The emphasis was put on the formal interactions between superiors and subordinates. However, a great deal of the informal interactions could also be traced because they often took place via e-mail, which the researcher had

access to. How the data were collected in both cases will be discussed in more detail in the next section.

4.3.3 Data collection

Primary means of data collection were semi-structured interviews with project members, observations of project meetings, and document study of project e-mails and organisational documentation. Moreover, case study results were discussed with the line management of the mentioned companies (i.e. consensus validation). Data collection was organised around the main elements of the descriptive process framework, namely the context, process and content of change. For each of these model elements multiple methods of data collection were used as summarised in Table 4. The data collection on each of the model elements is discussed in more detail below.

Table 4: Organisation of data collection

<table>
<tr><th></th><th>Sept-Nov</th><th>Nov-Dec</th><th>Jan-Feb</th><th>Mar-May</th><th>Jun-Jul</th><th>Sep-Oct</th></tr>
<tr><td>Context</td><td>Orienting interviews</td><td>Context interviews at TMX</td><td>Context interviews at TNL</td><td>Additional context interviews</td><td>Validation through workshop</td><td rowspan="4">Process interviews TMX and TNL</td></tr>
<tr><td>Context</td><td colspan="4" rowspan="3">Longitudinal tracking through participant observations of steering group and management meetings, informal talks, e-mail communication and organisational documentation</td><td rowspan="3">Validation of critical incidents through process interviews with key persons</td></tr>
<tr><td>Process</td></tr>
<tr><td>Content</td></tr>
</table>

Context of change

The context of change refers to the strategic context and cultural of collaboration.

Data were collected by means of context interviews (see Appendix C). In the context interviews people were asked about their perception on the differences and similarities between partners' work practices (cultural context) and on partners' strategy and goals pursued with the collaboration (strategic context). Interview questions with respect to partners' work practice were asked to TNL people who had been working at TMX or with TMX people and TMX people who had been working at TNL or with TNL people. Interview questions with respect to partners' strategy and goals were put to line managers of TNL and TMX. The context interviews were semi-structured and interview questions were open-ended. In total 30 context interviews were conducted. The interviews typically lasted about 1 to 1.5 hours. The context interviews were organised in two interview rounds. The first interview round was targeted at TMX people and was conducted in November/December 1999

at TMX. The second interview round concentrated upon TNL people and was conducted in January/ February 2000 at TNL.
Organisational documents also provided a rich source of information. They included project assignments, project specifications, time plans, quality handbooks, and project evaluations. They usefully complemented the context interviews by providing valuable background information. Also, they provided an important means for identifying the content and structure of formal procedures, rules and regulations.
Longitudinal tracking of e-mail communication and observations of project meetings were used to collect data on changes in the strategic and cultural context. Whenever changes in the strategic and cultural context or external incidents became visible and seemed to influence the projects they were regarded as a critical incident. These critical incidents were discussed with managers of both TNL and TMX at the end of both case projects in process interviews. The process interviews are discussed in more detail below.

Process of change

The process of change refers to the sequences of management, evaluation and adjustment incidents. Data on the process of change have been collected by means of observing project meetings, tracking e-mail messages exchanged between project members, gathering project documents and conducting process interviews.
In total fifteen steering group meetings were observed at TNL in which progress, problems and actions were discussed according to a fixed agenda. Within these observations the researcher focused on documenting the perceptions of project manager and steering group members of the project status and on the steering actions that were decided upon. The advantage of these observations over interviews was that it provided the opportunity to study superior-subordinate interactions as they occurred. Hence, there was little room for people to give their own sometimes distorted interpretations as is sometimes is the case in interviews. Furthermore, the observations served a good means of learning more about the background of the projects. Informal talks with managers after these telephone meetings were extremely valuable. During the course of the projects also two top management meetings were observed in which the line management of TNL and TMX discussed their collaboration in the two studied projects.
Due to the dispersion of people a lot of formal and informal communication went via e-mail. These e-mails proved to be a rich source of information. The researcher was part of the distribution list of project. In this way the researcher could track the formal communication between superiors and subordinates in both projects. Moreover, the project manager of the ISPV project and two line managers involved in both the ISPV and SINAP project provided the researcher with uncountable project-related e-mails that were sent by them.

Consequently, a great deal of the informal communication could be tracked as well.
Project documents, such as progress reports, minutes of meetings, quality reports, and risk analyses, proved to be a rich source of information. For instance, from action points described in progress reports and minutes of meetings it was relatively easy to identify steering and adjustment incidents. Evaluation incidents were less visible in project documents.
From the observation notes, e-mail messages, project documents, and informal talks with project members it was possible to construct a list of steering, evaluation, and adjustment incidents for both case projects (see Appendix B for an excerpt of the incident list). Given the length of the incident lists constructed (approximately 40 pages per project), and given that incidents seemed to differ with respect to their impact on project outcomes, it was decided to focus on critical incidents. A critical incident was defined as an occasion that significantly influenced the course of project activities in terms of operational effectiveness and relational performance. Initially the idea was to have the project members to come up with their own list of critical incidents. This would allow making comparisons betweem TNL and TMX with respect to what people regard as critical incidents. However, it proved to be extremely difficult for project members to think in terms of critical incidents without the help of the researcher. Interviewees needed to be reminded constantly of important (critical) project incidents before they were able to express their opinions on these incidents. Therefore, it was decided to pre-select critical incidents from the big list of incidents, as depicted in Figure 10). Subsequently, this short list of critical incidents was discussed with key persons in both projects. From these discussions a revised short list was constructed, which subsequently was discussed with the project members in process interviews.
The process interviews (see Appendix D) were conducted at the end of both case projects and were meant to validate critical incidents that occurred in the case projects and to identify people's perceptions and evaluations of these incidents. In total 30 process interviews were conducted. The interviews typically lasted about 1 to 1.5 hours and were recorded and verbally transcribed. The interviews were organised in two interview rounds. The first interview round was targeted at TNL people and was conducted in September 2000 at TNL. The second interview round was targeted at TMX people and was conducted in October 2000 at TMX. Finally, the list of critical incidents was coded into steering, evaluation and adjustment incidents. These incident tables provided the basis of the process analysis, which will be discussed in the next section.

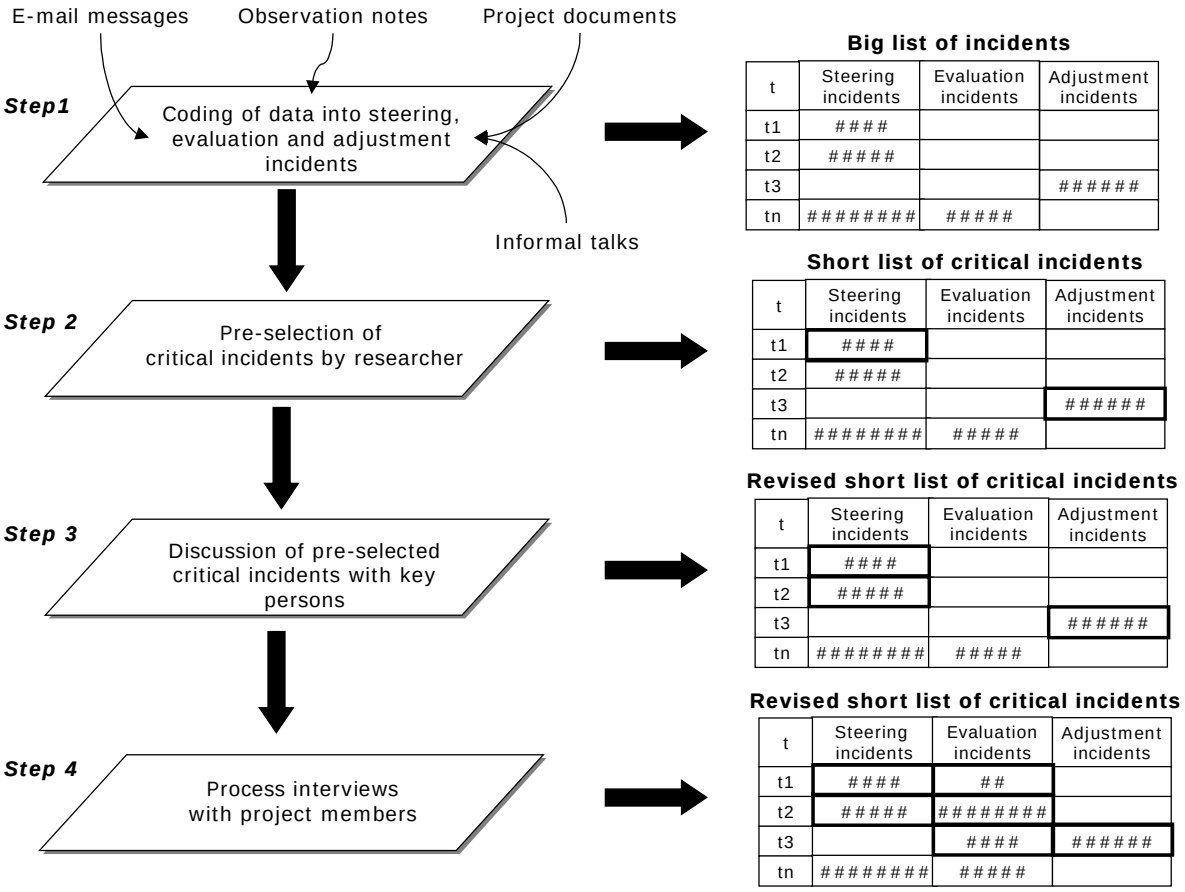

Figure 10: method of identifying critical incidents

Content of change

The content of change refers to the project organisation. The project organisation at the start of the collaboration was mapped out by studying project documentation (e.g. project assignments and project specifications). In these documents the project organisation is outlined in terms of organisation structure, people, means and work processes to be used. Changes in the project organisation were tracked through studying progress reports, minutes of project meetings, informal e-mail messages and through the process interviews that were conducted at the end of the SINAP and ISPV project. Changes in the project organisation were coded as adjustment incidents.

Feedback sessions

At several times during data collection the tentative case findings were discussed with people from both companies. Stakeholders and project members were kept abreast of the case findings via reports, presentations and informal discussions. Moreover, the initial findings of the context interviews were used to train Dutch and Mexican engineers on differences in cultural values and practices working on a project that started up when two case projects were almost finished. This helped us to improve on construct validity (Yin, 1989).

Limitations of data collection

The geographical dispersion of partners limited the possibilities of data collection. It was a physical impossibility to be at two sites at the same time. Most of the time the researcher was located at TNL. The researcher paid two visits to TMX in Mexico (the first visit lasted three weeks and the second visit lasted one week). Since most of the project work was executed at TMX the communication between project managers and project workers could not be tracked as detailed as the communication between steering group members and the project managers.

4.3.4 Data analysis

In Chapter 1 the research problem has been formulated. On the basis of this research problem a descriptive process framework was developed in Chapter 3. On the basis of the research problem and the descriptive process framework research questions were formulated (see section 3.7). In this section the main steps in the data analysis are discussed. Data analysis is divided into a process and a context analysis.

Process analysis

The purpose of the process analysis is twofold. The first purpose is to identify and typify the problems, which emerged during the collaboration. The second purpose is to identify how these problems have been evaluated (evaluation incident) and managed (steering and adjustment incidents). The process analysis stays close to the data and is descriptive in nature. It provides the basis for the context analysis.

Context analysis

The purpose of the context analysis is to gain a deeper understanding of the causes of the identified collaboration problems and into the effects of the identified management interventions (steering and adjustment incidents). Explanations are sought in the strategic and cultural context of partners (context of change) and the project organisation design (content of change).

4.4 Operationalisation of descriptive process framework

In the previous chapter the descriptive process framework, which is used in this research, was presented. In this section the different elements of the model are provided with an operationalisation.
In section 4.4.1 the content of change, which is the project organisation, will be operationalised. In section 4.4.2 the context of change, which comprises the strategic and cultural context of collaboration, will be operationalised. Finally, in section 4.4.3 the process of change, which comprises management, evaluation and adjustment incidents, will be operationalised.

4.4.1 Content of change: project organisation

In section 3.3.2 project organisations were defined as temporary (and dynamic) networks of *people*, who collaborate and perform *activities* using various *means* to achieve a *goal* of common interest, and in which the work is divided and co-ordinated by a variety of *organisational (structural and cultural) arrangements*. These elements of project organisations are provided with an operationalisation below (see Table 5). This operationalisation is used to describe the project organisation at the start of the collaboration. The different elements of the project organisation will change over time as a result of organisational adjustments, which are described in section 4.4.3 under adjustment incidents.

Goals

Goals are a desired state of affairs that organisational members attempt to reach (Daft, 1995). Goals can be attributed to individuals and to organisations. Translated to the focus of this research it is possible to distinguish project goals from the personal goals of project members and the goals of the partner organisations. The goals of the partner organisation are not addressed here but in the operationalisation of the strategic context (see section 4.4.2). Furthermore, the personal goals of project members are only considered relevant for this research when they influence the process of change.
Important characteristics of project goals are their content and ambition level. The ambition level of goals has been measured by analysing the slack that is allowed. Slack can be divided into time, financial and quality slack. Time slack can be measured by studying how much time is devoted in time plans to unforeseen circumstances. Financial slack has been measured by assessing to what extent costs may exceed project budgets. Quality slack has been measured by assessing how strict the quality norms are which are used to judge the quality of the product.

People

People refer to the project members, including steering group members, project manager and project workers, who perform the distinct activities. The roles that these people fulfil in collaborative NPD depend on characteristics such as power, knowledge and experience. Boer (1991:95) distinguishes three classes of human characteristics:

- *Cognitive capabilities*, comprising knowledge, skills and intelligence.
- *Behavioural attributes*, such as attitudes, personality, values and personal objectives.
- *Position*, reflecting a person's (decision-making) power and responsibility.

These classes of human characteristics have been used in this research to operationalise the characteristics of people. The cognitive capabilities

of people were measured by assessing people's education level and training received. An impression of the behavioural attributes of people could be obtained by observations of informal talks and interviews with people. Finally, the position of people was measured by assessing people's tasks, responsibilities and authorities.

Means

Means refer to the design and management tools, methods and techniques that people use to perform the different processes. Important attributes of means are their availability and use. The use of means can be divided into the prescribed use of means in a project and the actual use of means in a project. The availability of means has been measured by reviewing project documentation. The actual use of means has been measured by interviewing project members.

Processes

Processes refer to the activities that are needed to transform inputs into outputs. Activities can be divided into management, primary and support activities as discussed in section 3.3. The NPD activities performed in the project can be regarded as the primary activities. Important intrinsic characteristics of NPD activities are complexity and interdependence.

Complexity refers to the difficulty with which the work can be understood (Mintzberg, 1979). The complexity of NPD activities is dependent on the intellectual capacities of project members and content of the NPD task. What one project member may regard as complex, the other project member may regard as simple. Hence, the complexity of NPD activities is difficult to measure objectively. In this research the complexity of NPD activities therefore has been measured by asking project members how they would rate the complexity of their NPD tasks. In order to account for differences in intellectual capacities, the answers of the project members were interpreted in the light of their level of education, training and years of experience with this kind of work.

The interdependence of NPD activities refers to the extent to which (groups of) people depend on one another for their outputs (Thompson, 1967). The interdependence of NPD activities directly impacts the extent to which project members need to communicate and collaborate to perform their tasks. Hence, interdependence between activities largely determines the collaborative attitude that is required in a project. The interdependence between activities can be typified as pooled, sequential or reciprocal (Thompson, 1967; Van de Ven et al., 1976). Task interdependence has been measured by asking project members from both design centres how dependent they are on each other for performing their task.

Organisational arrangements

Organisational arrangements are defined as the more or less, durable, formal and informal, mechanisms to divide and co-ordinate the

constituent activities of the distinct processes. Organisational arrangements can be divided into structural and cultural arrangements. Whereas structural arrangement can be designed for cultural arrangements can only be developed. Both structural and cultural arrangements are discussed in more detail below.

Structural arrangements

Structural arrangements refer to the directives (e.g. rules and procedures) that result from the agreements made within an organisation (cf. Schuring, 1997). Following Krabbendam (1988) and Boer (1991) specialisation, unit grouping, unit size, lateral linkages and formalisation are regarded as important dimensions of structural arrangements. Specialisation concerns the way that activities are divided between people. Unit grouping concerns the bases on which groups are formed. Unit size refers to the number of people reporting to one supervisor. Lateral linkages refer to the mechanisms that are used to encourage horizontal communication between members of different units. Finally, formalisation refers to the use of rules and procedures to regulate the way processes are performed. These arrangements are just like cultural arrangements below subject to learning and adjustment.

Cultural arrangements

Whereas structural arrangements can be designed, cultural arrangements only can be developed. Cultural arrangements are defined as (Schein, 1985 and 1996):

> "a pattern of basic assumptions – invented, discovered or developed by a given group as its learn to cope with its problems of external adaptation and internal integration – that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems".

An important internal integration problem that members of collaborative NPD projects are confronted with is how to cope with the differences in people's cultural values.

It is expected that how project members communicate is strongly influenced by their national cultural values with respect to power distance and uncertainty avoidance (Hofstede, 1980a & 1994). Furthermore, it is expected that how people manage time is strongly influenced by their national cultural values with respect to time (Lewis, 1996). During collaboration people are confronted with each other's differences in cultural values as reflected in people's way of communicating and managing time. Over time, when people learn about each other's differences in ways of working, they may find ways to cope with these differences. These solutions can be regarded as cultural arrangements. The operationalisation of cultural arrangements is based on the operationalisation of the cultural context. The focus is on cultural values with respect to power distance, uncertainty avoidance and time.

In section 4.4.2 these are provided with a more elaborated operationalisation.
The operationalisation of the project organisation is summarised below.

Table 5: Operationalisation of project organisation

Variable	Attribute	Measurement scale
Goals	▪ Content ▪ Ambition level	▪ Description ▪ Time, cost and quality slack allowed
People	▪ Position ▪ Motivation ▪ Knowledge and skills	▪ Description of task, responsibilities and authorities ▪ High / low ▪ Description of training and education
Means (NPD and managerial)	▪ Availability ▪ Intended use ▪ Actual use	▪ Description ▪ Description ▪ Description
Processes	▪ Complexity ▪ Interdependence	▪ High/ medium/ low ▪ Sequential/ pooled/ reciprocal
Structural arrangements	▪ Specialisation ▪ Formalisation ▪ Unit size ▪ Lateral linkages	▪ Description of division of work ▪ Description of rules and procedures ▪ Description of the number of subordinates reporting to one superior ▪ Description of the organisation of horizontal communication
Cultural arrangements	Communication ▪ Power distance ▪ Uncertainty avoidance Time pacing ▪ Time orientation	 ▪ High/ medium/ low ▪ High/ medium/ low ▪ Multi-active/ linear-active

4.4.2 Context of change: strategic and cultural context of collaboration

The context of change is divided into a strategic and a cultural context. Both are discussed below.

Strategic context of collaboration

The strategic context refers to the strategy and goals of partners. The strategy and goals of each partner have been measured in terms of strategic importance, strategic contribution and strategic goals.
Strategic goals refer to the ambitions that partners hope to reach with the project. For instance, partners may want to develop new competencies or gain access to new markets. Strategic importance refers to the priority partners attach to the collaborative NPD project. This directly impacts the number of people and means allocated to the project and the willingness of partners to accept adaptations. Relative dependency refers to the extent to which one should bear in mind that the strategic context may change over time. For instance the priority attached to the project may change due to external incidents such as market changes or due to internal learning processes.
The strategic context was measured by interviewing managers of both TNL and TMX about the strategic issues listed in Table 6 below. Changes

in the strategic context were derived from the critical incident lists that were constructed for each case project and discussed with managers of both TNL and TMX after the case projects were finished.

Table 6: Operationalisation of strategic context

Variable	Attributes	Measurement scale
Strategic goals	▪ Ambition level ▪ Content	▪ Low/ medium/ high ▪ Description
Strategic significance	▪ Priority	▪ Low/ medium/ high
Relative dependency	▪ Dependency on others for reaching ones goals	▪ Low/ medium/ high

Cultural context of collaboration

The cultural context refers to the cultural values of the partners involved in collaborative NPD.

Given our choice to sample two organisations within one single multi-national company located in two different countries, it was to be expected that differences in cultural arrangements among partners can be mainly attributed to differences in national culture. Firstly, project members of both design centres were expected to be relatively homogeneous with respect to their education and received training. To put it differently project members were expected to share a rather similar professional culture. Secondly, both design centres are Telco subsidiaries and were expected to subscribe to the organisation culture of Telco to a large extent. Given the expected impact of national culture it has been decided to base the operationalisation of communication and time pacing on cross-cultural research on differences in national cultural values.

The operationalisation of communication and time pacing values are discussed below.

Communication

We expect that the way Mexican and Dutch people value power distance and uncertainty avoidance will exert a strong influence on how they communicate. Hofstede (1994) argues that from the four cultural dimensions he identified in his study, especially the power distance and uncertainty avoidance dimension affect our thinking about organisations. Organising, he argues, always demands answers to two basic questions:

(1) Who has the power to decide what?
(2) What rules or procedures will be followed to attain the desired ends?

Cultural values with respect to power distance influence our thinking about the first question, whereas values with respect to uncertainty avoidance influence our thinking about the second question[12].
Cultural values with respect to power distance influence the communication between superiors and subordinates in several ways[13]. Firstly, it influences the value that subordinates attach to work instructions and decisions. Stephens (1995) found[14] that Mexican subordinates are less likely to challenge supervisor's ideas or directives or to provide decision-making input than American subordinates. Secondly, cultural values with respect to power distance influence the leadership style of superiors. Hofstede (1980b) found that in high power distance cultures subordinates expect superiors to act autocratically, whereas in low power distance cultures, subordinates expect superiors to consult them. Hence, directive or autocratic leadership styles are preferred in high power distance cultures whereas consultative are preferred in low power distance cultures. Thirdly, cultural values with respect to power distance influence superiors' delegation of responsibilities to subordinates. Hofstede (1994) found that in high power distance cultures decision-making authority tends to be centralised and concentrated among a few top-level managers. In line with this, Stephens (1995) found that Mexican subordinates are not likely to take decision-making responsibilities and risks. Finally, research of Stephens (1995) also indicates that status is regarded more important in Mexico than in the U.S. due to the greater class distinctions.
Cultural values with respect to uncertainty avoidance also influence the communication between superiors and subordinates in several ways. Firstly, research of Hofstede (1994) indicates that subordinates in high uncertainty avoidance cultures prefer precise work instructions and detailed job descriptions. Secondly, Triandus & Albert (cited in Lawrence & Yeh, 1994) claim that in organisations in high uncertainty avoidance cultures communication is likely to be centred on rules, norms and proper behaviours. This is supported by the findings of Kras (1989) on differences between Mexican and U.S. management styles. She found that Mexicans at all social levels attach great importance to courtesy in social interactions. In the business environment there is an etiquette, which is strictly followed including handshaking in the morning, using

[12] Power distance is a measure of the extent to which people accept unequal distributions of power. In Hofstede's cultural survey of 1980 Mexico scored high on power distance (81), whereas the Netherlands scored low on power distance (38). Uncertainty avoidance is a measure of people's tolerance for uncertain or ambiguous situations. In Hofstede's cultural survey of 1980 Mexico scored high on uncertainty avoidance (82) whereas the Netherlands scored average on uncertainty avoidance (53).

[13] Please note that these findings say something about, how generally speaking, people from one national culture differ from another national culture. Individual exceptions can always be found.

[14] The power distance score of the U.S. (40) is comparable with that of the Netherlands (38). We assume therefore that these findings are also illustrative for characterising the differences between Dutch and Mexican companies.

the polite form even when complaining and using titles in formal conversations and correspondence. Thirdly, compared to low uncertainty avoidance cultures, Mexicans seem to be more sensitive to criticism and differences of opinion (Kras, 1989). For this reason they try to avoid situations of conflict, which show them in a negative light. As one Mexican executive told the author, "you cannot criticise a Mexican in front of his friends. It is a disgrace, and he will hate you for the rest of his life". Another implication of this is put forward by Stephens (1995). He found that Mexican managers are much more unwilling to disappoint than U.S. managers, which may lead to unrealistic commitments. Fourthly, compared to low uncertainty avoidance cultures, Mexican subordinates are found to be more afraid to admit mistakes and report disappointing progress (Stephens, 1995). This seems to be related to the high power distance situation in Mexico. Stephens (1995) argues that the authoritarian style of many Mexican managers does not encourage the reporting of problems of subordinates. Finally, Mexican subordinates are found to be more sensitive to 'being checked upon' than are American subordinates (Kras, 1989). When control systems are introduced subordinates often see it as a sign of mistrust. Bosses on the other hand, often feel it beneath their dignity to keep checking on tasks.
Based on the findings above, communication values have been measured by interviewing Dutch and Mexican organisational members[15], who have worked with respectively Mexican and Dutch colleagues in the past, about what they regard as the main differences in their way of communication. The interviews had an open character and the following checklist was used to stimulate the interviewees to think about differences in ways of communication (see Table 7).

Table 7: Operationalisation of cultural values related to communication

Variable	Attributes	Measurement scale
Power distance	▪ Status of work instructions ▪ Leadership style ▪ Extent to which responsibilities are delegated ▪ Extent to which subordinates are afraid to disagree with their superior	▪ Negotiable/ indisputable orders ▪ Directive/ consultative ▪ Task / relationship-oriented ▪ High/ medium/ low ▪ High/ medium/ low
Uncertainty avoidance	▪ Preference for precise work instructions ▪ Preference for taking initiatives (not to wait for further instructions) ▪ Preference for written and unwritten rules ▪ Horror of reporting problems	▪ High/ medium/ low ▪ High/ medium/ low ▪ High/ medium/ low ▪ High/ medium/ low

[15] These interviews were not restricted to project members of the case projects but also included people who worked in other projects.

Time pacing

Time pacing is defined as superiors' and subordinates' way of planning and control time in order to finish work by deadlines (cf. Gersick, 1988). We expect that the way Mexican and Dutch people value time will exert a strong influence on their time pacing routines.

Lewis (1996) distinguishes between linear-active and multi-active time orientations. The Dutch tend to have a linear-active time orientation. Lewis characterises linear-active people as those who tend to plan, schedule, organise and pursue unidirectional action chains, and do one thing at a time. Linear-active people think that in this way they get more things done. Besides this linear-active people regard time as a scarce commodity (time is money). In contrast, Mexicans tend to have a multi-active time orientation. Lewis characterises multi-active people as those who tend to do many things at once, plan their priorities not according to a time schedule, but according to the relative thrill or importance that each appointment brings with it. Relationships are more important than schedules. Human relationships are the best way they can invest their time. Multi-active people tend not to be very interested in schedules and punctuality.

Support for the multi-active time orientation of Mexicans can also be found in other bodies of literature. Kolland (1990) describes Mexicans as living for the present and not worrying about and planning for the future. In line with this, Hall & Hall (1987) describe the Mexican culture as past and present oriented with little emphasis on the future. Triandis (1982) claims that in Mexico there is a belief that people should not be slaves to time. Kras (1989) found that in Mexico time commitments tend to be seen as desirable objectives rather than binding promises. Support for the linear-active time orientation of Dutch people can also be found. Van der Horst (1999) argues that in the Netherlands appointments are carefully planned for, being late is not accepted, and appointments often simply cannot be delayed. In line with this, Trompenaars & Hampden-Turner (1998) argue that in the Netherlands time appointments tend to be kept strictly and relationships are subordinate to time schedules.

Based on the findings above time pacing values have been identified by interviewing Dutch and Mexican subordinates and superiors, who worked with respectively Mexican and Dutch colleagues in the past, about what they regard as the main differences in their way of managing time. The interviews had an open character and the following checklist (see Table 8) was used to stimulate the interviewees to think about differences in time pacing values.

Table 8: Operationalisation of cultural values related to time pacing

Variable	Attributes	Measurement scale
Time orientation	▪ Status of time commitments ▪ Punctuality ▪ Endings of meetings ▪ Horizon time plans ▪ Precision of time plans ▪ Parallel processing ▪ Use of time plans ▪ Intensity of time control	▪ Desirable objectives/ binding promises ▪ Important/ not important ▪ Flexible/ strict ▪ Long-term/ short-term ▪ Precise/ global ▪ Single/ multi-tasking ▪ Rigid/ flexible ▪ Strict/ loose

4.4.3 Process of change: management, evaluation and adjustment incidents

Management incidents

Management incidents are defined as the moments in which superiors attempt to plan and control project work and to lead subordinates.

Planning

Planning refers to the scheduling of activities in time and the allocation of these activities to subordinates. Planning can be seen as a means to reduce uncertainty and ambiguity on NPD tasks. It provides a blueprint for action. It can reduce misunderstandings and reduce co-ordination problems, as team members can refer to the plan for common language and understanding (Eisenhardt & Tabrizi, 1995). Degree and flexibility are important attributes of planning activities. High uncertainty situations are associated with extensive and flexible planning (see Daft, 1995). However, under conditions of extra-ordinarily high uncertainty, planning may not be helpful because the future is too difficult to predict. In such situations people tend to rely on real-time experimentation and improvisation (see Scott, 1987).

Control

Control refers to a superior's monitoring of project work. Control usually includes target setting, measurement of performance, comparison of actual against planned performance, and operational steering activities. In the present research the comparison of actual against planned performance is addressed by evaluation incidents (see section 4.4.3). Thus control refers to a superior's goal setting, measurement of performance and operational steering activities. Degree and type are important attributes of control activities. Both are discussed below.

The degree of control is closely related to the perceived uncertainty of partners. When partner A has little trust in the capabilities of partner B control is intensified and vice versa. Control may apply to entire organisations or individual organisational members referred to as strategic and operational control respectively. Therefore it is important to distinguish the level of control.

On the strategic level, Ouchi (1980) distinguishes between market, bureaucratic and clan control. Each form of control uses different types of information. However, these forms may be used simultaneously in an organisation. Market control uses economic information (e.g. prices and cost) to influence behaviour and evaluate output. For instance, partners may use fixed-price contracts to govern their collaboration. Bureaucratic control uses rules, policies, authority, standards, etc., to influence behaviour and evaluate output. For instance, one partner may force another partner to adjust. Finally, clan control uses shared values, commitment, trust, traditions and beliefs to influence behaviour and to evaluate output. For instance, one partner may rely on (trust) the word of other partner. Market control is used where outputs can be priced and competition exists, clan control is associated with uncertain and rapidly changing situations. Bureaucratic control can be used in wide range of situations.
On the operational level supervisors directly control the activities being performed by subordinates. Ouchi & Mcguire (1975) distinguish between output, behaviour and input control. Output control is used when the outputs of subordinates can be easily measured, such as the number of test cases performed. Behaviour control is based on personal observation of the work behaviour of subordinates to see whether they follow the correct rules and procedures. Finally, input control is used when neither outputs nor behaviours are easily measured. Input control uses training and indoctrination to regulate the knowledge, skills, values and motives of subordinates.

Leadership
Leadership refers to the attempts of superiors to influence subordinates. Important characteristics of leadership in the context of collaborative NPD are leadership - culture fit and leadership – competence fit. Both are discussed in more detail below.
Cross-cultural leadership research indicates that leadership styles vary across national cultures. For instance, Hofstede (1980b) found that in high power distance cultures (e.g. Mexico) subordinates expect superiors to act autocratically, whereas in low power distance cultures (e.g. the Netherlands) subordinates expect superiors to consult them. Leadership styles that work within one culture thus may not work in another culture. Consequently, the leadership styles of superiors need to be adapted to the cultural background of their subordinates. This can be achieved by selecting managers who are able to adjust their leadership style or by selecting managers with the desired leadership style.
Situational leadership theory (Hersey & Blanchard, 1977) asserts that superiors need to adapt their leadership style to the competence level of subordinates. According to this normative theory leaders need to balance task-oriented and relationship-oriented behaviour, depending on subordinate's willingness and ability to take responsibility for performing

tasks. Limited motivation and technical ability requires high task and low relationship behaviour of superiors (*directive leadership*). Sufficient motivation and low ability requires high task and high relationship behaviour of superiors (*coaching leadership*). Limited motivation and sufficient ability requires low task and high relationship behaviour (*supporting leadership*). Finally, sufficient motivation and ability of subordinates requires low task and low relationship behaviour of superiors (*delegating leadership*).
The operationalisation of management incidents is summarised in Table 9.

Table 9: Operationalisation of management incidents

Variable	Characteristics	Measurement scale
Planning	Who How ▪ Degree of planning ▪ Flexibility of planning When	▪ Description of role(s) ▪ Time spent on planning activities ▪ # revisions of time plan ▪ Slack built in time plan (high/ medium/ low) ▪ Date
Control	Who How ▪ Degree of control ▪ Type of control When	▪ Description of role(s) ▪ Strict/ medium/ loose ▪ Market/ bureaucratic/ clan control ▪ Output/ behaviour/ input control ▪ Date
Leadership	Who How ▪ Leadership – culture fit ▪ Leadership – competence fit When	▪ Description of role(s) ▪ Extent to which leadership style is adapted to the cultural background of subordinates (high/ medium/ low) ▪ Extent to which leadership style is adapted to the competence level of subordinates (high/ medium/ low) ▪ Date

Evaluation incidents

Evaluation incidents are moments in which project members reflect upon goal attainment and collaboration in the project[16].
Goals are defined as the desired state of affairs that partners attempt to reach (Daft, 1995). Operational project goals describe the measurable targets that are set for the project with respect to lead-time, costs and quality. The attainment of operational project goals is referred to as operational effectiveness. Goal attainment was measured by reviewing progress reports and interviewing project members.
Collaboration refers to the working together of people to achieve a goal of common interest (cf. Pinto & Pinto, 1990). Collaboration is a fuzzy concept, which bears similarities with concepts such as communication, integration and co-ordination. For instance, Lawrence & Lorsch (1967) define integration as the quality or state of collaboration that exists

[16] Please note that we are not so much interested in the evaluation events themselves but into the outcomes of these events. More specifically, we are interested in the outcome of partner's evaluation of actual and expected goal attainment and collaboration.

among departments that are to achieve unity of effort. Nevertheless, it is possible to characterise collaboration to some extent. For instance, Kahn (1996) regards collective goals, mutual understanding, formal and informal working together, sharing of ideas, information and resources and shared vision as important ingredients of collaboration. Pinto & Pinto (1990) regard open communication and team spirit as important ingredients of collaboration. In this research collaboration has been measured by interviewing project members about the degree of support (sharing ideas and resources), openness of communication, degree of mutual understanding and degree of team spirit (working together). The perception of collaboration denotes the relational performance of the project team.
The operationalisation of evaluation incidents is summarised in Table 10 below.

Table 10: Operationalisation of evaluation incidents

Variable	Characteristics	Measurement scale
Operational effectiveness	Goal attainment ▪ Speed ▪ Cost ▪ Quality	▪ On schedule / # of weeks behind schedule ▪ Within budget / exceeding the budget with [..]% ▪ Within quality norms/ exceeding quality norms with [..]%
Relational performance	Perception of collaboration ▪ Degree of support from partner ▪ Openness of communication ▪ Mutual understanding ▪ Team spirit	 ▪ High /medium/ low ▪ High /medium/ low ▪ High /medium/ low ▪ High /medium/ low

Adjustment incidents

Adjustment incidents are defined as the moments in which the structural properties of the project organisation are changed.
Important characteristics are the trigger, initiator, object, nature, frequency, date and impact of adjustments. The trigger denotes what induced managers to adjust the project organisation. This is closely related to evaluation incidents. For instance, poor collaboration may trigger managers to change the communication structure in a project. The initiator denotes who decided to change the project organisation. The adjustment object refers to what is changed. In line with the conceptualisation of the project organisation adjustments may refer to changes in goals, people, means, processes and organisational arrangements. The frequency of adjustments refers to how often certain organisational elements are changed. Furthermore, it is important to map out when adjustments are made. For instance, do managers pro-actively or re-actively change the project organisation. Finally, the impact of adjustments refers to the fact that they do not necessarily produce the desired effect. Therefore the impact of adjustments will be mapped out.

The operationalisation of adjustment incidents is summarised in Table 11.

Table 11: Operationalisation of adjustment incidents

Variable	Characteristics	Measurement scale
Adjustments	▪ Trigger ▪ Who (initiator) ▪ What (object) ▪ How (frequency) ▪ When ▪ Impact	▪ Description ▪ Description ▪ Goals, people, means, processes and organisational arrangements ▪ # times ▪ Date ▪ Pro-active/ re-active ▪ Description

4.5 Concluding remarks

In this chapter the research design and operationalisation of the descriptive process framework has been discussed. It was decided to study the development of collaboration by means of a longitudinal case study. Two software development projects jointly executed by two local design centres of one multinational were selected as cases. Within these case projects the focus was on the interaction between superiors and subordinates. Observations, semi-structured interviews, document studies and feedback sessions were used as primary methods of data collection. Furthermore, the descriptive process framework as presented in chapter 3 has been further operationalised in this chapter. The following chapter introduces the cases and presents the findings of the context analysis.

5

CONTEXT OF CASE PROJECTS

Letter from Mr Smith

"Another thing I don't understand is why they always act so co-operative and agreeable. They rarely make any comments on my decisions unless I specifically request them, and even then the response is very diplomatic and guarded.[..] Overall, as you can see, these past six months have been extremely frustrating. Although the Mexicans are courteous and unquestioning in their acceptance of my authority, they just silently ignore aspects of their work they either don't understand or don't agree with. What a mentality to try to decipher! Nevertheless, in spite of my frustrations, I still feel that tight controls and a strict approach are the only ways to teach them the right way to run a business."

Eva S. Kras, 1989, 'Management in Two Cultures: Bridging the problem between U.S. and Mexican managers', p.13-17

5.1 Introduction

In this research two collaborative NPD projects jointly executed by a Mexican and a Dutch local design centre within one single multi-national company, Telco, have been studied over a period of one year. The purpose of this chapter is to describe the context within which the case projects have been conducted. To this end an outside-in approach will be taken. Starting from the corporate organisation we will move inwards to the strategic and cultural context of both case projects

In section 5.2 Telco, the multi-national company to which both local design centres belong, is introduced. In section 5.3 the Dutch local design centre Telco-TNL and the Mexican local design centre Telco-TMX are introduced. Furthermore, the history of collaboration between the local design centres is discussed. In section 5.4 the strategic and cultural context of the collaboration between TNL and TMX in the case projects is discussed. This chapter ends in section 5.5 with some concluding remarks.

5.2 Telco and IN development

In section 5.2.1, the multi national company Telco is introduced. Furthermore, in order to get a feeling of the technical domain of study the basic principles of IN are briefly explained in section 5.2.2. The IN development organisation at Telco is introduced in section 5.2.3. Furthermore, given the central place of project management in this research, the standard project management of Telco is briefly explained in section 5.2.4.

5.2.1 Telco

Telco was founded at the end of the 19th century as a workshop for repairing telegraph instruments. In 1892, the first product was introduced, a tabletop device with a separate hand-held microphone. Since then the company has grown into a world-leading manufacturer of systems and products for fixed-wire and mobile Tele-communications in both public and private networks. Nowadays, Telco has more than 100,000 employees and local subsidiaries in 140 countries and a turnover of about 2,2 billion EURO in 1998. The operations of Telco are organised in five market areas: Western Europe, North America, Asia Pacific, Latin America and Africa/ Middle East. Nowadays, the organisation is divided into six business units: Mobile Systems, Multi Service Networks, Consumer Products, Data Backbone & Optical Networks, Internet Applications & Solutions and Global Services. The development of Intelligent Networks (IN) is an important activity for Telco.

5.2.2 Intelligent Networks

IN technology allows Telco operators to offer value-added services to their customers. IN allows Telco operators to design their own, unique services or adapt existing services to specific customer demands. A classic example of an IN service is the nationwide Pizza chain (Havelin, 1995:4):

> "It would be nice for a chain of pizza shops to advertise on national television and give a single phone number (1-800-PIZZAS), which the customer could dial to receive a tasty, steaming hot pizza. But which pizza shop should receive the order? It's no good if the shop is too far from the customer. Luckily, IN comes to rescue. The IN service can look at the number of the dialling subscriber (the A-number) and decide which pizza shop is closest. Then it will route the call to that shop."

IN networks are based on the idea of separating the switching functionality from service functionality. Whereas switching is handled by standard telephone exchanges, service handling is done by computer platform centrally positioned in the network. This computer platform is the core of an IN network and is referred to as Service Control Point (SCP) as depicted in Figure 11 below.

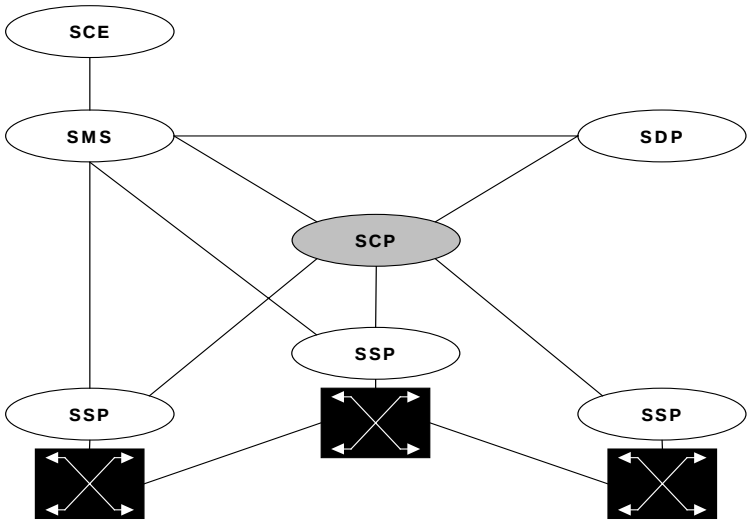

Figure 11: A simplified IN network

In order to enable the interaction between a telephone exchange and the SCP a Service Switching Point (SSP) is added to the telephone exchange. The SSP allows the SCP to temporally take over control of a call. When someone makes a call to an IN service, this call is routed to the SSP. In short, the SSP recognises the call as needing IN and communicates to the SCP that a call has been received. The SCP contains the "intelligence" in the Intelligent Network and decides how the call will be handled (e.g. play an announcement) and instructs the SSP to carry out the necessary action. The communication between SSP and SCP is based on the Intelligent Network Application Part (INAP) protocol. During the execution of a service call the SCP is supported by a database referred to as Service Data Point (SDP), containing customer specific information. A Service Management System (SMS) controls the services in turn. The development and implementation of new services is handled in a Service

Creation Environment (SCE). The software for new services can be downloaded by the SMS from the SCE and subsequently be installed in the relevant IN nodes such as SCP, SSP and SDP.

5.2.3 IN development at Telco

IN provisioning, located at Telco TNL[17] in The Netherlands, co-ordinates the efforts of the local design centres, nine in total, in the area of Intelligent Network (IN) platforms and service applications for IN solutions in networks based on different standards. IN provisioning was established at the end of October '99 after a re-organisation of the product unit Voice Added Services, whose role within Telco was seen as unclear and its organisation as too complex and not efficient. IN provisioning works as an orderer towards the local design centres that are active in the field of IN. Work is ordered within frame agreements and associated assignments. One of the first things IN-provisioning did was to reduce the number of local design centres working in the area of IN. It appointed three main local design centres for existing IN products: TNL/R located in the Netherlands, TMX/M located in Mexico and TSW located in Sweden. Furthermore, three main local design centres for next generation IN products were appointed: again TNL/R, and local design centres in Canada and Sweden. This resulted in the starting up of transfers of activities from local design centres to main local design centres[18].

5.2.4 Project management at Telco

An important means to co-ordinate NPD activities within Telco is the project management method PMA[19]. PMA was first developed in 1989 and initially intended for use at the business area public Tele-communications for technical development projects. Nowadays it has been widely applied throughout Telco, in all kinds of projects.
PMA provides a generic framework for project management that serve as a common language in the global development organisation of Telco. In PMA five fixed moments (Tollgates) are distinguished. Tollgates (TG's) are the main decision points in a project, at which formal decisions are made concerning the aims and execution of the project. At the five tollgates the following decisions are made:

TG1	Decision to start project feasibility study
TG2	Decision to start project execution
TG3	Decision to continue project execution
TG4	Decision to make use of the final project results, hand-over to customer, or limited introduction on the market

[17] Hereinafter referred to as TNL-provisioning

[18] Main local design centers are design centres that are responsible for product development activities in a particular area.

[19] This is a fictitious name

TG5 Decision to conclude project

PMA is composed of two type of models: project and work models. The project model describes which project management activities need to be performed and which project documents need to be prepared from the initiation of pre-study to project conclusion. The project model is divided into four phases, the pre-study, feasibility study, execution and conclusion phases. The start of these phases is marked by respectively TG1, TG2, TG4 and TG5. The project sponsor makes the tollgate decisions and takes the overall business responsibility for the project and its outcomes.
Work models describe the activities that will be performed in a project to arrive at the required project result (e.g. software). Besides this it also includes definitions of milestones. Different work models exist for different types of projects. A milestone is defined as an intermediate objective that defines an important, measurable event in the project, and represents a result that must be achieved at that point. Milestones link the work models to the project model. They are used to monitor progress and to structure time plans. Before each milestone is reached, a milestone review is performed in order to check the results against the milestone criteria.
Since PMA is a generic method it needs to be adapted to specific situations. Firstly, PMA is sometimes adapted to a specific company or business unit. Such an adaptation entails describing the interface between PMA and the existing routines. Secondly, PMA needs to be adapted to the particularities of projects, which is referred to as a PMA application. A PMA application is defined as the generic project model complemented by one or more specific work models, as well as by descriptions of the project activities, milestones and documents belonging to the work models. If it is decided not work according to PMA for every single different activity an “exemption” procedure needs to be written. Finally, as PMA puts a rather heavy documentation and administration load on projects it is simplified for small and non-complex projects. PMA provides some clues how to use it in such projects.

5.3 Local design centres

As noted in section 5.2.3 Telco TNL, located in the Netherlands, and Telco TMX, located in Mexico are two main local design centres in the area of Intelligent Networks. Both are discussed in more detail below.

5.3.1 Telco TNL

Telco has been operating in the Netherlands since 1920. More than 2,500 people are working in marketing & sales, logistics, operations,

consulting and R&D. Telco TNL/RI[20] is a local design centre for standard development of IN solutions. Within the Telco organisation TNL is responsible for (product owner) the development of the SCP-T product. SCP's are the nodes where the main intelligence is located within a Tele-communication network. It contains the logic required to carry out IN services. Well-known applications of IN are service numbers (0800 numbers in The Netherlands), voting systems used in TV shows and mobile pre-paid systems. Within the corporate Telco organisation TNL is a leading design centre in the area of SCP's. By October 2000 around 180 people were working at the RI department, with many technical positions being vacant. Responsibilities are decentralised and the organisational structure can be characterised as a balanced matrix structure.

Table 12: Basic information Telco TNL/R

Basic information	
Product	Software development and maintenance on IN platforms and services
Strategic goals	To be an important design centre within the Telco organisation in the area of 3rd generation IN
Status	Within Telco a leading local design centre on the area of IN. Product responsibility for SCP
Organisation	Decentralised organisation Balanced matrix structure
Size	Around 180 people are working at the R department Shortage in technical resources

The organisation structure of TNL can be typified as a balanced matrix structure. Project members have two bosses: the resource owner and the project manager. Competence managers are acting as resource owners and the operational manager is acting as a multi-project manager. Consequently, competence managers are allowed to overrule decisions of the operational manager when competence development is in danger. One TNL manager explained the difference between TMX and TNL as follows: "on a scale of getting the job done on the one end and the training of people at the other end TNL and TMX are both extremes. At TNL the danger is that job training is always favoured for getting the work done. At TMX the danger is that job training is always subordinated to getting the job done". The main task of the operational manager is to support and co-ordinate the different projects. Instead of the resource owner, the operational manager attends the steering group meetings of running projects.

[20] In September 1999 when the researcher started at Telco the department was called TNL/RI. However, the department's name changed several times. In this study we refer to this department as TNL.

Table 13: Changes during research period at Telco TNL

Changes during research period	
October 1999	▪ Re-organisation on product unit level, IN provisioning organisation set up to co-ordinate local IN design centres
January 2000	▪ RI department is merged with RS and Integration and from now on is called RG ▪ Competence managers are responsible for groups of 30 people
October 2000	▪ All R&D departments are clustered in a new business line Euro Lab Netherlands TNL/RG
October 2000	▪ Re-organisation of RG department ▪ Project office is set up that functions as a single point of contact towards IN provisioning ▪ Couples of competence and operational managers are leading product groups. Furthermore, a Jambala group is added

5.3.2 Telco TMX

TMX is a local design centre located in the North of Mexico. By the end of 1999, 350 people were working at TMX. The M department is responsible for the development of market, standard and network products among which Intelligent Networks (IN) for the Mexican, US, Central America Caribbean and some South American markets. By the end of 1999, approximately 120 people were working at TMX/M[21], of which approximately 28 people were working in the MI group supported by a technical support and project management group.

Table 14: Basic information TMX/M

Basic information	
Products	▪ Market, standard and network product among which IN
Strategic goals	▪ To be an effective and efficient local design centre within the IN provisioning organisation
Status	▪ Fairly new local design centre in the area of IN, eager to prove itself as a competent local design centre for IN provisioning
Organisation	▪ Centralised and hierarchical organisation ▪ Functional matrix structure
Size	▪ Between August 1999 and November 2000 the IN department grew from 22 to 57 people

The organisation structure of TMX can be typified as a functional matrix structure. The functional boss or line manager has primary authority and project managers simply co-ordinate the project activities towards its goals. The line manager is responsible for the work assignments and the project manager works for the line manager. As one TNL interviewee put it “TMX is more hierarchical than TNL, people are less self-driven and have to ask more frequently for permission and project managers have less authority than at TNL”. In October 1999 operational and competence

[21] Hereinafter referred to as TMX

management were both performed by the line manager. Consequently, operations often overruled competence development.

Table 15: Changes during research period at TMX

Changes during research period	
October 1999	▪ Re-organisation on product unit level, IN provisioning organisation is set up to co-ordinate local IN design centres
February 2000	▪ Re-organisation of M department ▪ IN Group is divided into three sub-groups: PDS, Customisations & services, and Platform development ▪ Management layer added ▪ Dutch line manager and Mexican MI group manager become business development managers
August 2000	▪ The IN group becomes a separate department within the M department and is called TMX/IC, approximately 54 people are now working in this department ▪ Management team established consisting of a general manager, a business development manager and several group managers

5.3.3 History of collaboration TNL and TMX

The foundations for the collaboration between TNL and TMX were laid in 1995 when Jan (currently general manager of IN-provisioning) met Francisco (currently group manager of TMX) in a project that was executed in Sweden[22]. Jan was project manager of a project in which Francisco participated as software designer. Both became good friends. Lateron, when Jan in the meantime had become line manager at TNL, and the department experienced a shortage of qualified engineers, Jan thought of his Mexican colleague. TNL hired a number of software engineers from TMX to cope with the shortage of human resources. TNL management was fairly satisfied with the people they got from TMX, they were flexible, motivated and hard working. One of these people was Francisco who worked as a function test leader and as a technical co-ordinator at TNL from October 1996 to October 1997 and from October 1998 to June 1998.

At the end of 1998 TNL subcontracted activities to TMX for the first time. Due to a lack of function testers at TNL part of the test activities of the INMQA project were subcontracted to TMX. The activities were started, based on hardly any agreement. During the project agreements had to be made and committed. In December 1998 the preparation of function test activities started at TMX. The setting up of the test environment at TMX proved to be problematic. By February 1999, testers found out that an essential hardware piece was missing. Hardware was ordered but not in the right way. During March 1999 it turned out that the order was never received at the hardware manufacturer in Sweden. After some efforts to trace back the order a new delivery date was negotiated with the hardware manufacturer. In order to avoid further delays a Dutch graduate student was sent to Sweden to pick up the hardware piece and to personally deliver it at TMX in Mexico. Furthermore, a technical co-

[22] These are fictitious names

ordinator was sent to TMX to support the testers with building the test configuration and providing on the job training. Not before May 1999 the missing hardware was available and working. After a scope reduction in April 1999 the project was concluded in July 1999. The project delayed six weeks mainly due to the unavailability of the test facilities at TMX and a lack of testers at TNL. The planning constants for this project proved to be twice as high than comparable projects at TNL. This caused a high resistance from the project sponsor who did not want to pay for what he called “the education of our Mexican colleagues”.
In spite of these first problems the collaboration between TNL and TMX was expanded. The SINAP and ISPV projects, which are the two case projects of the present thesis, were started up at TMX by the time the INMQA project was about to finish. Around the same time a TNL manager was offered a job as provisioning manager at TMX in Mexico. One of his tasks was to co-ordinate the collaboration between the two local design centres.

5.4 Context of collaboration

In this section the context of collaboration will be discussed. In line with our descriptive process framework, the context of collaboration is divided into a strategic and a cultural context of collaboration. Both are discussed in more detail below.

5.4.1 Strategic context

In this section the strategic context of collaboration is discussed. The strategic context of collaboration is divided into a general strategic context and a strategic context specific to the SINAP and the ISPV project. These are discussed in more detail below

General strategic context

For TNL the collaboration with TMX was seen as a solution to their human resource problems. It was increasingly difficult to staff IN projects and TMX had plenty of engineers available. Previous experience with TMX as a “resource provider” indicated that, although TMX was less experienced in the IN area, people were motivated, working hard and learned fast. TMX saw in the collaboration with TNL the opportunity to gain experience in the area of IN and to become a resource provider to other IN local design centres. Acquisition of product responsibility was initially not an ambition of TMX. However, all this changed when the product unit in the area of IN was re-organised and a new IN organisation was established in October 1999. This new organisation was named IN provisioning. One of the first things IN provisioning did was to reduce the number of design centres working in the field of IN to three IN local design centres. Besides TNL in the Netherlands and LMI in Sweden, TMX in Mexico was appointed as main IN local design centre

within the IN provisioning organisation. One of the main reasons of IN provisioning to appoint TMX as main local design centre was that in contrast to other design centres it was motivated to perform 2nd generation IN maintenance work. TMX thus developed from a resource provider and subcontractor of TNL to important local design centre operating besides TNL.

Strategic context SINAP project

In this section the strategic context of the SINAP project will be discussed. The following stakeholders are involved in the SINAP project:

- Customer: TED, a Danish Tele-communication company
- Project sponsor: TDA, a Danish market unit
- Main contractor: TNL, a Dutch local design centre
- Sub-contractor: TMX, a Mexican local design centre

TED has two different types of exchanges in its Tele-communication network which cannot communicate with each other. The purpose of the SINAP project was to develop a new Intelligent Networks Protocol Manager (INMP) block that allows the inter-working between a non-Telco SSP and a Telco SCP. TDA acquired the assignment from TED. They negotiated the end-date, price and functional requirements with the customer. TDA was fully financing the project. They want the project team to solely focus on the implementation of the functional requirements of the customer, which limits the use of the product for other markets. TDA attached high priority to the SINAP project. TDA contacted TNL to execute the project, since they are the responsible organisation in this area. Through a product committee (PC-SCF) TNL co-ordinates the efforts within development projects in the area of SCF. Although TNL realised that the product would be a custom-specific product, they saw some possibilities for standardising the SINAP product. TNL attached medium priority to the SINAP project because SINAP would not be a standard IN platform product. TNL did not have sufficient engineers available to perform the project. Therefore the project was subcontracted to TMX. TMX saw in the collaboration with TNL an opportunity to gain knowledge and skills in the area of IN, and to prove to TNL and the IN provisioning organisation that it was a competent IN design centre. Not surprisingly the SINAP project did have high priority within TMX.

Strategic context ISPV project

In this section the strategic context of the ISPV project will be discussed. The following stakeholders are involved in the ISPV project:

- Customer: several First-Order Application (FOA) customers
- Project sponsor: TNL-provisioning, a Dutch co-ordination body
- Main contractor: TNL, a Dutch local design centre

- Resource provider: TMX, a Mexican local design centre

FOA customers are customers who agreed to test a newly developed IN platform before it was officially launched onto the market. Within TLN a new IN platform was developed, which was about to be launched onto the market. The main purpose of the ISPV project was to system-test this new IN platform. Previously, customers instead of Telco found a lot of faults. The reason for these faults is that in live exchanges faults occur that normally would not be detected during regular function tests. ISPV was planned to find and solve these faults before First Order Applicants (FOA) customers start to use the platform. TNL-provisioning was the sponsor of the ISPV project. TNL-provisioning co-ordinates the efforts of local design centres in the area of IN. Both TNL and TMX have to report to TNL-provisioning. TNL did not have sufficient testers available to execute the ISPV project. Therefore testers were hired from TMX to help perform the test activities. Later on the whole ISPV project was moved to TMX. In total five testers and two test facilities were hired from TMX for executing the test activities. TMX is very eager to become a leading design centre in the area of IN. The ISPV project was among the first projects in which TMX collaborated with TNL. The ISPV project did not have low priority at TNL and TNL-provisioning. The project was started up and closed down several times due to priority shifts at TNL and TNL-provisioning. TMX attached medium priority to the ISPV project.

5.4.2 Cultural context

The cultural context of collaboration refers to partners' cultural values and norms with respect to time pacing and communication. Both are discussed below.

Cultural differences in time pacing

Time pacing is defined as people's way of managing time in order to finish work by deadlines (cf. Gersick, 1988). Below differences between TNL and TMX with respect to their values and practices with respect to time pacing are discussed.

Punctuality

The first big differences between TNL and TMX is that at TNL almost everybody has and uses an agenda for making appointments, whereas at TMX only a few people, mostly managers, have and use agenda's. Several TMX engineers indicated that at TNL people seem to make appointments for everything. At TNL appointments are planned for and kept stricter than at TMX. At TMX appointments are more subordinate to relationships than at TNL. If you have an appointment with someone he or she will take all the time that is needed. Hence appointments are not so much dictated by a time plan. Furthermore at TMX it seems to be more common to arrive late at meetings and that meetings have flexible endings.

Team spirit

Indications were found that at TMX a more collective attitude exists among employees than at TNL. At TMX people do not easily say 'no' to requests for help by colleagues. It is not very uncommon at TMX that people try to help each other even though people do not really know how to help the other. The co-operative attitude of TMX people allows them to perform complex tasks for which they lack technical competencies. Several TMX interviewees argued that at TNL people work more focused and stick to their job descriptions more tightly. Compared to TMX there are a more specialists available at TNL who are able to provide quick answers to technical problems. TMX designers frequently use this collective attitude as an argument for why (personal) time plans get messed up. As one TMX interviewee remarked "planning is more flexible here at TMX, we do not say easily no to requests for help, which will impact our personal planning, in this project I have learned to say 'no' to requests sometimes". To sum it up, at TMX, people are regarded more important than time plans and consequently people's personal time plans are frequently messed up due to unexpected requests for help. In contrast, at TNL there is a tendency to subordinate people to time plans. People are asked to come back another time or to ask somebody else.

Time control

Time is considered very important at TNL and more a side dish at TMX. As one TNL interviewee remarked: "Mexicans are perfectionists who want to deliver perfect quality. But the market does not demand perfect quality but products that are delivered on time. They take their time to come to a perfect solution". Thus at TMX quality is regarded more important and being on time is regarded less important than at TNL. This difference might be related to the difference in customer demands in Latin America compared to Europe. Indications were found that in Mexico customers are less concerned with lead-time than in the Netherlands. As one TMX manager indicated, "In other projects lead-time did not play such an important role. Customers were always willing to wait a bit longer when a project is delayed".

Cultural differences in communication

Communication is defined as people's way of exchanging information with other people. The focus here is on how subordinates report progress, problems and actions and how superiors lead subordinates. Below differences between TNL and TMX with respect to their communication values and practices are discussed.

Respect for authority

The power distance at TMX seems to be much higher than at TNL. At TMX there is a command like structure. Superiors instruct subordinates what to do and subordinates don't really question their superiors. As one

TMX interviewee put it “basically people here just do what managers say, we do not perceive an alternative way because we are afraid of losing our job”. At TMX subordinates assume that superiors know what they are doing. They do not say when they feel not confident about directives of their superiors. In line with this several TNL interviewees stated that TMX people tend to say “yes to everything what is asked from them”. As one TNL interviewee remarked “At first sight TMX commits itself very easily but at second sight, they cannot hold on to their promises, it is better to be open and honest about ones capabilities”. Consequently, for some TNL people it was difficult to judge if TMX people did really understand what was explained to them. As one TNL interviewee puts it: “Sometimes TMX engineers pretend to understand what I tell them, I have to continuously check if they really understand what I tell them”. In line with this, another TNL interviewee stated: “at TMX people tend to muddle through, people are afraid to lose face”. At TNL superiors tend to treat subordinates more as equals. Superiors and subordinates might have lunch together and dance with each other on company parties. Subordinates are very critical towards their superiors and often want to know the ‘why’ of instructions. Consequently, superiors spend a lot of time on explaining the ‘why’ of things. The TMX who have worked at TNL were quite surprised by how direct and critical TNL engineers are vis-à-vis their supervisors. On the other hand TNL managers were quite surprised by the obedient attitude of TMX engineers. As one TNL manager remarked, “TMX engineers have a very obedient attitude, I first have to drag them a bit higher, I want to communicate with them on basis of equality”. An important consequence of the command-like structure at TMX is that subordinates tend to wait for further instructions, instead of looking for answers themselves.

Leadership

TNL and TMX managers differ with respect to their leadership style. The leadership style of TNL (project) managers can be characterised as consultative and supportive, whereas the leadership style of TMX (project) manager can be characterised as directive and paternalistic. This can be explained if one considers the power distance situation at TNL and TMX. There is medium need of uncertainty avoidance and a small power distance between superiors and subordinates at TNL. Consequently, project managers and project workers treat each other as equals. Project managers act like co-workers with specific administrative tasks. Project workers are consulted and provide decision-making input. Work instructions tend to be global, to be filled in by subordinates. Furthermore, is it not uncommon that subordinates criticise or oppose the opinions of their superiors. In contrast, there is high need for uncertainty avoidance and large power distance between superiors and subordinates at TMX. Consequently, project managers and project workers consider each other as unequal. Project managers act as father

figures to their subordinates. Project workers are instructed by project managers in a precise way what to do and rarely provide decision making input. It is very rare that subordinates criticise or oppose the opinion of their superiors. Controlling progress is sensitive and checked by informal and indirect talks with project workers.

Precision of work instructions
At TMX people tend to ask for more detailed work instructions than at TNL. The preference for detailed work instructions is related to the high uncertainty avoidance and power distance situation at TMX. People tend to stick to the letter and not the intent of work instructions. Furthermore, own initiative and pro-active behaviour are not very much encouraged by the power distance between superiors and subordinates. The preference of detailed work instructions is also related to the technical competence level of TMX engineers. As one TNL interviewee remarked "TMX people seem to be more task-oriented. At TNL there also people who can see the bigger picture". At TMX project managers need to see the bigger picture, whereas at TNL project managers are more equal to project members. There is less need for project managers to see the bigger picture.

Preference for rules
No differences were found with respect to preferences for written and unwritten rules. However, with respect to social rules of communication several TMX interviewees pointed out that TMX people are less direct than their Dutch counterparts. One TMX interviewee formulated it as follows: "An important difference between Northern Europeans and Mexicans is that the Northern Europeans are more direct, which is considered rude in Mexico. We have difficulties in separating work and private life. Mexicans avoid conflicts, they want to be in harmony with their environment". For many TMX people it is difficult to understand that people who have a conflict in a meeting might get along afterwards.

Reporting of disappointing progress
People at TMX were found to be more hesitant to report problems and disappointingly progress than at TNL. As one TNL interviewee remarked: "Reporting problems is problematic, they are very good in window dressing. If progress reports look nice there are definitely problems". On the other hand, some TMX interviewees were quite surprised that it is allowed at TNL to say that hardly any progress is made on a specific task. This fear of admitting failure might be connected to cultural values with respect to power distance. The authoritarian style of Mexican managers does not encourage subordinates to report problems and disappointing progress (Stephens, 1995).

5.5 Concluding remarks

This section introduced the corporate organisation and the local design centres within which the case projects were executed. Furthermore the historical, strategic and cultural context have been outlined. The collaboration between TNL and TMX grew out of a personal relationship between two line managers and the studied projects were among the first projects they collaborated in. There was no long collaboration history between TNL and TMX when the case projects started. With respect to the strategic context it was observed that TNL saw the collaboration as a solution to their human resource problems, whereas TMX saw the collaboration as an opportunity to learn and to prove themselves as competent design centre. Important differences between the strategic context of the SINAP and ISPV project are the following. Firstly, whereas the SINAP project got medium-high management priority, the ISPV project got medium-low priority. Secondly, whereas TMX was treated as a sub-contractor in the SINAP project, TMX was treated as a resource provider in the ISPV project. Thirdly, in contrast to the ISPV project the SINAP is characterised by conflicting development strategies. Whereas TNL preferred a standard development strategy, TDA preferred a customised development strategy. Finally considerable differences in cultural arrangement between TNL and TMX were found. These differences are summarised in Table 16.

Table 16: Cultural differences in time pacing and communication

Cultural context	TNL	TMX
Time pacing		
▪ Punctuality	▪ Important	▪ Not so important
▪ Ending of meetings	▪ Kept strictly	▪ Flexible
▪ Team spirit	▪ Medium	▪ High
▪ Time control	▪ Important	▪ Not so important
Communication		
▪ Respect for authority	▪ Low	▪ High
▪ Status of work instructions	▪ Negotiable	▪ Indisputable orders
▪ Leadership style	▪ Consultative/ supportive	▪ Directive/paternalistic
▪ Delegation of responsibilities	▪ High	▪ Low
▪ Preference for precise work instructions	▪ Low	▪ High
▪ Social rules of communication	▪ People are relatively direct	▪ People are relatively indirect
▪ Sensitivity of reporting problems	▪ Medium	▪ High

These differences in strategic and cultural context are expected to influence the collaboration between TNL and TMX considerably. How these differences affected the collaboration between TNL and TMX and how managers tried to cope with these differences in the SINAP and ISPV project will be discussed in chapter 6 and 7.

6

DEVELOPMENT OF COLLABORATION IN THE SINAP PROJECT

Letter from Sr. González

"On a more personal note, none of us envies him his life style, which seems to involve nothing but work, with very little time for leisure. We have never met his wife or family, and he never mentions them. It certainly must be a strange existence. After all, what is life worth if one does not have time to enjoy it with family and friends! Finally, though I mentioned this before, there is the question of good manners. Most North Americans are apparently unaware of the unfortunate impression they create when they disregard common courtesies. In addition to the incident that occurred on the day of his arrival, let me tell you another story – the ultimate example of bad manners! One day he called a 'U.S.-style informal meeting.' He actually put his feet up on top of the desk! Can you imagine a Mexican general manager behaving in such an uncivilized fashion?"

Eva S. Kras, 1989, 'Management in Two Cultures: Bridging the problem between U.S. and Mexican managers', p.21-22

6.1 Introduction

This chapter describes and analyses the development of collaboration in the SINAP project. The case analysis is divided into a process and a context analysis. In section 6.2 the results of the process analysis are discussed. In section 6.3 the results of the context analysis are discussed. This chapter ends in section with 6.4 concluding remarks.

6.2 Process analysis

In this section the development of collaboration that emerged in the SINAP project is analysed. The purpose of the process analysis is twofold. The first purpose is to identify and typify the problems which emerged during the collaboration. The second purpose is to identify how these problems have been evaluated (evaluation incident) and managed (steering and adjustment incidents). The process analysis stays close to the data and is descriptive in nature. It provides the basis for the context analysis, which is discussed in section 6.3.

The development of collaboration is described in terms of critical incidents. A critical incident is defined as an occasion that significantly influenced the course of project activities in terms of operational effectiveness and the partners' perception of collaboration (see section 4.3.3 for the method used to select critical incidents). In line with our descriptive process framework critical incidents are divided into evaluation, steering and adjustment incidents. Sequences of evaluation, steering and adjustment incidents – not necessarily in this order – that refer to a particular problem are grouped into a fragment. Evaluation incidents denote the managers' evaluation of the problem at hand. Steering and adjustment incidents denote how managers have dealt with the problem at stake.

In section 6.2.1 the initial project organisation is outlined. In section 6.2.2 the critical incidents that emerged in the SINAP project are described. In section 6.2.3 the critical incidents are interpreted in terms of the incidents of our descriptive process framework. Finally, in section 6.2.4 the project outcomes are discussed.

6.2.1 Initial project organisation

In line with the conceptualisation of project organisations as presented in section 3.3.2, the project organisation will be discussed in terms of goals, people, means, processes and organisational arrangements.

Project goals

As discussed in section 5.2.2 the inter-working between a Service Switching Point (SSP) and a Service Control Point (SCP) in an IN network is normally arranged by the INAP protocol. A Telecom operator in

Denmark has two different exchanges in his network, a non-Telco SSP and a Telco SCP. At the time the project started it was not possible to connect these two one another because the standard used to develop these blocks is open for interpretation on several points, giving rise to incompatible blocks. The purpose of the SINAP project was to develop a new Intelligent Networks Protocol Manager (INMP) block that allowed the inter-working between a Mesa[23] SSP and a Telco SCP.

People

The SINAP project was executed at TMX by a project team in which the following roles were represented:

- One project manager
- Six designers
- Three testers
- One test co-ordinator
- One technical co-ordinator
- One project administrator
- One quality co-ordinator
- One configuration manager
- One Test Configuration Management (TCM) responsible
- One Release responsible[24]

Most designers and testers had little to no experience in the area of IN development. No training needs were identified at the beginning of the project. People were supposed to learn these competencies on the job.

Processes

The complexity of the design activities was regarded as medium to high. The project was regarded by TNL as rather straightforward. However, since it concerned an interface (protocol) between two blocks, knowledge of both these blocks was needed. TMX is dependent upon TNL and TDA for this specialist knowledge. The inter-working test that was needed to check if the Telco and Mesa block could communicate with each other via the SINAP protocol, would be executed at TDA. Thus TDA could not start before TMX was ready with their SINAP project.

Means

Various reporting tools were used to store project documentation in the corporate library for design and management information. Furthermore, it was decided to use a simulated test environment for test execution. This was expected to speed up test execution significantly.

[23] Mesa is a fictitious name

[24] A release responsible checks all project documents

Organisational arrangements

In the project quality plan it was stated that the project manager was authorised to take decisions regarding the acceptability of test results, documentation and products to be released and the results of milestone reviews.

Progress meetings were held every Friday at TMX, and minutes of the meetings were prepared and stored on the project web page. TNL initially demanded monthly progress reports. However, lateron (when the steering group was implemented) this changed to weekly progress reports. Phone meetings with TNL were held on a weekly basis. Furthermore, quality reports were prepared and distributed on a monthly basis and technical meetings were held whenever it is needed.

The design models and processes used were based on the corporate standard design process. The corporate standard project management methodology PMA were used to control the project. All project documents were stored on the corporate database for design and management information.

To insure quality to two internal audits and one external audit were conducted during the execution of the project. Process adherence was promoted by means of process presentations given at the beginning of the project as well as prior to the beginning of each project phase.

It was decided that the Product Committee of Service Control Functionality (PC-SCF) at TNL would review the input documentation and the functional specifications. In order to identify faults inspections and desk checks were performed during the project.

6.2.2 Description of critical incidents

In this section the critical incidents that emerged during the collaboration are described. The critical incidents are grouped into fragments, marked, and numbered[25].

Fragment 1: project start-up

In the beginning of May 1999 TDA committed an end-date to the customer TDK before Tollgate 2 had been passed **[1a]**. TDA asked Strategic Product Management (SPM) to look for an organisational unit that could execute the project. Since TNL was responsible for the development of all SCF-related products SPM asked TNL to execute the project. TNL regarded the committed end-date as feasible **[1b]**. TNL accepted the assignment **[1c]**. Since TNL did not have enough engineers to execute the project, TMX was asked to perform the project. TMX accepted the assignment and the project was subcontracted to TMX **[1d]**. June 1, the project was officially started up at TMX **[1e]**. A collaboration agreement between TNL and TMX was made, which was signed by the

[25] Critical incidents are marked and numbered using the following logic: **[fragment number: 1,2,3, etc, and incident number within fragment: a,b,c, etc]**

resource owners of TNL and TMX at July 21. This collaboration agreement was not a thick legal contract, but an informal contract stating what was expected from TMX in broad terms. TNL was responsible for the project and TMX would execute the project.

Fragment 2: time planning problem[26]

Already in May 1999 TMX started to work on a time plan for the project **[2a]**. By that time, however, the results of the pre-study, which was performed by TDA were still not available. Hence, TMX started to develop a time plan based on what they got on information from TDA. The first time plan was sent on 22 May 1999 to TNL. Both TNL and TDA were not satisfied with this time plan because it lacked precision **[2b]**. TMX was urged to come up with a more precise time plan **[2c]**. Several revisions of the time plan followed with varying end-dates. However, each time the steering group was not satisfied with the content of the time plan and TMX was urged to come up with a better time plan. In the steering group meeting of September 6 the 7th revision of the time plan was discussed. TDA and TNL still felt that this time plan contained too many risks due to the low competence, parallel development and lack of slack **[2d]**.

Fragment 3: competence problem[27]

In August 1999 both TNL and TDA started to doubt if TMX had enough technical competencies to execute the project **[3a]**. TNL and TDA asked TMX if it could use some help with the functional specifications and trouble shooting. An experienced designer of TNL and a technical co-ordinator of TDA were sent to TMX to provide technical support **[3b]**. The TDA technical co-ordinator was responsible for the pre-study of the SINAP project, which was performed at TDA. He had identified the functional requirements in discussions with the customer. These requirements now had to be translated into functional specifications. The idea was that the TDA technical co-ordinator would work on together with the TMX technical co-ordinator on the functional specifications initially for a couple of weeks. In reality he stayed to the end of the project. The TNL designer would act as a troubleshooter. The idea was that he could support the TMX designers in solving technical problems. Both experienced problems with the TMX designers and testers because people did not ask much and tended to pretend to understand what was explained to them. According to the TDA technical co-ordinator he had to continuously ask if everything was going well without giving them the feeling that he was checking them.

[26] This fragment has been labelled time planning problem, because it describes the difficulty of TMX to come up with a reliable time plan

[27] This fragment has been labelled competence problem, because the steering group managers suspect that TMX does not have enough competence to execute the project independently

Fragment 4: steering problem[28]

TMX viewed the internal client TDA as the boss and therefore TMX reported progress to TDA instead of to TNL, although TNL was responsible for the product **[4a]**. TNL felt that TDA was trying to steer the project behind their backs and urged TMX to report progress, problems and actions to them as well **[4b]**. The TMX project manager did not really understand why TNL acted like they are the bosses **[4c]**. At the end of August 1999 TNL decided to establish a steering group in order to get more control over the project and to co-ordinate the steering activities with TDA **[4d]**. In the steering group the following roles were represented:

- TNL: operational management and system management
- TMX: project management and co-ordination management
- TDA: project orderer
- ERA: strategic product management

The objective of the steering group was to assist the project manager in achieving the goals set for the project. It was decided that the project manager would produce weekly progress reports (containing a summary of T, Q and C, project status, resource economy, quality issues, problems and risks) and distribute these in advance. Monthly reporting was thus replaced by weekly reporting. The steering group would have a telephone meeting every Monday, which would run according to a fixed agenda.

Fragment 5: time planning problem[29]

On September 8, a Tollgate 2 meeting was held. In this meeting the most recent time plan of TMX was discussed. The steering group decided not to pass Tollgate 2, mainly due to the unstable time plan **[5a]**. There was a common feeling at TDA and TNL that the current time plan still contained too many risks due to low competence, parallel development and no slack. From the Tollgate meeting TNL sensed that TDA was willing to build in some slack in the time plan (less activities in parallel) to improve the reliability of the time plan **[5b]**. In response to the comments made on the Tollgate 2 meeting TMX developed a new time plan, which was not regarded realistic **[5c]**. On September 9, the TDA steering group manager referred the time planning problems to strategic product management **[5d]**. TDA wanted to get a higher attention of TMX (priority) to the project in order to secure the delivery plan to the customer. Main concerns for TDA were:

[28] This fragment has been labelled steering problem, because the double steering situation is perceived as problematic by TNL and TMX

[29] This fragment has been labelled time planning problem, because it describes the difficulty of TMX to come up with a reliable time plan. The fragment is related to fragment 2

- Time plan: current time plan with a pre-delivery on January 12 and a function test delivery on February 14 left too little time for TDA and TDK to perform the inter-working tests.
- Competence: the level of IN competence of TMX was not high and therefore a clear risk for the quality. TDA wanted to see more IN competence added to the project.
- Project management: TDA had concerns on the quality of the project management organisation at TMX. According to TMX the project management organisation was in right shape and should not be seen as a risk factor.
- Project status: project did not pass TG2.

The following actions were proposed to cope with these concerns of TDA:

- TNL would inspect the time plan of TMX. The objective was to have a committed time plan, which was supported by the product unit management and TDA on September 23, when it would be presented to the customer **[5e]**.
- TNL would look into the project organisation at TMX and would define actions to be taken (if needed) to re-enforce the project organisation.
- TNL would look into possibilities to increase the effort in the project. TDA was willing to financially support any extra-ordinary efforts with an incentive scheme.

On September 15 TNL reviewed the time plan of TMX. They concluded that more slack needed to build into the time plan in order to avoid quality and lead-time risks. TNL proposed to build in 1.5 months of slack resulting in a pre-delivery in mid-March and a function test delivery in early May (worst case scenario). On September 21 a second Tollgate 2 meeting was held. In this meeting the new time plan was discussed. It was decided that the deadlines for pre-delivery would be February 4, function test March 13 and inter-working test June 15 **[5f]**.

Fragment 6: incentive problem[30]

During the meeting the partners discussed possibilities to speed up the project. It was decided to implement an incentive scheme **[6a]**. The idea of the incentive scheme was to motivate people to speed up and improve the quality of project work. However, TMX designers and testers mainly interpreted the incentive scheme as a sign of mistrust and were not in favour of it **[6b]**. As one TMX engineer put it “people said we don’t need more money to do our job, they are offering us more money because they think we cannot do the job”.

[30] This fragment has been labelled incentive problem, because the incentive scheme was perceived a sign of distrust

Fragment 7: competence problem[31]

TDA and TNL also considered assigning a project management assistant to the project. TNL and TDA felt the TMX project manager could use some help because they did not have much trust in the planning and control capabilities of the TMX project manager, and they sense that the TMX project manager was also rather busy with activities for other projects **[7a]**. They argued that the project manager could use an assistant to cope with the administrative workload (e.g. writing of progress reports and time plans). TMX rejects this idea, which they perceived as a sign of mistrust **[7b]**.

Fragment 8: time planning problem[32]

On October 6 a steering group meeting was held in which TDA stressed that the current time plan was very out of line with what they originally promised the customer **[8a]**. TNL defended the time plan that was developed by TMX and checked and improved by TNL, towards TDA by emphasising that it would be better to pursue a realistic than an unrealistic time plan **[8b]**. In the time plan there were a lot of activities in parallel, which was considered a risk by TNL because of the reciprocal interdependencies of activities. Changes in one activity would require adjustments of other activities and vice versa. Further compressing the planning would increase the risk. TNL regarded the current planning as feasible. TNL stressed that it has extra resources to cover unforeseen situations. At the end of the steering group meeting TDA accepted the arguments for delaying the project **[8c]**.

Fragment 9: co-ordination problem[33]

At the beginning of October it became clear that the communication between the TDA technical co-ordinator and TNL system management on the one hand, and between the TDA technical co-ordinator and the TMX technical co-ordinator on the other hand was not as it should be **[9a]**. On October 13, the steering group discussed the roles and responsibilities of the two technical co-ordinators in the project. Over the last months the TDA troubleshooter had become the informal project technical co-ordinator because of his knowledge of the functional specifications. However, there had been conflicts between the (formal) TMX technical co-ordinator and the (informal) TDA technical co-ordinator about the functional specifications. Moreover, the TDA technical co-ordinator largely neglected the comments of TNL system management on the documentation of the functional specifications. The TMX technical co-ordinator agreed with the comments of TNL system management. He felt

[31] This fragment has been labelled competence problem, because the steering group managers distrust the managerial competencies of the TMX project manager

[32] This fragment has been labelled time planning problem, because it describes the difficulty of TMX to come up with a reliable time plan. The fragment is related to fragment 2 and 5

[33] This fragment has been labelled co-ordination problem, because it refers to a conflict between the technical co-ordinators with respect to the technical co-ordination of the project

that the functional specifications were unclear. The steering group felt that more than one technical co-ordinator in the project would be a risk for the project because "too many cooks will spoil the soup". The steering group felt that one technical co-ordinator should be made responsible for the project and that it was up to TMX to decide who this would be **[9b]**. The TMX project manager was asked to clarify the technical co-ordination role **[9c]**. The TMX project manager, however, communicates that the steering group had decided to make the TDA person the overall project technical co-ordinator and the TMX person as the technical co-ordinator of unit design. On October 21 the project manager reported in a steering group meeting that the TDA troubleshooter would be the project technical co-ordinator **[9d]**. The steering group, in turn, stressed that the steering group did not care about who would be the technical co-ordinator as long it is clear who was the technical co-ordinator **[9e]**. The steering group urged the project manager to come up with a definition of the roles and responsibilities of both technical co-ordinator functions **[9f]**.

Fragment 10: competence problem [34]

In response to the concerns of TDA and TNL (see fragment 5) with respect to the competence level of TMX a TNL competence manager visited TMX on October 28 and 29 **[10a]**. Overall goal of the visit was to intensify the bonds, to get acquainted with TMX management, and to assess the technical competence level of TMX **[10b]**. The competence manager interviewed several managers and engineers about competence development situation at TMX. He concluded that TMX was relatively new in the area of IN. The most experienced people had one, maximum two years of experience in IN, gained abroad. The competence manager identified several areas in which knowledge was missing. He mapped out the competence level of TMX and compared it to the critical level of competence (minimal level). This resulted in a competence plan for TMX. TMX management was made responsible for ensuring that TMX engineers would receive the needed training.

Fragment 11: quality problem [35]

At the beginning of November '99 an inspection of the product committee SCF (PC-SCF inspection) revealed that the project did not follow the standard Telco document structure. System management of TNL (responsible for PC-SCF inspection) could therefore not approve the functional specifications **[11a]**. For system management it seemed that everything was according to the customer's wishes, thus neglecting the internal corporate quality standards. System management envisaged that if TMX would not act on their comments this would result in higher

[34] This fragment has been labelled competence problem, because it is a direct result of the competence problems described in fragment 3 and 7

[35] This fragment has been labelled quality problem, because TNL system management has major concerns about the quality of the SINAP product

maintenance cost. TDA was concerned that TNL was trying to enforce their standardisation development strategy upon the project and hands over the quality problems to strategic product management **[11b]**. Strategic product management stressed that they agreed to develop a custom-specific product, but agreed with TNL system management that product maintainability and quality cannot be compromised by customer wishes **[11c]**. The TDA technical co-ordinator working at TMX, was urged to re-work the functional specifications **[11d]**.

Fragment 12: co-ordination problem[36]

On November 10 the TNL steering group manager urged the TDA technical co-ordinator working at TMX, a TDA technical co-ordinator working at TDA and TNL system management to set up weekly technical meetings to co-ordinate their opinions of the functional requirements **[12a]**. Furthermore, the TDA technical co-ordinator was urged to comply with the Telco standards of product quality and maintainability **[12b]**. The TDA technical co-ordinator was not impressed. He felt these weekly technical meetings were a waste of time and they only would make sense when there was really something to discuss **[12c]**. He rejected the management directive to set up weekly meetings. He thought he could sort things out by e-mail **[12d]**. On November 15 the project manager reported to the steering group that from now on the TMX technical co-ordinator would be the overall technical co-ordinator **[12e]**. In the steering group meeting it was decided that the acting overall technical co-ordinator (the TDA person) would provide the initial technical approval of the functional specifications (as last act as overall TC), instead of TNL system management. However, a study would be performed to assess the amount of time needed to standardise the documentation, in such a way that it is acceptable for the product committee (TNL system management). Ultimately it was decided to re-work the documentation in accordance with the quality standards **[12f]**.

Fragment 13: collaboration problem[37]

On November 17, a workshop was organised for TNL and TMX managers at TNL **[13a]**. During the workshop it became clear that the collaboration between TNL and TMX was in need of improvement **[13b]**. Both partners were not really working together to solve the encountered problems but instead were blaming each other for the problems encountered. During the workshop it became clear that the TNL was in a learning curve of sub-contract management whereas TMX was in a learning curve of IN development.

[36] This fragment has been labelled co-ordination problem, because it refers to a conflict between the technical co-ordinators with respect to the technical co-ordination of the project. The fragment is related to fragment 9

[37] This fragment has been labelled collaboration problem, because the workshop was organised to evaluate the rather problematic collaboration in the SINAP and ISPV project

Fragment 14: progress problem[38]

On November 20 the project received 23 Change Requests (CRs) **[14a]**. The TNL steering group member at first thought this would provide the project with an opportunity to re-negotiate the end-date with the customer and hence mitigate the penalties that the TDA needed to pay due to the delayed delivery to the customer **[14b]**. However, after inspection of these CRs by TNL system management **[14c]** he found out that most of these CRs were not new customer requirements but clarifications of existing functional requirements **[14d]**. The TDA technical co-ordinator wrote most of the CRs to clarify the functional requirements to the TMX technical co-ordinator and TNL system management. The remaining CRs were needed to cope with things that the project team discovered during the project, things they did not see in the beginning. According to TDA technical co-ordinator the area was complex because Telco and Mesa use different document formats and standards. November 29, a steering group meeting was held in which the impact of the CRs was discussed. The TMX project manager envisioned a delay of two weeks, if the time needed to re-work the functional specifications was not sufficiently covered with human resources. TMX would allocate one additional engineer to the project to cover the time loss that would be needed for re-working the functional specifications **[14e]**.

Fragment 15: control problem[39]

In December TNL and TDA were starting to doubt TMX's reporting of progress **[15a]**. On December 4 the TMX project manager reported that no problems and risks were foreseen and that everything was under control **[15b]**. The project manager hoisted the green flag for lead-time. On December 6 the TDA steering group member complained that the project manager had hoisted the green flag rather quickly. The project manager replied that the final delivery would not be delayed. On December 13 TNL and TDA thought it was strange that the project manager foresaw no risks since according to their information 16 tasks were behind schedule. The project manager, however, claimed that only 7 of the 67 tasks were behind schedule. On December 20 the project manager again reported that everything went fine. This did not reassure TNL and TDA. They received different signals from their local troubleshooters **[15c]**. Consequently, they remained sceptical about the reporting of progress of the TMX project manager. On January 26, one day before the weekly steering group call, the project manager reported to the steering group that he had to hoist the yellow flag for lead-time **[15d]**. According to the project manager the project was facing a delay in software unit design due to the complexity of software coding, which

[38] This fragment has been labelled progress problem, because the major concern of the managers was the impact of the CRs on the progress of project work

[39] This fragment has been labelled control problem, because it denotes a typical control issue namely the timely reporting of progress by subordinates

might affect the pre-delivery date. The steering group managers doubted if they were tracking closely enough and asked the TMX project manager to provide daily updates of the progress **[15e]**.

Fragment 16: progress problem[40]

TDA was very concerned about the delay the TMX project manager envisaged due to the complexity of coding **[16a]**. TDA stressed that it needed the pre-delivery on time. The following actions were proposed to cope with the anticipated delay **[16b]**:

- Several test activities will be executed in parallel;
- Basic test team changed and increased to 4 people.

At the beginning of February the problems with the complexity of coding seemed to be solved and the project was back on track.

Fragment 17: test preparation problem[41]

At the beginning of February the TNL troubleshooter was withdrawn from the project. He was needed in another project, which had higher priority at TNL **[17a]**. On February 19 several faults were found in the MGTS database, which was a simulated environment to test software **[17b]**. The TNL operational manager requests dedicated support from a Telco subsidiary in Australia (TAS) with expertise in this area **[17c]**. He was offered standard support, which he regarded insufficiently, because they had to support more projects **[17d]**. On February 23 the red flag was hoisted for lead-time because test cases had not been passed due to faults in the MGTS database. The MGTS problems were reported to TAS, who in turn provided a new version of the MGTS database. This version, however, did not solve the problem. The TNL steering group manager referred the MGTS problems to the next level of management at TAS **[17e]**. At the same time the TMX operational manager referred this issue to the general manager of product unit SCSA/IN provisioning. He demanded dedicated on-line support from TAS, which in turn promised to do the best they could. TAS arranged remote support for the SINAP project **[17f]**. They had a tool that enabled them to remotely log onto the database at TMX and see every keystroke they made. On March 2 the project manager reported that the MGTS database was finally stable and that the project was delayed for 5 days due to the problems with the database.

[40] This fragment has been labelled progress problem, because the project manager is concerned about the progress of project work due to the complexity of software coding

[41] This fragment has been labelled test preparation problem, because it describes the problems that were encountered during test preparation due to the instability of the test environment

Fragment 18: progress problem[42]

On March 11 the project was faced with a delay due to the problems with the simulated test environment **[18a]**. The project manager was requested to provide daily progress reports on the progress on function test. TMX testers were working overtime to compensate for the delay **[18b]**. Furthermore, three more resources were added to the project in order to speed up the passing of test cases **[18c]**. An experienced designer of TNL provided remote support on test cases for one week/ 1 hour a night in March **[18d]**. On March 30 the final steering group call was held. The main part of the project was finished and transferred to TDA where the inter-working test would be performed. There were still some activities that needed to be performed but these were not on the critical path. There would be monthly reporting instead of weekly reporting and phone conferences when needed. The project work was finished almost in time (2 weeks of delay) according to the revised time plan and delivered with good quality (only 5 trouble reports in function test, whereas 14 were estimated). At the end of April the project was really finished. On May 5 the steering group congratulated the project team for the hard work, dedication and a job well done.

6.2.3 Interpretation of critical incidents

In the previous sections the development of collaboration has been described in terms of fragments. Each fragment contains critical incidents, which were marked in the text. In this section these critical incidents will be interpreted in the light of the incidents distinguished in our descriptive framework. Furthermore, the relationship between fragments will be globally explored. A more detailed analysis of the interconnections between incidents is provided in the next section.

The fragments can be divided into three episodes in which one particular type of problem dominated as depicted in Figure 12 below. The impact and duration of the problems observed are based on the individual perception of the researcher and are not based on the shared perceptions of project members. The figure below should therefore be seen as a rough sketch of the impact and duration of the problems observed[43].

[42] This fragment has been labelled progress problem, because the main concern of the managers was the progress of the test activities. The problem is a direct result of the test preparation problem

[43] Questions on the impact of the problems observed were not part of the process interviews. By the time the researcher realised that this could yield valuable information it was already too late to collect this data.

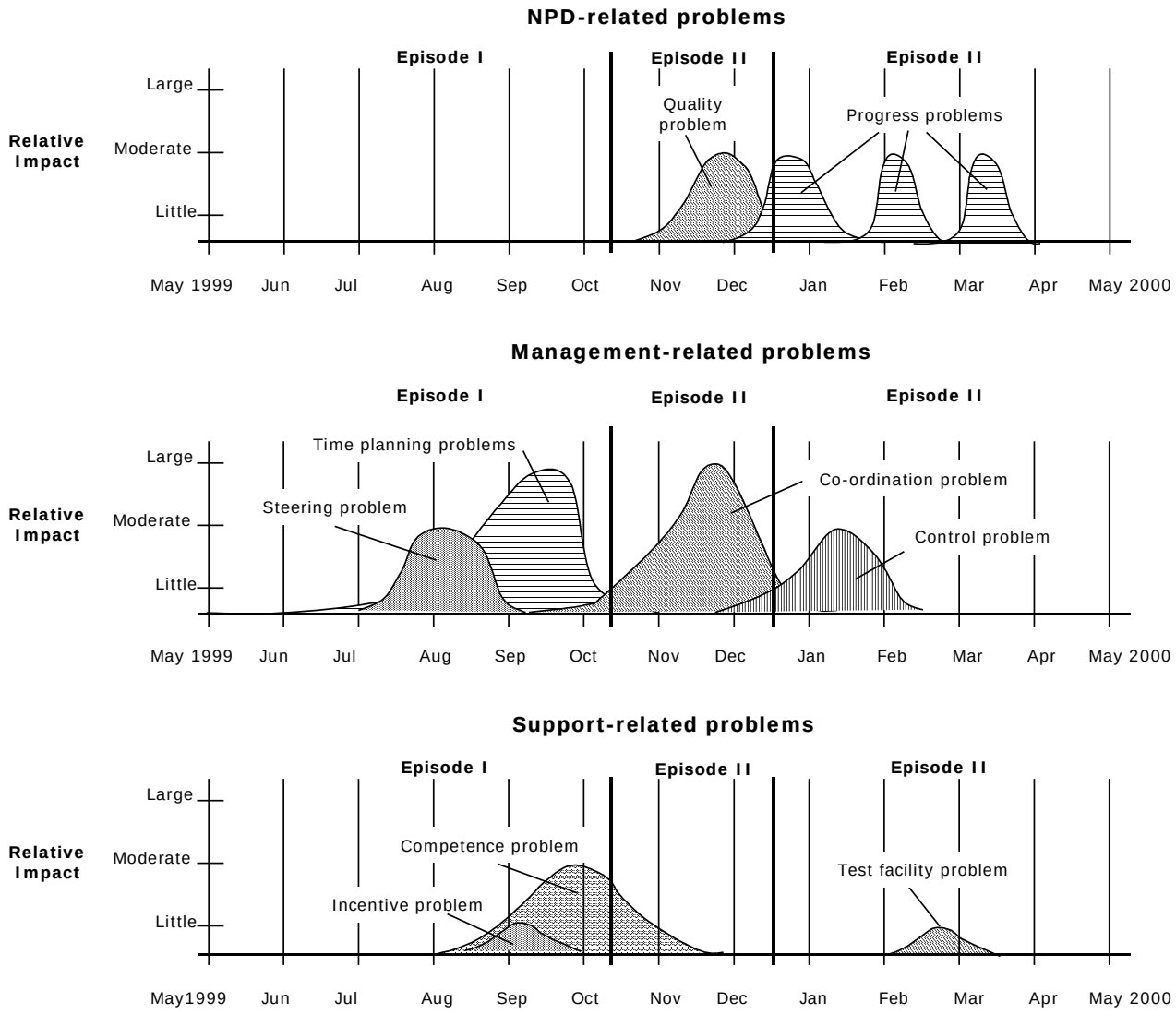

Figure 12: overview of problems observed during the SINAP project

Episode I, which comprises fragments 1 to 8, was dominated by time planning-related problems. Episode II, which comprises fragments 9 to 13, was dominated by co-ordination-related problems. Finally, episode III, which comprises fragments 14 to 18, was dominated by progress-related problems. Each episode will be summarised and discussed in more detail below.

Episode I

Time planning was a dominant theme in the first episode. In Fragment 1 the first indications can be found for the time planning problems. TDA committed an end-date before a thorough feasibility study was conducted. The first time planning problems emerged when TMX did not succeed in coming up with a reliable time plan quickly as described in Fragment 2. An important consequence of this was that TNL and TDA started to doubt TMX's technical and managerial competencies (Fragment 3 and 7). TMX's time planning efforts were complicated by the conflicting instructions it got from TNL and TDA (Fragment 4). In order to

resolve the time planning problems TNL inspected the time plan of TMX and built more slack into the time plan (Fragment 5). Not satisfied with this delay the steering group thought of ways to speed up the project. One of the ideas was to implement an incentive scheme to motivate TMX engineers to speed up. This incentive scheme, however, was interpreted as a sign of mistrust (Fragment 6). Finally, TDA initially rejected the thought of having to inform the customer about the delay. TNL needed to convince TDA that it made no sense to pursue an unrealistic time plan. The critical incidents that emerged in episode I are summarised in Figure 13.

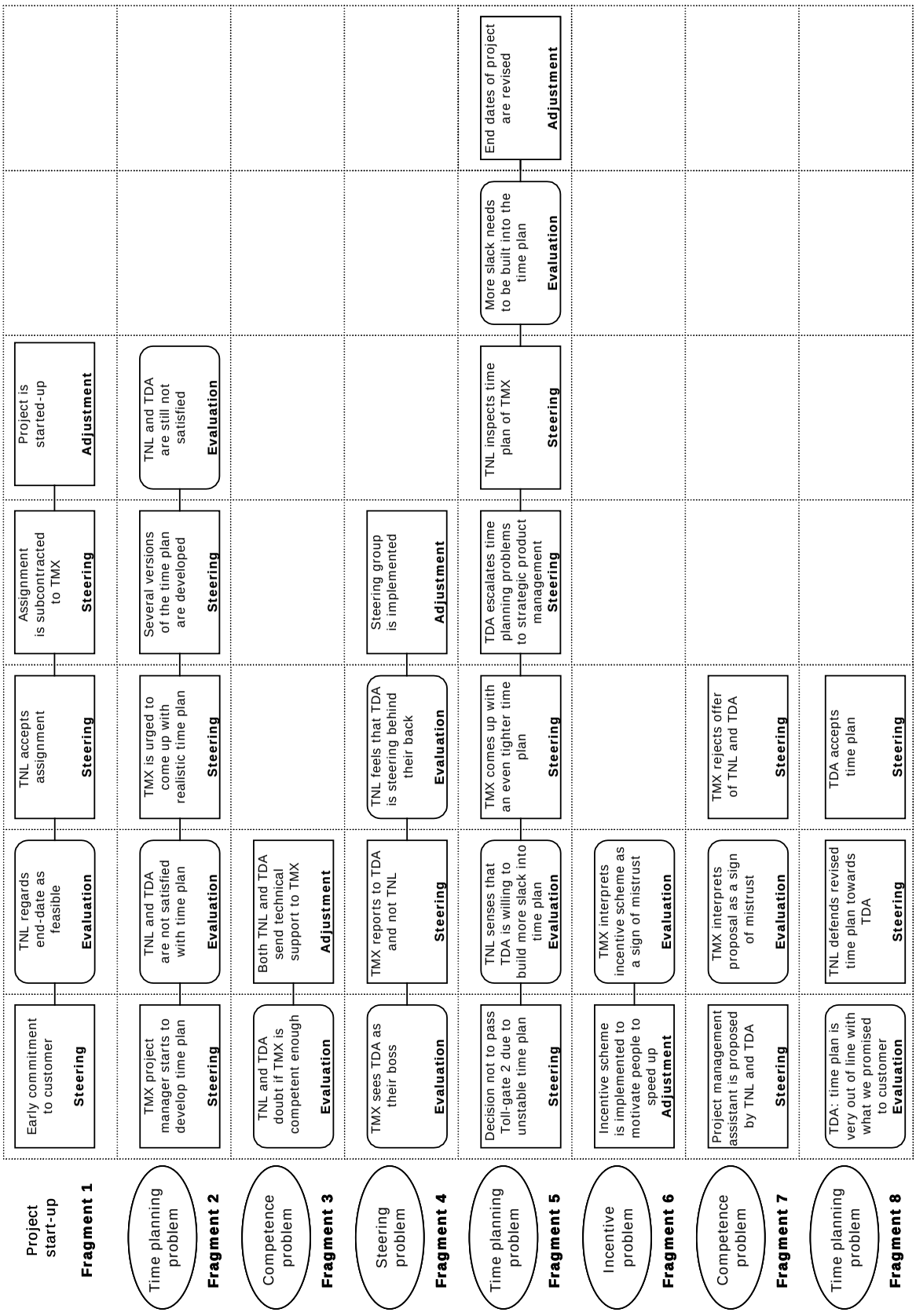

Figure 13: critical incidents episode I

Episode II

Episode II was characterised by co-ordination (related) problems. The first cause of this problem was sending technical support to TMX, being the TDA technical co-ordinator (Fragment 3). Due to his knowledge of the functional requirements he became the informal project technical co-ordinator and could technically steer the project towards the wishes of TDA and the customer. Comments of TNL system management and the TMX technical co-ordinator were often not acted upon by the TDA technical co-ordinator. However, the technical solutions need to be approved by TNL system management in their roles as product committee. In order to deal with the technical co-ordination problem TMX is asked to clarify the roles and responsibilities of both technical co-ordinators (Fragment 9). This did not really solve the problem. TNL system management did not approve the functional specifications because they envisaged quality problems (Fragment 11). The TDA technical co-ordinator is urged to set up meetings with TNL system management (Fragment 12). This management directive is pretty much ignored by the TDA technical co-ordinator. However, by that time the TDA technical co-ordinators takes up on the comments of TNL system management and starts to re-work the functional specifications resulting in several change requests (Fragment 14). Fragments 10 and 13 are not related to the co-ordination problems. Fragment 10 describes actions that were triggered by the competence problem identified in Fragment 3. Finally, Fragment 13 is not specifically related to the co-ordination problems but refers to the collaboration problems encountered in general. The critical incidents that emerged in episode II are summarised in Figure 14.

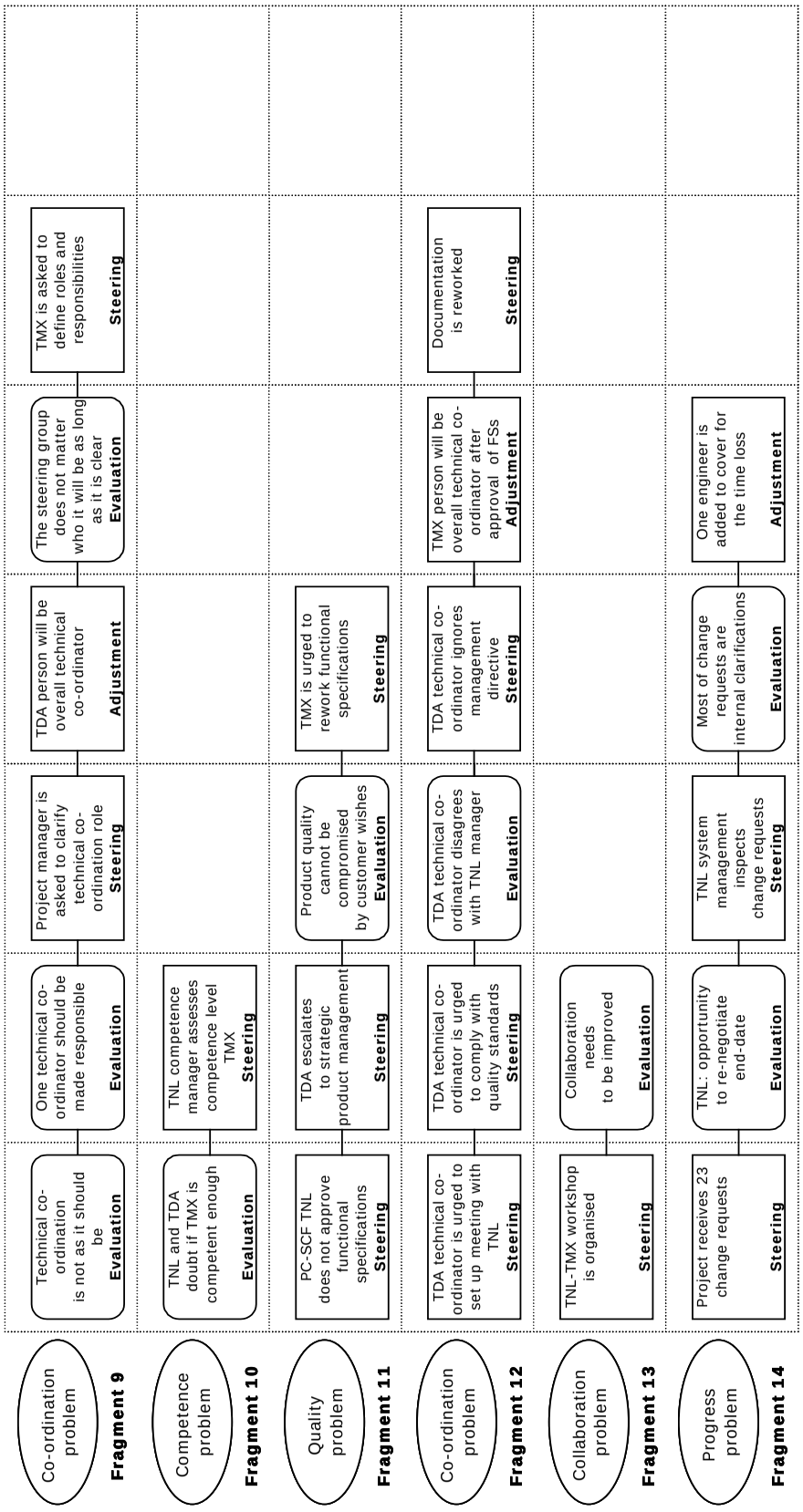

Figure 14: critical incidents episode II

Episode III

Episode III was characterised by progress-related problems. The project was getting closer to the deadline and every problem could impact the delivery date to TDA. TNL and TDA were very concerned about the progress of project work. Their local troubleshooters informed them that the project was behind schedule. Yet the project manager was reporting that everything was going fine. They were starting to doubt the project manager's reporting of progress (Fragment 15). At the end of January the project manager had to hoist the yellow flag for lead-time. The project manager reports that software coding is more complex than anticipated (Fragment 16). Several actions are undertaken to cope with the envisaged delay. Close before the delivery date, the project team encounters problems with configuring the simulated test environment, which is expected to delay the project (Fragment 17). Ironically, the reason to use this test environment was to speed up test activities. The project requests for dedicated test support to solve the problems. Furthermore, testers will work overtime and three more testers are added to speed up test activities (Fragment 18). The critical incidents that emerged in episode III are summarised in Figure 15.

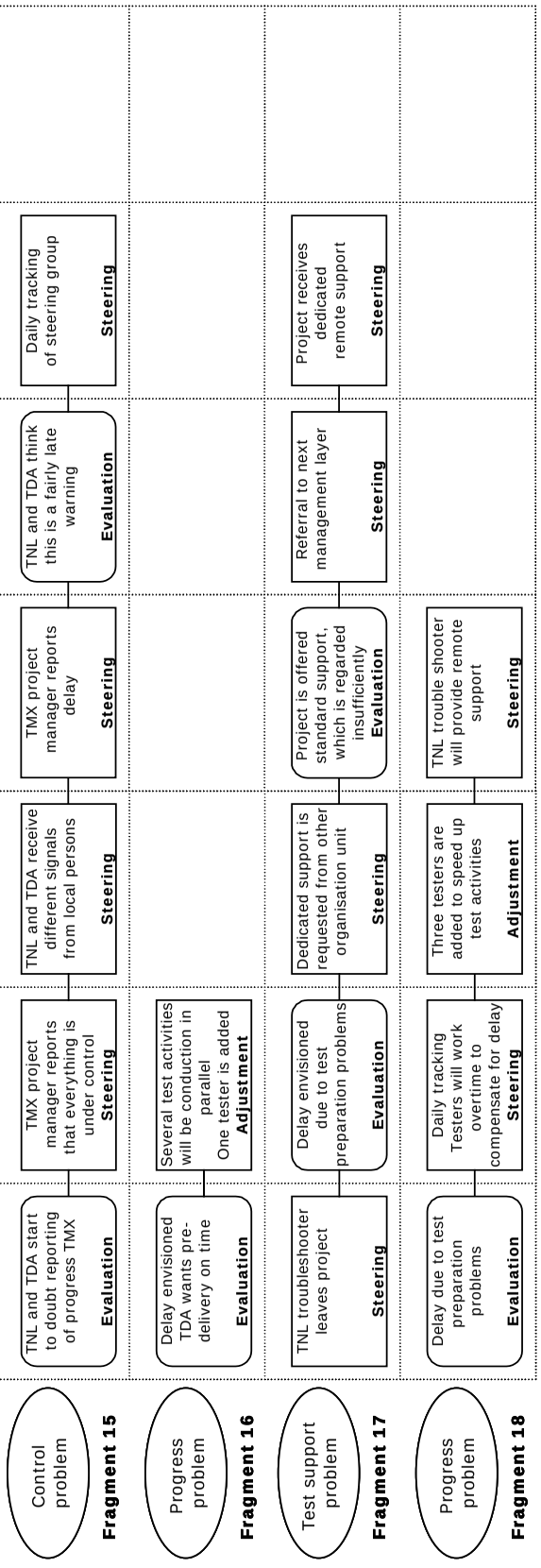

Figure 15: critical incidents episode III

In section 6.3 the causes of the identified problems will be analysed, as well as the effects of the management interventions that were enacted to cope with these problems.

6.2.4 Project outcomes

In this section the outcomes of the SINAP project are discussed in terms of operational effectiveness and perception of collaboration.

Operational effectiveness

The pre-delivery is finished on time and the final delivery delayed for three weeks. This delay did not have a major impact in the starting date of the inter-working test, which would be performed by TDA. The quality was regarded as very good. The project team received its bonus. The original budget was exceeded by 30%. Within TMX the project is seen as a best practice project, TNL and TDA are also quite satisfied with the end result. For TMX the success of the SINAP project proves that they are capable of executing IN development projects independently. TNL sees this somewhat differently. They feel that for now TMX can only execute projects such as SINAP if they are technically supported by TNL.

Perception of collaboration

Both TNL and TMX are quite satisfied with the collaboration in the SINAP project. TMX especially likes the technical support of TNL and TDA and the way TNL brought the time plan back to realistic proportions. TNL has some reservations about how TMX deals with commitments and reports disappointingly progress. They feel that TMX has committed itself too easily to what are in their eyes unrealistic time plans. A TNL manager formulated this as follows: “At first sight TMX commits itself very easily. At second sight, they cannot hold on to their promises. It is better to be open and honest about one’s capabilities.” Furthermore, TNL is not satisfied with TMX’s reporting of disappointing progress. They feel that TMX reported problems in a fairly late stage. TMX, on the other hand, has problems with the detailed way TNL and TDA have been monitoring progress in the SINAP project. They feel that the TMX project manager was busier with writing progress reports and updating time plans that actually leading the project.

6.3 Context analysis

In this section the results of the context analysis are discussed. The purpose of the context analysis is to gain insight into the causes of the problems that emerged during the collaboration and into the effects of management interventions (steering of project activities and adjustment of project organisation).

The causes of problems are sought in the strategic and cultural context of partners, project organisation design and preceding incidents. Problems trigger management interventions, which produce desired and

undesired effects. In the analysis two types of causal relationships are distinguished. Firstly, influence relationships describing the influence of collaboration conditions on project (management, NPD and support) activities or vice versa. Secondly, triggers describing the temporal relationship between incidents (evaluation, steering and adjustment). In line with the conceptualisation of processes as discussed in section 3.3.1, problems have been divided into NPD-, management-, and support-related problems.
In section 6.3.1 the NPD-related problems are discussed. In section 6.3.2 the management-related problems are discussed. Finally, in section 6.3.3 the support-related problems are discussed.

6.3.1 NPD-related problems

In this section the NPD-related problems that emerged during the collaboration are discussed.

Quality problem

During a formal inspection of the project document the product committee SCF concluded that they could not approve the documentation of the functional specifications, because they were specifically tailored to the customer wishes, which partly conflicted with the corporate internal quality standards. The product committee was concerned that this would harm the product quality and increase product maintenance costs. The problems that TNL system management already had with the functional specifications were already communicated to the TDA technical co-ordinator in an early stage but were only partly acted upon. According to TNL system management the standard answer of TDA was always “this is what the customer wants”. Important sources of the quality problem are the differences in strategic context among partners and the management process. Both are discussed below.

- *Strategic context gap*. The development solutions proposed by the customer and taken over by TDA are not in line with the internal Telco quality standards. TNL system management tried to convince the TDA technical co-ordinator to re-work certain functional specifications. However, the TDA technical co-ordinator neglected many comments of the TNL system management presumably because he interpreted these attempts to direct him towards a standardised technical solution.

- *Management process*. By sending the technical co-ordinator to TMX the formal communication lines were by-passed. The informal communication lines between the TDA technical co-ordinator and the TMX project team were much shorter than the formal communication lines between the TMX project team and TNL system management in its role of product committee. This made it difficult for TNL system

management maintain an overview of the work being done at TMX and to get their comments through.

TDA referred the quality problem to strategic product management. TDA felt that TNL was trying to enforce their preferred standardised solution to the project. Re-working the functional specifications would require time and TDA was concerned about a possible delay. Strategic product management confirmed that it was agreed in the beginning to develop a customised product, but agrees with TNL system management (PC-SCF) that product quality and maintainability cannot be compromised by customer wishes. Therefore, the TDA technical co-ordinator is urged to re-work the documentation of the functional specifications. This induced the TDA technical co-ordinator to write change requests in order to clarify the functional specifications towards TNL system management and the TMX technical co-ordinator.
The quality problem and its causes, as well as the management intervention aimed at solving this problem and its effect are summarised in Figure 16.

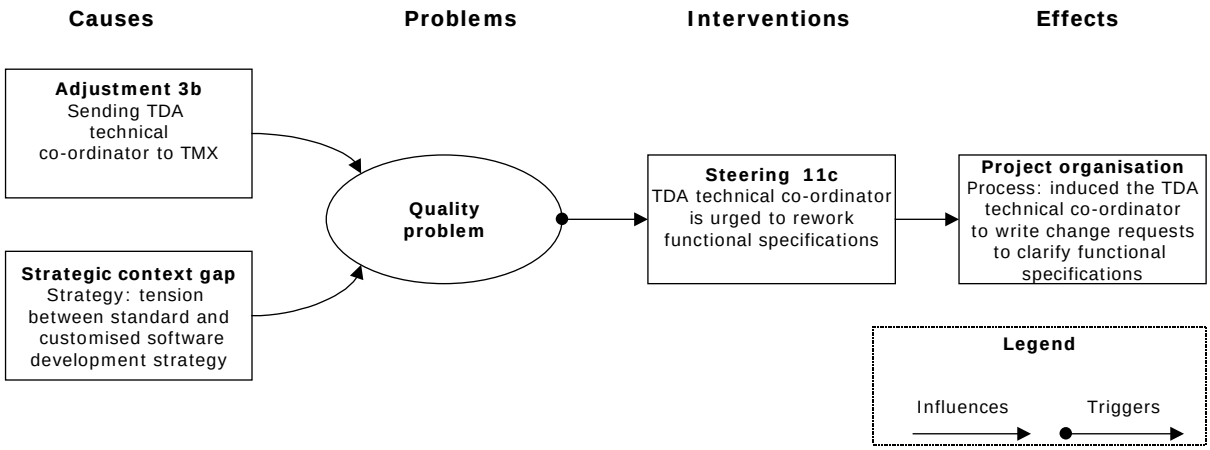

Figure 16: quality problem

Progress problems

At the end of November 1999 the project team is confronted with 22 change requests. The project manager envisions a delay because of the extra work needed to issue these change requests. Most of these change requests are internal change requests, that is clarifications of existing functional requirements written by the TDA technical co-ordinator and not new functional requirements from the customer. At the end of January 2000 the project manager reported that software coding proved to be more difficult than expected. A delay was envisioned. Towards the end of the project outcome problems arose due to setbacks concerning the use of a simulated test environment. Ironically, managers were expecting that using a simulated test environment would speed up the project because it allows people to perform test activities in parallel. The

TNL and TDA steering group managers were very concerned about these problems because the deadline was coming close and every delay could impact the lead-time of the project. These progress problems can be attributed to the project organisation and differences between partners' strategic context. Both are discussed below.

- *Project organisation*. The progress problems induced by the change requests and the complexity of coding are partly the result of the complexity of the design task in combination with the limited knowledge and skills of the TMX project team. People needed to understand two sub-systems (the Mesa SSF and the Telco SCF) and map the protocols of these sub-systems to one another. The progress problems are the result of the instability of the test facilities.

- *Strategic context gap*. The progress problems induced by the change requests are partly the result of the tension between the standard development strategy pursued by TNL and the customised development strategy pursued by TDA. As a result of this ongoing tension comments of TNL system management were not acted upon by the TDA technical co-ordinator until the PC-SCF inspection, which resulted in considerable re-work.

An important tactic to speed up project work was to add human resources whenever delays were visible (adjustments 14e, 16b and 18c). This not always proved to be an efficient strategy because people needed to learn the job before being able to really contribute anything to the project. Project members thus needed to invest time to explain things to these people. Another tactic was that the most complex development tasks were assigned to the best human resources. This proved to be an effective tactic. Especially, the TNL troubleshooter and the TDA technical co-ordinator were indispensable for the project. Many interviewees doubted if the project could have been finished on time (after re-planning) when they would not have been allocated to the project.
The progress problems and their causes, as well as the management interventions aimed at solving these problems and their effects are summarised in Figure 17.

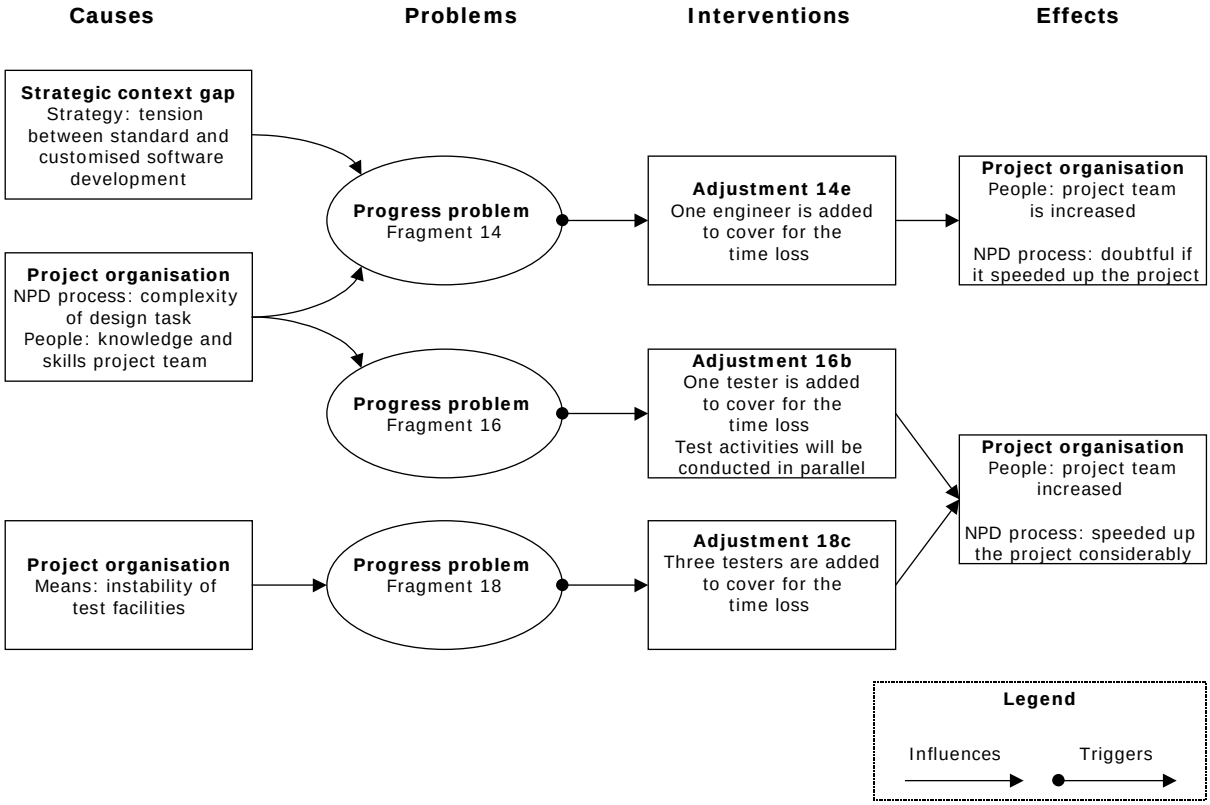

Figure 17: progress problems

6.3.2 Management-related problems

In this section the management-related problems that emerged during the collaboration are discussed.

Steering problem

In the beginning the roles of TDA and TNL were unclear to TMX. TDA was project sponsor and represented the customer and TNL was the main contractor and technically responsible (product responsible) for all product development on SCF sub-systems. TNL envisioned that TMX would execute the project and report to them and that TNL would steer the project and report to TDA. However, TDA did have a different approach in mind. They wanted to do directly steer the project at TMX and bypass TNL. At several occasions TDA tried to steer the project at TMX without involving TNL. Consequently it was very confusing for TMX whom to take orders from. They tended to see TDA as their boss and did not really understand why TNL was acting as their boss. Important sources of the steering problem are the project organisation and the differences between the strategic and cultural context of partners.

- *Project organisation*. The roles and responsibilities of TDA and TNL were not clear to TMX in the beginning. TMX saw TDA as their boss, yet TNL was also acting as if they were their bosses.

- *Strategic context gap*. Both TDA and TNL wanted to steer the project in opposing strategic directions. TDA wanted to steer the project according to what they promised the customer. TNL wanted to steer the project according to their way of developing standard IN products. This resulted in a confusing situation for TMX because it received opposing management directives.

- *Cultural context gap*. In contrast to the Dutch and Danish culture within the Mexican culture it is not common to work with two bosses. Matrix organisations are not really accepted in Mexico. This might be related to need of many Mexicans to avoid uncertainty (see uncertainty avoidance scores Hofstede, 1980a).

TNL dealt with the steering problem by implementing a steering group (adjustment 4b) in which TNL, TDA and TMX line managers were represented. The implementation of a steering group did have a positive effect on the project. By implementing a steering group the steering actions of the different partners could be co-ordinated and the chain of command was made clearer for TMX. However, by implementing a steering group the tensions between the customised product development strategy pursued by TDA and the standardised product development strategy pursued by TNL remained.
The steering problem and its causes, as well as the management intervention aimed a solving this problem and their effects are summarised in Figure 18.

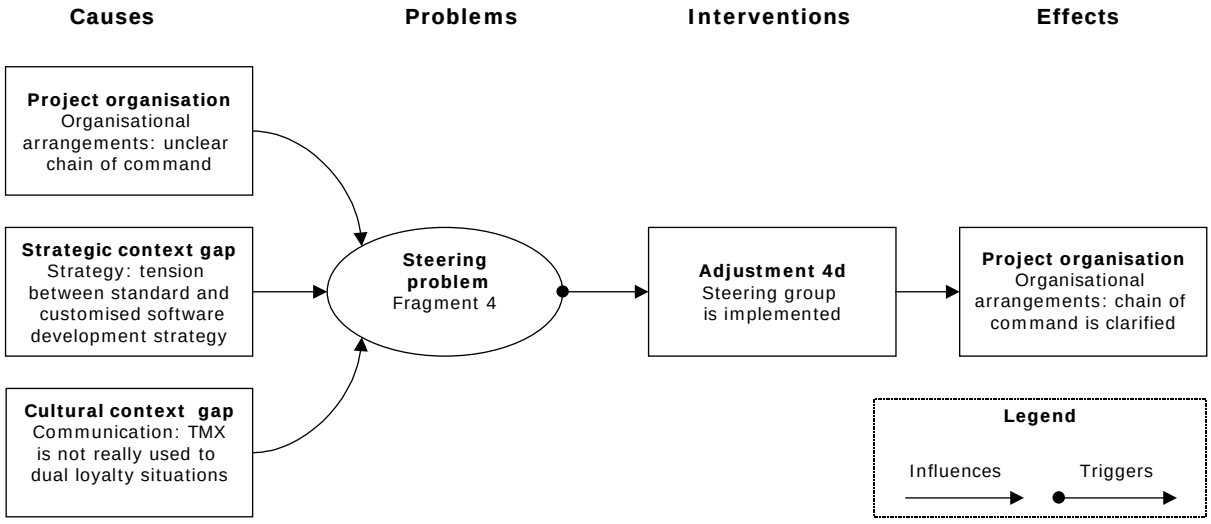

Figure 18: steering problem

Time planning problems

The first time planning problems arose when TMX failed to deliver a reliable time plan at short notice. Both TNL and TDA expected a reliable time plan quickly. However, TMX needed more time than was expected by TNL and TDA to come up with a reliable time plan. The various time

plans, which TMX developed, lacked precision and the end-dates fluctuated heavily. On top of this TMX seemed to be willing to commit itself to all of these time plans. Not before nine revisions of the time plan were issued, TNL and TDA were satisfied about the time plan. Important sources of the time planning problems are the project organisation, the management process, and the strategic and cultural context of collaboration. These are discussed in more detail below.

- *Project organisation*. It was difficult for TMX to come up with a reliable time plan due to their limited technical competencies in the field of IN. Thirdly, time planning was hindered by the information backlog of TMX. The pre-study and the negotiations were performed by TDA and in the initial stages TMX and TNL did have an information backlog compared to TDA. The input documentation contained tacit knowledge, which was difficult to translate into a time plan.

- *Management process*. The end-date was committed to the customer before a thorough feasibility study was performed (steering incident 1a). The standard Telco project management process (PMA) dictates that commitments to the customer cannot be given before the feasibility study results are available (Tollgate 2). TDA thus did not follow the standard assignment process. Over time it became clear that it was not possible to perform the project within the time frame, which was committed to the customer.

- *Cultural context gaps*. Differences between the cultural context of partners also contributed to the time planning problems. Firstly, whereas at TMX time plans tend to be seen as desirable objectives at TNL they tend to be seen as binding promises. TMX was eager to commit itself to the time plan they developed. TNL felt it had to protect TMX from committing itself to an unrealistic time plan. Secondly, whereas at TMX subordinates tend not to question or even comment decisions of their superiors, at TNL subordinates tend to be very critical towards the decisions of superiors. Consequently, it was difficult for TMX to challenge the end-date that TDA committed to the customer. However, when it became clear that the end-date was not realistic TNL expected TMX to communicate this to TDA.

In order to improve the time plan of TMX several actions were undertaken.

- *Steering 2c and 2d*. TMX was pressed to come up with a better time plan. The steering group managers felt that important activities were missing in the time plan and that too many activities were performed in parallel. Parallel activities were seen as a risk to product quality. Furthermore, TDA urged TMX to stay within the committed deadline.

These actions did not have the desired effect because it did not compensate for the limited IN competencies of TMX. The quality of the time plan remained problematic. It was therefore decided not to pass Tollgate 2.

- *Steering 5e*. After TDA referred the time planning situation to strategic product management (SPM), it was decided that TNL would inspect and correct the time plan of TMX. TNL hesitated long before stepping out of the steering role and into the project management role. They did not want to interfere with the time planning activities of TMX.

- *Adjustment 5g and steering 8b*. By inspecting the time plan, building more slack into the time plan and defending this towards TDA, TNL compensated for the limited IN competencies of TMX and at the same time by-passed the reluctance of TMX to challenge the end-date of TDA.

The time planning problems and their causes, as well as the management interventions aimed at solving these problems and their effects are depicted in Figure 19.

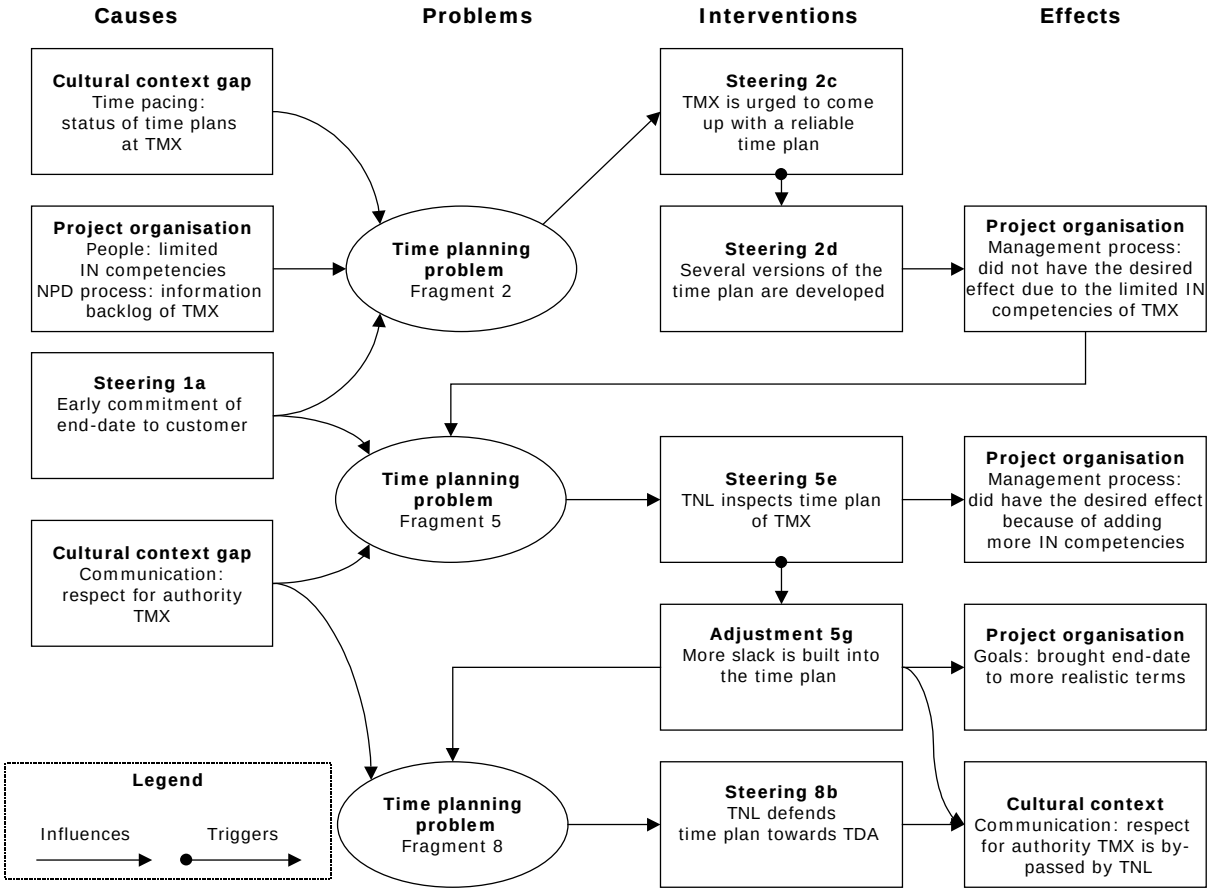

Figure 19: time planning problems

Co-ordination problems

During the project differences of opinion about the functional specifications became clear among the TDA technical co-ordinator on the one hand and the TMX technical co-ordinator and TNL system management on the other hand. The TDA technical co-ordinator performed the pre-study and feasibility study for the project. Moreover, he was involved in the negotiations with the customer and had been frequently in contact with the customer about the functional requirements. These activities were conducted at TDA before the project was started at TMX. Since the TDA technical co-ordinator was the most knowledgeable person with respect to the functional requirements of the SINAP product, he was sent to TMX to help with the writing of the functional specifications. He could exert great influence on the course of the project because he represented the orderer and because of his knowledge on the functional requirements. Informally he became the technical co-ordinator of the project. The TMX technical co-ordinator and TNL system management did not always agree with the solutions the TDA technical co-ordinator proposed. The TDA technical co-ordinator neglected many comments of TNL system management and it was difficult to convince him to change. Important sources of the co-ordination problems are the project organisation, the decision to send technical support to TMX, and the differences among the strategic context of partners.

- *Project organisation*. The roles and responsibilities of the two technical co-ordinators were unclear. Officially the TMX technical co-ordinator was the technical co-ordinator of the project. However, due to his knowledge of the functional requirements the TDA technical co-ordinator became the informal technical co-ordinator of the project. All this did not happen without role conflicts between the two technical co-ordinators during the project.

- *Strategic context gap*. TNL and TDA pursued different development strategies. TNL saw possibilities to standardise the product for other markets. TDA solely wanted to develop a customised product. They did not want to pay for efforts aimed at standardising the product. Comments of TNL on the functional requirements were interpreted as attempts to direct the technical solutions towards a standardised product. Consequently, many comments of TNL system management were neglected by the TDA technical co-ordinator.

- *Management process*. By sending a TDA technical co-ordinator to TMX the formal lines of communication between TNL system management and the TMX project team were much longer than the informal lines of communication between the TDA technical co-ordinator and the TMX project team. The TDA technical co-ordinator could influence the

development strategy of the project because of his presence at TMX and his knowledge of the functional requirements.

In order to bridge the difference of opinion between the technical co-ordinators and the TDA technical co-ordinator and TNL system management the following actions were undertaken.

- *Steering 9c*. The TMX project management was asked to clarify the roles and responsibilities of the TDA and TMX technical co-ordinator.

- *Adjustment 9d*. It was decided that the TDA technical co-ordinator would be the technical co-ordinator of the project. This is in line with the informal relations in the project.

- *Steering 12a*. The TDA technical co-ordinator and TNL system management were both urged to set up technical co-ordination meetings to resolve their differences of opinion. This management directive was ignored by the TDA technical co-ordinator. He felt that these meetings were not necessary and too time-consuming.

- *Steering 12b*. The TDA technical co-ordinator was urged to comply with the Telco standards and to act upon the comments of TNL system management. The TDA technical co-ordinator largely ignored these management directives. A possible explanation for this might be that the technical co-ordinator saw these comments as an attempt of TNL to enforce a standardised solution to the project.

- *Adjustment 12e*. The TMX project manager renounces of his decision to make the TDA technical co-ordinator of the project because he feels TMX should develop these competencies. The TMX technical co-ordinator will be the overall technical co-ordinator again.

The co-ordination problems and their causes, as well as the management interventions to cope with these problems and their effects are summarised in Figure 20.

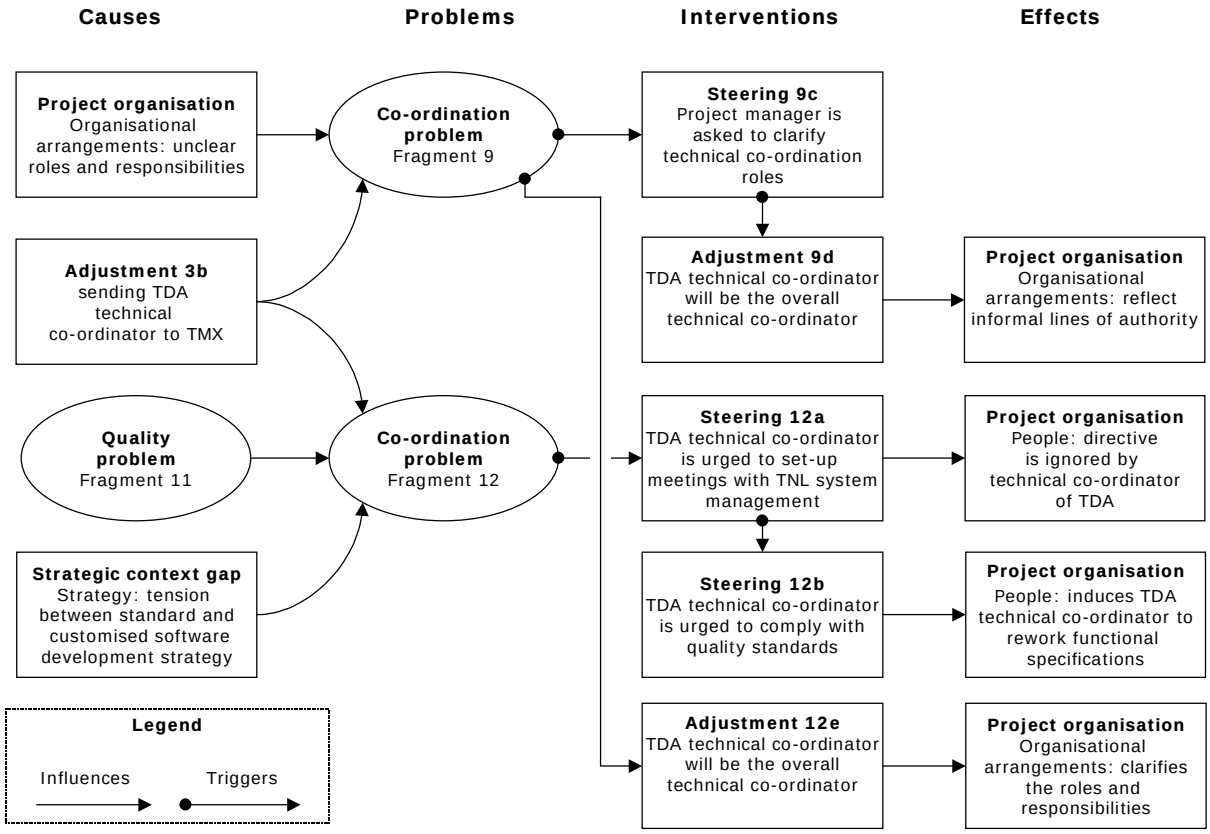

Figure 20: co-ordination problems

Collaboration problem

On November 17 a workshop was organised for TNL and TMX managers at TNL. During the workshop it became clear that the collaboration between TNL and TMX was in need of improvement. Both partners were not really working together to solve the encountered problems but were pointing fingers to each other. Explanations for this collaboration problem can be found in the project organisation and the management process. Both are discussed below.

- *Project organisation*. A first explanation for the collaboration problem can be found in the limited history of collaboration between TNL and TMX. The SINAP project was among the first projects in which TNL and TMX collaborated. TNL did not really know how to organise and manage the collaboration with TMX. A second explanation for the collaboration problem can be found in the management process. Both TNL and TMX poorly managed the expectations with respect to the collaboration. For instance, TNL assumed that TMX could execute the project independently of TNL because it committed itself relatively easily to the project goals. TMX, on the other hand, assumed that TNL would support them to execute the project.

- *Preceding problems*. The collaboration problem can be seen as an aggregate of the preceding problems encountered. These problems shaped the perceptions of each other, thus forming the collaboration problem.

The TNL-TMX workshop had a positive effect on the collaboration relationship between TNL and TMX managers. It allowed managers to share their perceptions of the collaboration and to think of solutions to improve the collaboration. Furthermore, it improved the understanding of each other's strategic and cultural context.
The collaboration problem and its causes, as well as the management interventions aimed at solving this problem and its effects are summarised in Figure 21.

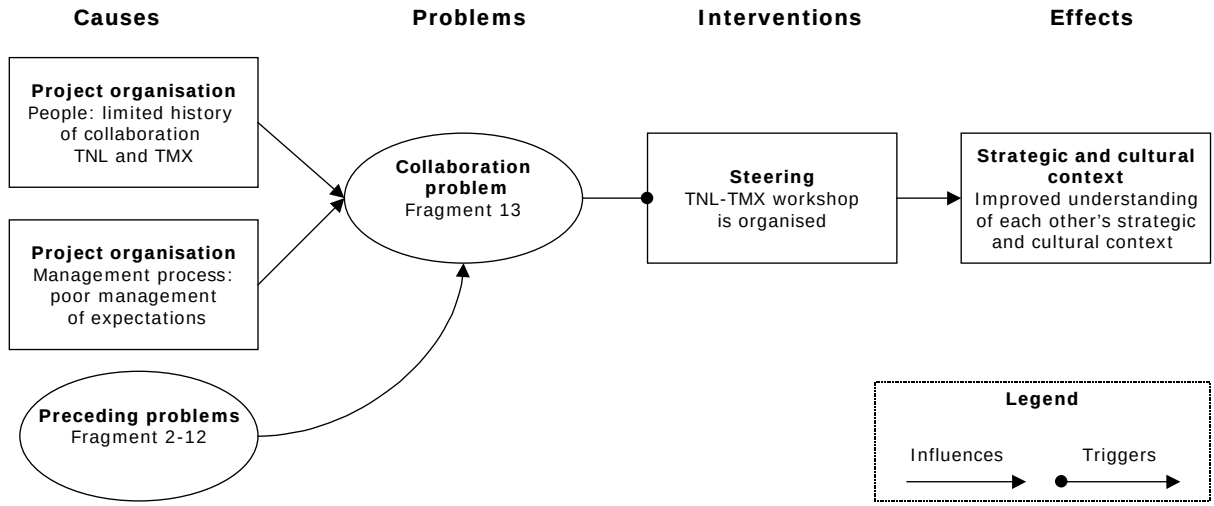

Figure 21: collaboration problem

Control problem

Towards the end of the project both TNL and TDA started to doubt the forthrightness of the project manager's reporting of progress. They suspected that the TMX project manager reported problems in a very late stage. The TNL and TDA steering group manager were kept informed about the situation at TMX by respectively the TNL troubleshooter and TDA technical co-ordinator working at TMX. These persons were important information source for the TNL and TDA steering group managers. They reported problems much earlier than the TMX project manager. In steering group meetings the TNL and TDA managers were therefore rather sceptical about the, what was in their eyes optimistic, progress reporting of the TMX project manager. The control problem can primarily be attributed to differences in partner's cultural context and the project organisation. Both are discussed below.

- *Cultural context gap*. TNL and TMX differ with respect to their reporting practices. People at TMX are more hesitant to report

problems and disappointing progress. They do not report problems automatically, which is a standard work practice at TNL. The direct line of questioning of TNL and TDA steering group managers did not encourage the TMX project manager to report problems earlier. It left little room for the TMX project manager to reveal failure and problems without losing face, which is an important condition for tracking progress at TMX.

- *Project organisation*. Firstly, the presence of the TNL troubleshooter and TDA technical co-ordinator allowed the steering group managers to control the reporting of progress of the TMX project manager. Without the presence of these persons there would probably not have been a reporting problem in the first place. Secondly, whenever the TMX project manager communicated that there were problems the steering group demanded that he calculated the impact of the problems on the time plan, revised the time plan accordingly, and provided daily updates. In other words, whenever there was a crisis the project manager's administrative load was increased, which delimited his opportunities to actually solve the problem. This did not motivate him to report problems.

In order to cope with the reporting problem the steering group managers confronted the TMX project manager with his late reporting of problems. Furthermore they demanded daily updates of the TMX project manager whenever there was a delay. This temporarily improved the control of the steering group managers, but it did not motivate early reporting of progress as discussed before.
The control problem and its causes, as well as the management interventions aimed at solving this problem and its effects are summarised in Figure 22.

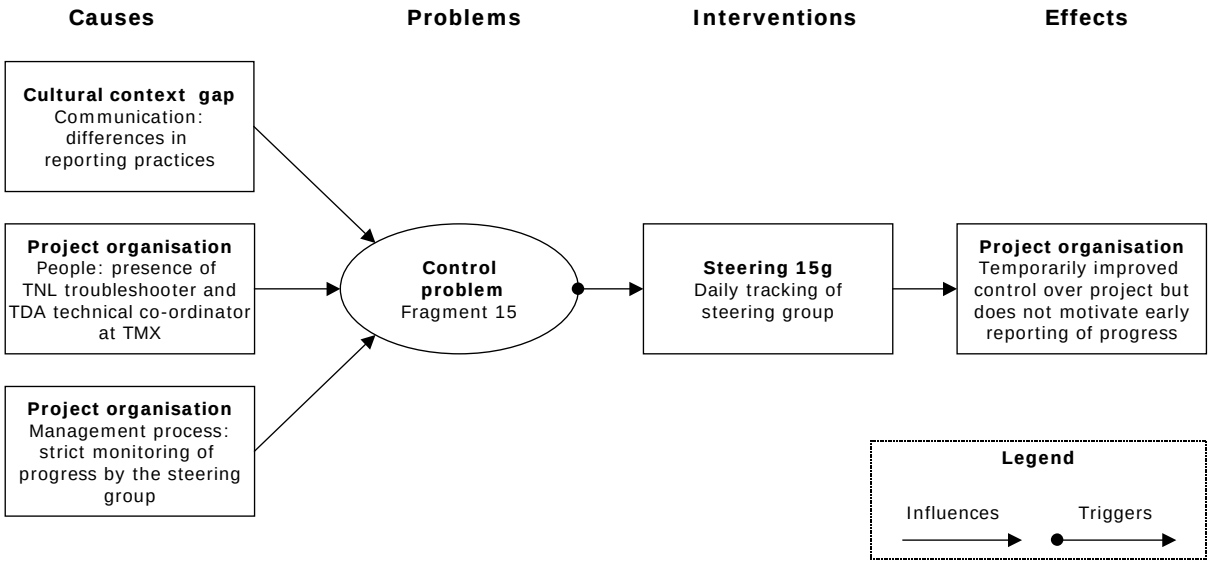

Figure 22: control problem

6.3.3 Support-related problems

In this section the support-related problems that emerged during the collaboration are discussed.

Incentive problem

In order to speed up project work it was decided at the Tollgate 2 meeting to implement an incentive scheme for the TMX project workers. The incentive scheme was based on both quality and time. The idea of the incentive scheme was to motivate people to speed up and improve the quality of project work. However, many of the TMX project members interpreted the incentive scheme as a sign of mistrust and were not in favour of it. As one TMX engineer put it "people said we don't need more money to do our job, they are offering us more money because they think we cannot do the job". The causes for the incentive problem can be found in the project organisation and differences in partner's cultural context. Both are discussed below.

- *Project organisation*. The timing of implementing the incentive scheme was not optimal. The proposal to implement the incentive scheme came shortly after TNL and TDA openly expressed their concern about TMX's technical competencies. Consequently, TMX interpreted the incentive scheme as a sign of mistrust.

- *Cultural context*. In contrast to TNL engineers TMX engineers are not really used to being rewarded for speeding up. In past projects lead-time was never really an issue. It was always possible to take more time when needed. In general TMX engineers tend to attach more value to quality than to speed and efficiency.

The incentive problem was not acknowledged by the steering group because neither the TMX project manager nor TMX engineers communicated the problems they had with the incentive plan to the steering group.
The incentive problem and its causes are summarised in Figure 23.

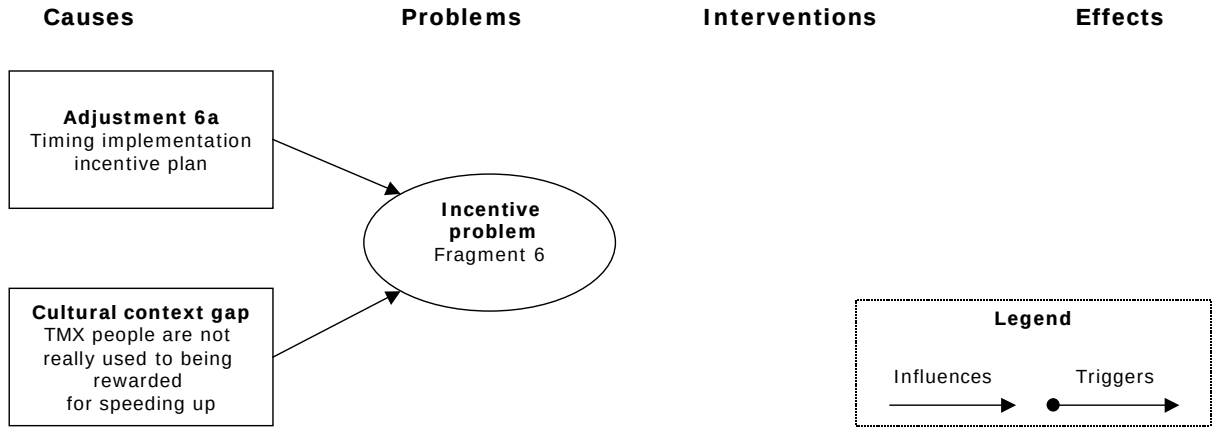

Figure 23: incentive problem

Competence problems

Already during the initial stages of the project TNL and TDA were starting to doubt whether TMX had sufficient technical expertise (Fragment 3) and project management capabilities (Fragment 7) to run the project. The time planning incidents did not reassure them. Important sources of the competence problems are the project organisation and differences among partners' strategic context (strategic context gaps).

- *Project organisation*. TMX has a short tradition of IN development. Most experienced people have one, maximum two years of experience in the area of IN. On the other hand, TNL has a relatively long tradition of IN development. Although lately they have encountered severe problems with keeping engineers working at TNL there are always enough highly experienced people available to which less experienced people can turn to for questions.

- *Strategic context gap*. Whereas TMX tends to rely on a more ad hoc and broad competence development strategy, TNL tends to rely on a more structural and focused competence development strategy. At TMX engineers are supposed to learn their competence on the job. However, it is rather difficult to learn and perform time-pressured IN work at the same time. They often receive little formal training before being put on a particular project. Furthermore, the same person performs the operational management and competence management function. Consequently, operations often overrule competence development. Moreover, at TMX competence development is less focused than at TNL. TMX management aims at developing broad IN specialists, meaning that people need to develop expertise on different IN areas. This allows TMX management to put people on different IN projects. However, several TMX engineers indicated that it is difficult to be an expert in several IN areas. Especially if one is suppose to

learn all this while doing time-pressured projects and TMX management sold them as experts to the customer. At TNL engineers receive extensive formal training before being put on projects. Competence management and operational management are separate functions. Moreover, competence managers can overrule the operational manager. Consequently there is less risk that competence development is being overruled by operations. Moreover, engineers are trained to become specialists in one or more areas.

- *Strategic context gap*. TMX management sold the TMX engineers as 'IN experts' to TNL, which set unrealistic expectations at the side of TNL and TDA. TMX management wanted to leave a good impression and instructed TMX engineers to ask not too much to TNL engineers because they did not want to give TNL the impression that they could not do the job. This does not enhance a rapid building up of competence. This "impression management" like behaviour of TMX management can be understood if one considers the perceived dependency of TMX and TNL. Whereas TMX felt it had to prove itself as a competent partner towards TNL, TNL felt not really dependent on TMX. They saw TMX as just one of their sub-contractors.

- *Time planning problem*. Time planning problems caused TNL and TDA to doubt the technical and managerial competencies of TMX. In the following section the cause of the time planning problems are discussed in detail.

In order to improve the technical competence situation at TMX the following actions were undertaken:

- *Adjustment 3b*. Both TNL and TDA have sent technical support to TMX. TDA has sent an experienced technical co-ordinator and TNL has sent an experienced trouble–shooter to TMX. This considerably upgraded the knowledge and skills of the project team. However, the unintended consequence of sending the TDA technical co-ordinator to TMX was that co-ordination and quality problems arose.

- *Steering 7a*. Due to the time planning problems TNL and TDA also started to doubt the project management capabilities of TMX. In order to improve the managerial capabilities, the TDA and TNL steering group manager proposed to add a project management assistant to the project. TMX was quite offended by this proposal and refused to add a project management assistant to the project.

- *Steering 10b*. Besides the management interventions described above, the steering group also decided to assess the competence level of TMX and to write a competence development plan. A TNL competence

manager visited TMX in order to identify the knowledge needs of TMX. However, the recommendations of the TNL competence manager were hardly acted upon by TMX management. The transfer of activities from other local design centres to TMX, which were the result of a re-organisation on the product unit level, had more priority than competence development.

The competence problems and their causes, as well as the management interventions aimed to cope with these problems and their effects are depicted in Figure 24.

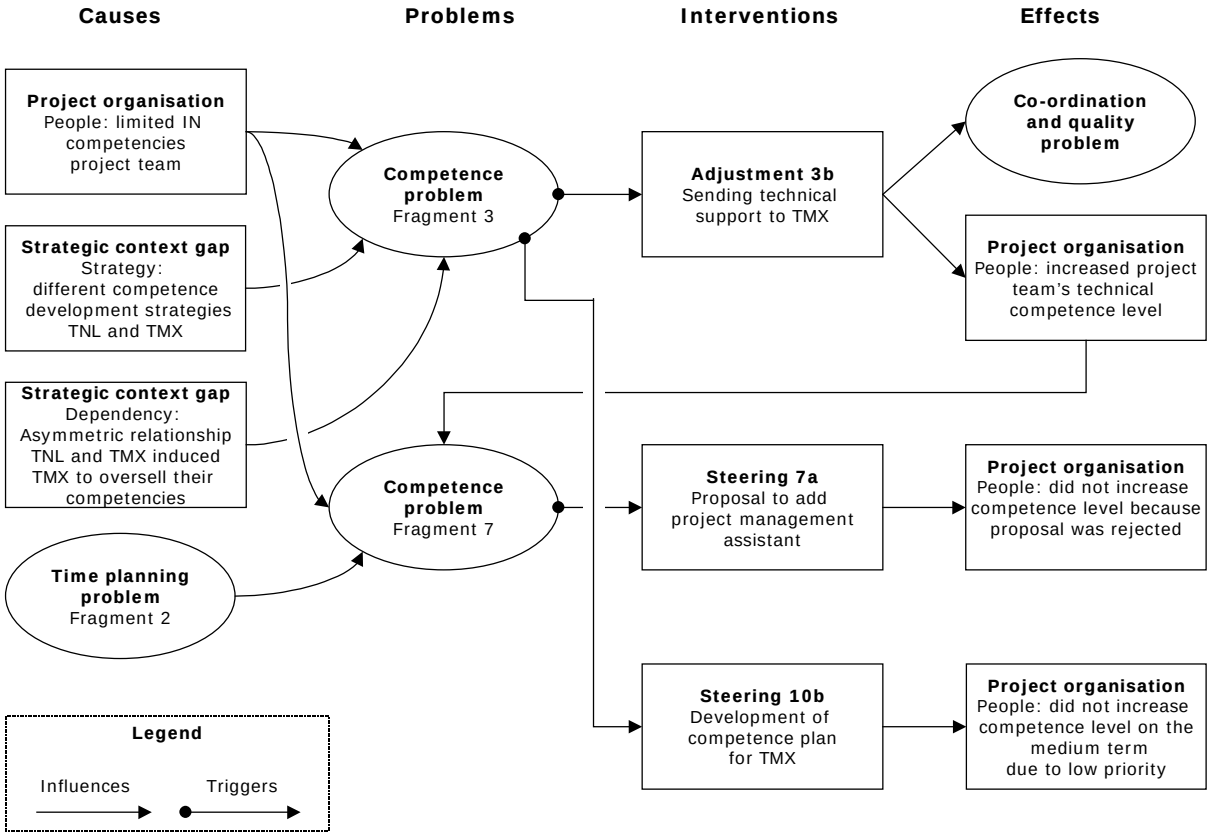

Figure 24: competence problems

Test facility problem

On February 19 several faults are found in the MGTS database, which is a simulated environment to test software. By using a simulated test environment the project and steering group managers hoped to speed up test execution. Compared to a physical test environment a simulated test environment more testers can be used. Furthermore, test facilities do not have to be shared with other projects, as was the case in the ISPV project. In order to solve the problems the TNL operational manager requested dedicated support from a Telco subsidiary in Australia (TAS) with expertise in this area. He is offered standard support, which he regarded insufficiently because the project is on a time critical path.

Sources of this test support problem can be found in the project organisation and the strategic context of partners. Both are discussed below.

- *Project organisation*. The main source of the test facility problem is the test facility itself. The version of the simulated test environment that was provided to the project was unstable.

- *Project organisation*. Within the project team there were few people available with expertise of the simulated test environment. Consequently, the project team was dependent on external support for the problems that were encountered.

- *Strategic context gap*. The test facility problem illustrates the dependency of the support from other organisational units. Getting dedicated support from these units is not always easy (see ISPV project) because of the priority setting of these units may not be in line with the priority setting within the project.

The test facility problem was solved rather quickly compared to the ISPV project (see next chapter) after the TNL operational manager referred the issue to the next management level of TAS.
The test support problem and its causes, as well as the management interventions and their effects are summarised in Figure 25.

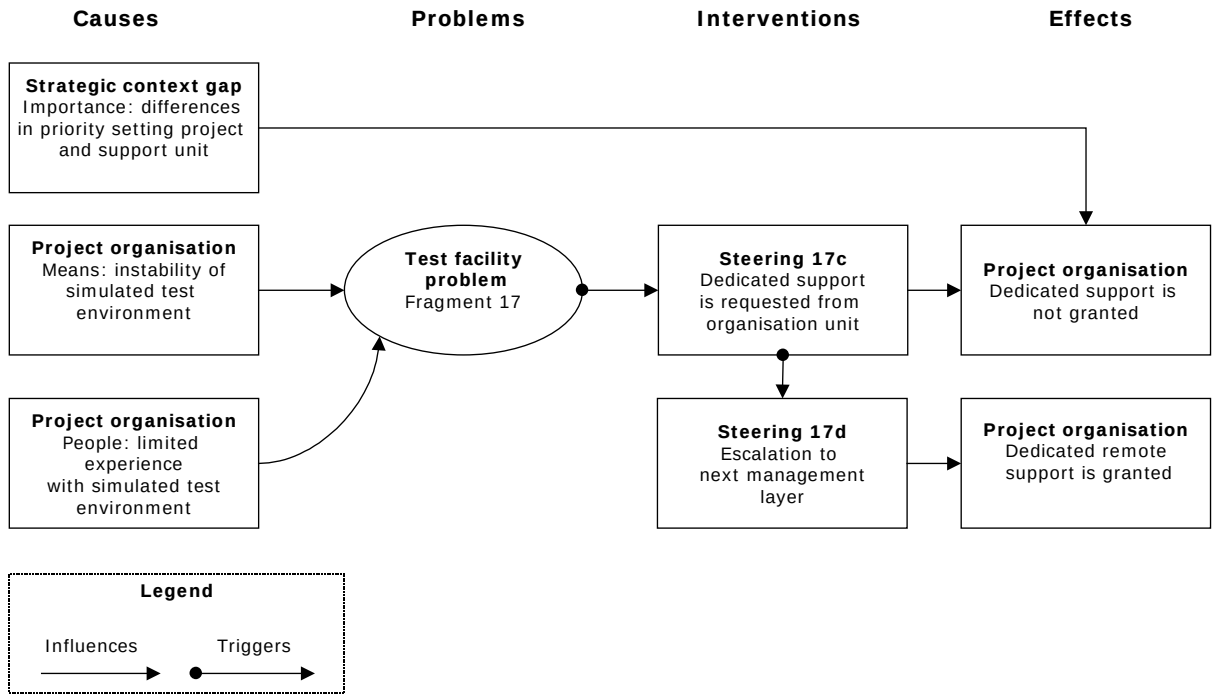

Figure 25: test facility problem

6.4 Concluding remarks

Despite of the differences in the partners' strategic and cultural context and unfavourable initial conditions such as limited technical competencies and tight time schedule, the SINAP project was a success both in terms of operational effectiveness and perception of collaboration.
The strategic context, more specifically the differences in development strategies between TNL and TDA, significantly influenced the project. These differences, which were not acknowledged in the beginning, confused TMX and are largely responsible for the observed time planning, control and co-ordination problems. However, over time these differences could be bridged at least to some extent by implementing a steering group, appointing one technical co-ordinator for the project, and deciding to re-work the functional specifications.
The cultural context, more specifically the differences in time pacing and communication values and practices, manifested themselves primarily on the project steering level and were less prevalent on the project execution level. The TMX project manager could translate cultural sensitive steering group decisions to the cultural situation at TMX. Cultural clashes did not reduce the motivation of the TMX project team. It primarily affected the TMX project manager.
Unfavourable initial project conditions such as the limited technical competencies of TMX project workers and the limited time slack could be changed by sending technical support to TMX and revising the initial time plan. However, the drawback of sending technical support was that it induced co-ordination and quality problems.

7

DEVELOPMENT OF COLLABORATION IN THE ISPV PROJECT

Letter from Mr Smith

"After months of hitting my head against a brick wall, I was feeling totally demoralized. At the end of one particularly frustrating day, I happened to stop by Sr. González's office. We ended up going out for a drink and after a few beers really began to talk. I was amazed at what he said. His comments and some soul-searching on my own have led to a lot of insights into how you run a business in Mexico. [..] When you first meet with your management group, the most important task is to gain their confidence and respect. The Mexicans will view you first as a person and only secondly as part of the company and will expect you to do the same with them. Trying to launch immediately into your executive role needlessly risks alienating them – which is what I did and created all kinds of unnecessary problems. If you relax, show your interest in them as people, and take your time getting to the management issues, you'll gain their trust.."

Eva S. Kras, 1989, 'Management in Two Cultures: Bridging the problem between U.S. and Mexican managers', p.75

7.1 Introduction

This chapter describes and analyses the development of collaboration in the ISPV project. The case analysis is divided into a process and a context analysis. In section 7.2 the results of the process analysis are discussed. In section 7.3 the results of the context analysis are discussed. This chapter ends in section 7.4 with a summary of the main findings and conclusions.

7.2 Process analysis

In this section the development of collaboration that emerged in the ISPV project is analysed. The purpose of the process analysis is twofold. The first purpose is to identify and typify the problems which emerged during the collaboration. The second purpose is to identify how these problems have been evaluated (evaluation incident) and managed (steering and adjustment incidents). The process analysis stays close to the data and is descriptive in nature. It provides the basis for the context analysis, which will be described in section 7.3

The development of collaboration is described in terms of critical incidents. A critical incident is defined as an occasion that significantly influenced the course of project activities in terms of operational effectiveness and the partners' perception of collaboration (see section 4.3.3 for the method used to select critical incidents). In line with our descriptive process framework critical incidents are divided into evaluation, steering and adjustment incidents. Sequences of evaluation, steering and adjustment incidents – not necessarily in this order – that refer to a particular problem are grouped into a fragment. Evaluation incidents denote the managers' evaluation of the problem at hand. Steering and adjustment incidents denote how managers have dealt with the problem at hand.

In section 7.2.1 the initial project organisation is outlined. In section 7.2.2the critical incidents that emerged in the ISPV project are described. In section 7.2.3 the critical incidents are interpreted in terms of the incidents of our descriptive process framework. Finally, in section 7.2.4 the project outcomes are discussed.

7.2.1 Initial project organisation

In line with the conceptualisation of project organisations as presented in section 3.3.2, the initial project conditions will be discussed in terms of goals, people, means, processes and organisational arrangements.

Goals

The main purpose of the ISPV project is to system test a new IN platform in such a way that the risk finding system faults on a live exchange using the system would be minimal. Previously, it was the customer instead of Telco who found a lot of faults. The reason for these faults is that in live exchanges faults occur that normally would not be detected during regular test activities. ISPV is planned to find and solve these faults before First Order Applicants (FOA) customers start to use the platform. FOA customers are customers who agreed to test the product before it is officially launched on the market.

Phase 1: platform stability testing. These activities should be ready before the FOA customers would go live (February 2000);
Phase 2: platform stability testing for the complete platform. These activities should be ready as soon as possible (preferably before February 2000);
Phase 3: year 2000 compliance testing, CANDI tool and INM measurements. These activities should be ready as soon as possible (preferably before February 2000).

Trouble reports (TR) were generated whenever a fault was found. Ideally, the TR flow should indicate an acceptable stability of the SCF platform before delivery. The business case was covered by the IN 3.0 project, no separate business case was made for ISPV. The scope of the ISPV project was defined rather broadly because by the time the project started nobody could really say on what tests it should concentrate. The project scope was not reduced until it became clear that the project could not finish on time just before the deadline.

People

The project manager anticipated that ISPV would need beside himself, one or two experienced technical co-ordinator(s) depending on the competence of the testers, and five testers with good exchange and IN knowledge. The project started at TMX with one project manager, one experienced technical co-ordinator and four testers (a fifth tester was added in late September). The technical co-ordinator was experienced in IN. The IN and system test competence of three TMX testers was considered to be limited (6 months of experience in IN). The other two testers had no IN experience at all. Only one TMX tester had limited system test experience. No formal training was planned for the TMX testers due to the tight time schedule. However, towards the end of the project several presentations were given by the TNL technical co-ordinator.

Means
The project used two Service Test facilities and different testing tools among other things to simulate traffic, handle trouble reports, and calculate restart time.

Processes
The ISPV project is regarded as a rather complex activity. SCF, SSF and SMAS (see section 5.2.2) are tested in conjunction. System knowledge is required to perform such test activities.

Organisational arrangements
The ISPV project was part of the IN3.0 main project, which was already finished when the project started. Although there was a work assignment between TNL and TMX, TMX had no financial responsibility for the project. The project was treated as an internal TNL project (project manager reporting only to TNL) using TMX people and test facilities (insourcing). Two-weekly condensed progress reports were prepared for various stakeholders at TNL (project manager IN3.0, operational manager TNL and IN provisioning, product management and system management). Furthermore, monthly progress reports (project status overviews) were prepared for the TNL operational manager. The TNL project manager used personal communication and e-mail messages to arrange day-to-day business. Furthermore, a web site was set up for the project, which contained all kinds of project information. Project meetings were organised twice a week, one to discuss all project issues and one to check the technical activities. In contrast to the project issue meetings, no minutes were prepared for the technical meetings. The system test models and processes that were used were based on the corporate standard design process. The corporate standard project management methodology PMA was used to control the project. All project documents were stored on a corporate database for design and management information.

7.2.2 Description of critical incidents
In this section the critical incidents that emerged during the collaboration are described. The critical incidents are grouped into fragments, marked and numbered[44].

Fragment 1: project staffing problem[45]
Project activities started with a feasibility study mid 1998. At the end of 1998 the total project effort was estimated at 3 months for 2 testers and 0,5 general support (like project management). The estimation was partly based upon the data from the feasibility study and an informal discussion. Due to other priorities at TNL the project was not started up

[44] Critical incidents are marked and numbered using the following logic: **[fragment number: 1,2,3, etc, and incident number within fragment: a,b,c, etc]**
[45] This fragment has been labelled project staffing problem, because it denotes the difficulty of the project manager to staff its project

until January 18 (week 99-3) **[1a]**. Two testers started part-time January 25 (week 99-4), but due to other priorities of these testers the number of hours invested was limited. By February 15 (week 99-7) both testers were taken out of the project due to a new priority setting by the product unit VAS the project came to a stop **[1b]**. On March 29 (week 99-13) the project was started up again with three testers working full-time **[1c]**. By April 5 (week 99-14) progress reports indicated that the test services appeared to be more complicated to work with than anticipated and that competence problems could be expected. By April 5 (week 99-14), TDA stopped their ISPV project due to resource and budget problems. According to several people at TNL the results of these test activities were not well documented. During system tests a lot of SSF related faults were found. By May 3 (week 99-18), due to a new priority setting by product unit VAS, all testers were taken out of the project and the project came to a stop again **[1d]**. After extensive resource hunts **[1e]** of the project manager during week 99-23 and 99-24, the project was started up again on June 21 with **[1f]**:

- One full-time TMX tester working at TNL;
- Support from three engineers from a support department working at TNL;
- One TNL technical co-ordinator working at TMX;
- Two full-time TMX testers working at TMX.

Fragment 2: SSF support problem[46]

ISPV was originally planned as a joint effort between TNL (SCF-part) and TDA (SSF-part). On June 18, the project manager requested SSF support from TDA **[2a]**. However, TDA management communicated that it did not have any people available to support the ISPV project. The ISPV project team could make use of the normal help-desk (standard SSF maintenance) **[2b]**. The TNL project manager regarded standard SSF support as insufficient **[2c]**.

Fragment 3: test facility problem[47]

June 20 a TNL troubleshooter was sent to TMX to help with the setting up of the test facilities **[3a]**. June 28, the troubleshooter reported that the INM-QA project was delayed and that people and test facilities were still tied to the INM-QA project. The test facilities were thus not yet available for the ISPV project. Furthermore, Test Configuration Management (TCM) support would not be available for July 12 **[3b]**. The troubleshooter could not do much for the ISPV project and therefore decided to help out the delayed INM-QA project. July 12, the troubleshooter informed the project manager that the test facilities had

[46] This fragment has been labelled SSF support problem, because the project manager regards the support he received from TDA as insufficient

[47] This fragment has been labelled test facility problem, because it describes the problems encountered with the setting up the test facilities at TMX

to be shared with other groups and were only available for 3.5 days per week instead of 5 days per week. Furthermore, the test facilities were only available during unfavourable shifts (Wednesday afternoons to Saturdays) **[3c]**. The project manager referred this to TMX management and urged them to improve the situation because this was not what they have agreed upon **[3d]**.
TMX management argued that it was unclear what was expected from them and asked the project manager to write an assignment specification **[3e]**. The TNL project manager suspected TMX of buying time but nevertheless started to work on an assignment specification. On July 14, the project manager finished the assignment specification for ISPV at TMX and communicated this to TNL and TMX management **[3f]**.
An important choice of TNL was that the ISPV project, which from that moment on would be performed at TMX, would be regarded as an internal TNL project **[3g]**. The responsibility for the project execution was laid at TNL and the TNL project manager reported to TNL line management. The role of TMX was to deliver testers and test facilities to the project. An important consequence of this decision was that TMX management felt less responsible for the project. However, the project manager was dependent on the TMX infrastructure (read TCM support) and TMX management for executing the project.

Fragment 4: TCM support problem[48]

From July 19 to August 16 the project manager was on holidays. His tasks are taken over by a colleague (hereinafter referred to as the interim project manager). During this time it becomes clear that the test preparation does not proceed as planned. Target dates for the test facilities to be operational were not met **[5a]**. Important parts of the test configuration were missing and have to be ordered in and Test Configuration Management (TCM) support was not what it should be. TMX testers had to build their own test sites, which was normally a job of TCM **[5b]**.
On August 5, the interim project manager reported the problems to the TNL operational manager, who in turn contacted TMX management **[5c]**. He stated that the test preparation was now 4 weeks behind schedule and the main planning was now impacted on a day-to-day basis. He demanded that this issue be solved as soon as possible, by means of a new, reliable committed target date for the test facilities to be operational for test execution.

Fragment 5: time planning problem

At the beginning of August, several First Order Application (FOA) customers were found who were willing to try out the new IN 3.0 platform **[5a]**. A new planning was made according to the FOA delivery dates **[5b]**.

[48] This fragment has been labelled time planning problem, because it denotes the problems of the project manager in getting comments of project members and management on the time plan

- Planned end-date phase 1: November 20, 1999
- Planned end-date phase 2: December 6, 1999
- Planned end-date phase 3: January 3, 2000
- Planned end-date conclusion: January 14, 2000

On August 18, the planning was distributed among the ISPV team at TMX for inspection and approval **[5c]**. The time plan had already been discussed and approved by the ISPV team at TNL. The project manager wanted the approval of the technical co-ordinator and all testers. He stressed that the time planning was not made to pressure people, but only for planning and tracking purposes. Both TMX testers and TMX management hesitated to give their commitment to this time plan. Although the project manager asked to provide their feedback within a week, TMX testers and management were reluctant to provide their comments on the time plan. The project manager urged people to provide their input **[5d]**. Moreover, both TMX testers and management did not have many comments on the time plan **[5e]**. Over time, when the delays became visible, and TMX testers and management lost their confidence in the time plan, the project manager was asked several times to build more slack into the time plan **[5f]**. The project manager, however, did not want to revise the time plan every time delays became visible **[5g]**.

Fragment 6: progress problem[49]

On August 23, the project manager decided to move all project activities and people to TMX **[6b]**. TMX management welcomed this idea. They believed that this would allow the project manager to check progress and gain insight into the day-to-day operations at TMX more easily. Major reasons given by the project manager for this transfer were **[6a]**:

- Support from the part-time testers of the Global Response Centre is limited and costly;
- Using test facilities at two locations is costly. At TMX there were test facilities available, which were much cheaper than at TNL[50];
- The availability of test facilities at TNL would drop in the near future.

Furthermore, the project manager decided to work in a rhythm of one week at TNL and three weeks at TMX.

Fragment 7: control problem[51]

At the beginning of September all project activities and project members were present at TMX. By that time test preparation was already 6 weeks

[49] This fragment has been labelled progress problem, because the slow progress was the main motivation of the project manager to move the project to TMX

[50] Test facilities at TNL cost about 70 EURO whereas at TMX test facilities cost about 40 EURO

[51] This fragment has been labelled control problem, because it describes the problems the project manager encountered with respect to controlling progress

behind schedule. TMX testers were not reporting progress, problems and actions automatically, which was normally done at TNL **[7a]**. The project manager decided to implement individual planning and tracking meetings **[7b]**, in order to regain control over the project. TMX testers were asked to make their own personal planning and to report progress once a week. These individual planning and tracking meetings were not a success, because they induced continuous negative feedback cycles, which reduced the motivation of the testers.

Fragment 8: TCM support problem[52]

On September 11 the project manager discussed the test support situation with TMX management. Test Configuration Management (TCM) support at TMX had been limited **[8a]**. Instead of TCM people, ISPV testers with little experience had to do most of the test site set up work. Problems with hard- and software availability were not solved and a mobile test facility had to be reconfigured to a fixed test facility. The TMX/M group manager asked for facts and situations on test facility situation in order to set up a discussion with the support department **[8b]**. This discussion resulted in an e-mail list where all kinds of requests for TCM support the project can put, which had to be checked and confirmed by TCM support **[8c]** and weekly meetings with the TCM department to check status **[8d]**.

Fragment 9: commitment problem[53]

During October and November the project team tried to compensate for the delay by working overtime **[9a]**. The project manager asked the TMX testers and TNL technical co-ordinator to inform him about when and how much overtime was made. The project manager noticed that TMX testers did not work for the committed hours during overtime shifts and regular working hours **[9b]**. He frequently checked if people work for the committed hours and he frequently urged people to report if they could not work overtime or if they are late/ not in during regular working hours **[9c]**. TMX testers argued that especially the absence of technical support during overtime shifts was a problem **[9d]**. To improve technical support the project manager provided the TNL technical co-ordinator with a cellular phone **[9e]**. Whenever they encountered a problem when the technical co-ordinator was not present, they could phone the technical co-ordinator. All these managerial actions did not produce the desired effect.

[52] This fragment has been labelled TCM support problem, because the project manager regards the TCM support at TMX insufficiently

[53] This fragment has been labelled commitment problem, because the project manager considers the loose observance of commitments to be problematic

Fragment 10: SSF support problem[54]

On October 7 the project manager requested for dedicated SSF support **[10a]**. Again he was offered standard SSF maintenance, which he regarded insufficiently **[10b]**. The support problem was referred to the product unit level **[10c]**. The general manager of the IN provisioning organisation in turn asked strategic product management to set priorities. End of November TDA promised to give priority to the trouble reports on SSF-related problems but they could not guarantee that the trouble report handling would be faster than the normal response time because their own projects were also under a great time pressure **[10d]**.

Fragment 11: implementation of steering group[55]

At the end of October a steering group was established **[11a]**. Steering group meetings were organised every 1, 2 or 3 weeks depending on the turbulence of the project. The steering group was composed of the following roles:

- Project manager TNL;
- Operational manager IN provisioning;
- Line management TMX;
- Line management TNL.

The project manager felt that the steering group was established at a rather late stage.

Fragment 12: SCF support problem[56]

On November 1 the project manager and the TNL operational manager consider sending an experienced TNL tester to TMX **[12a]**. The project manager saw opportunities if this person would be at TMX that week, would do standard test work and provide support, would work overtime and would stay at TMX until 99-50 or longer. However, it appeared that this person needed to be available for problem solving at other projects at all time. The project manager did not regard this kind of support as workable **[12b]**.

Fragment 13: project staffing problem[57]

At the beginning of November one TMX tester informed the project manager that he would give a course on simulated test environments for the SINAP project (16 hours) **[13a]**. The project manager did not give him permission because of the time critical path the project was in at that moment **[13b]**. The resource owner (TMX general manager) overruled this

[54] This fragment has been labelled SSF support problem, because the limited SSF support from TDA is regarded problematic. This fragment is related to fragment 2

[55] This fragment has not been labelled as a problem, because it was not interpreted as a problem but the late implementation of the steering group caused various problems in the collaboration

[56] This fragment has been labelled SCF support problem, because the limited support the project got from TNL was regarded to be problematic by the project manager

[57] This fragment has been labelled project staffing problem, because the conflict between the project manager and TMX line management is about project staffing

decision **[13c]**. The project manager felt that he was unfairly overruled without any discussion **[13d]**. The project manager referred the problem to the TNL operational manager, who in turn stressed towards TMX management that it was not wise to pull people from an already endangered project **[13e]**.

Fragment 14: progress problem[58]

On November 2, IN provisioning questioned whether TMX testers were pressured enough to meet individual commitments, working during holidays was considered and also what TMX was going do to make it work. IN provisioning urged the TMX testers to speed up **[14a]**. On November 3 the TNL project manager sent an e-mail message to IN provisioning stating that the pressure that was put on the project was not helping. He felt that the effort at TMX was underestimated and that it did not help to pressure more because most of the delay had to do with limited (but increasing) competence **[14b]**. On November 5 an IN provisioning manager urged TMX management to come up with action proposals to improve the 'sense of urgency' of the TMX testers **[14c]**. On November 11 the TMX general manager decided to attend the weekly project meetings to get an update on progress and commitment of TMX testers. The general manager participated in two meetings with little result **[14d]**. Also on November 11 it was decided to cancel individual planning and tracking meetings **[14e]**. The project manager wanted to use the individual planning and tracking meetings to ask for personal opinions, ideas and frustrations. On November 12 the TMX group manager urged the TMX testers to provide the project manager with all the information and comments he required and to report problems immediately and to keep track of their individual activities to prevent delays **[14f]**. On November 17 the TNL technical co-ordinator wrote an e-mail message to IN provisioning that too much pressure was put on the project **[14g]**. Project members were getting stressed and sick because some project members (three resources also worked on the INMQA project) had already worked under pressure for 8 months. An IN provisioning manager responded to these complaints that they knew the team had reached its limits and that they intended to relieve the pressure to a manageable and acceptable level. He proposes to reduce the scope of test activities.

Fragment 15: collaboration problem[59]

On November 17, a workshop was organised for TNL and TMX managers at TNL **[15a]**. During the workshop it became clear that the collaboration between TNL and TMX was in need of improvement **[15b]**. Both partners were not really working together to solve the encountered problems but

[58] This fragment has been labelled progress problem, because the slow progress of test work is regarded to be problematic by the project manager and the TNL line managers

[59] This fragment has been labelled collaboration problem, because the workshop was organised to evaluate the rather problematic collaboration in the SINAP and ISPV project

instead were blaming each other for the problems encountered. During the workshop it became clear that the TNL was in a learning curve of sub-contract management whereas TMX was in a learning curve of IN development.

Fragment 16: progress problem[60]

At the end of November the steering group decided that there should be a scope reduction. Due to the slow progress in test execution it was not very likely that the project would finish before the first delivery to the FOA customer **[16a]**. The steering group decided that of project phase 1 only the load test would be executed before FOA delivery **[16b]**. The strategy was to perform the most important tests first in order to build in flexibility at the end of the project. On December 13 (week 99-50) the load test of phase 1 was finally ready. Although the deadline was week 99-46, this did not cause major problems since the FOA customer was delayed too **[16c]**. November 29, the steering group decided that phase 1 stability and robustness testing, the whole of phase 2 and the Y2K and INM tests from phase 3 would be cancelled **[16e]**. The main reasons for the scope reductions were **[16d]**:

- The slow progress so far and estimates indicating no improvement;
- There was not enough budget left to finish the remaining tests;
- The findings suggested that almost all faults are related to SSF and not SCF.

Three change requests were issued for the scope reduction. Only the CANDI tool measurements would remain. The number of testers would be reduced from 5 to 2 testers because the remaining measurements could be executed more efficiently in this way **[16e]**. CANDI tool measurements were re-planned to an end-date in week 00-12. A 50% progress factor for TMX testers (with one experienced TC for support) was used **[16f]**.

Fragment 17: Tollgate 2 assessment[61]

On February 8, the steering meeting decided that the Tollgate 2 assessment was superfluous in this stage of the project **[17a]**. Tollgate 2 assessments are normally conducted before project execution. ISPV was part of the IN 3.0 main project, for which a business case already had been defined. This apparently made the Tollgate 2 assessment less urgent. The assignment specification and BTA were seen as replacement for the Tollgate 2 assessment for the time being.

[60] This fragment has been labelled progress problem, because the slow progress induces the steering group managers to reduce the scope of the project

[61] This fragment has not been labelled as a problem, yet is important to mention because early tollgate assessment could have prevented problems from happening

Fragment 18: test facility problem[62]

CANDI tool measurements initially went faster than planned probably due to the relatively technical simplicity of these measurements and to the fact that the technical co-ordinator had more time to contribute to execution instead of to helping out others. At the beginning of February limited test facility time was available at TMX during normal working hours **[18a]**. Referral via TMX management did not result in more test facility time **[18b]**.

Fragment 19: progress problem[63]

At the end of February it was decided to the cancel regression test activities because no budget was available and testers kept on finding new SSF-related faults **[19a]**. One TMX tester was released from the project **[19b]**.

Fragment 20: project staffing problem[64]

On February 23, the TNL technical co-ordinator ended his contract at TMX and returned to TNL **[20a]**. From now one TMX tester had to execute the remaining two test cases without the direct support of the technical co-ordinator. The project manager requested TNL for a replacement for the technical co-ordinator **[20b]**. This request was not granted due to the unavailability of qualified people **[20c]**.

Fragment 21: progress problem[65]

On April 10 the remaining test cases were still not finished. The only remaining TMX tester was not capable of executing the remaining test cases without the help of the TNL technical co-ordinator **[21a]**. The project manager arranges that the TNL technical co-ordinator would provide remote support from TNL. **[21b]** This option did not work out. It proved to be too difficult to solve the problems remotely **[21c]**. Moreover, the remaining TMX tester was not really motivated anymore to fasten his teeth into the subject. Therefore the project manager suggested to close down the project and to plan for having the remaining two test cases, which were anticipated to take two days, to be executed in another project **[21d]**.

7.2.3 Interpretation of critical incidents

In the previous sections the development of collaboration has been described in terms of fragments. Each fragment contains critical incidents, which were marked in the text. In this section these critical incidents will be interpreted in the light of the incidents distinguished in

[62] This fragment has been labelled test facility problem, because the availability of the test facilities drops, which is regarded to be problematic

[63] This fragment has been labelled progress problem, because the decision to cancel the regression test activities is induced by the slow progress

[64] This fragment has been labelled project staffing problem, because the leaving of the TNL technical co-ordinator created a project staffing problem

[65] This fragment has been labelled progress problem, because the decision to stop the project was induced by the slow progress of test execution

our descriptive framework. Furthermore, the relationship between fragments will be globally explored. A more detailed analysis of the interconnections between incidents is provided in the next section.
The fragments can be roughly divided into three episodes as depicted in Figure 26 below. The impact and duration of the problems observed are based on the individual perception of the researcher and are not based on the shared perceptions of project members. The figure below should therefore be seen as a rough sketch of the impact and duration of the problems observed[66].

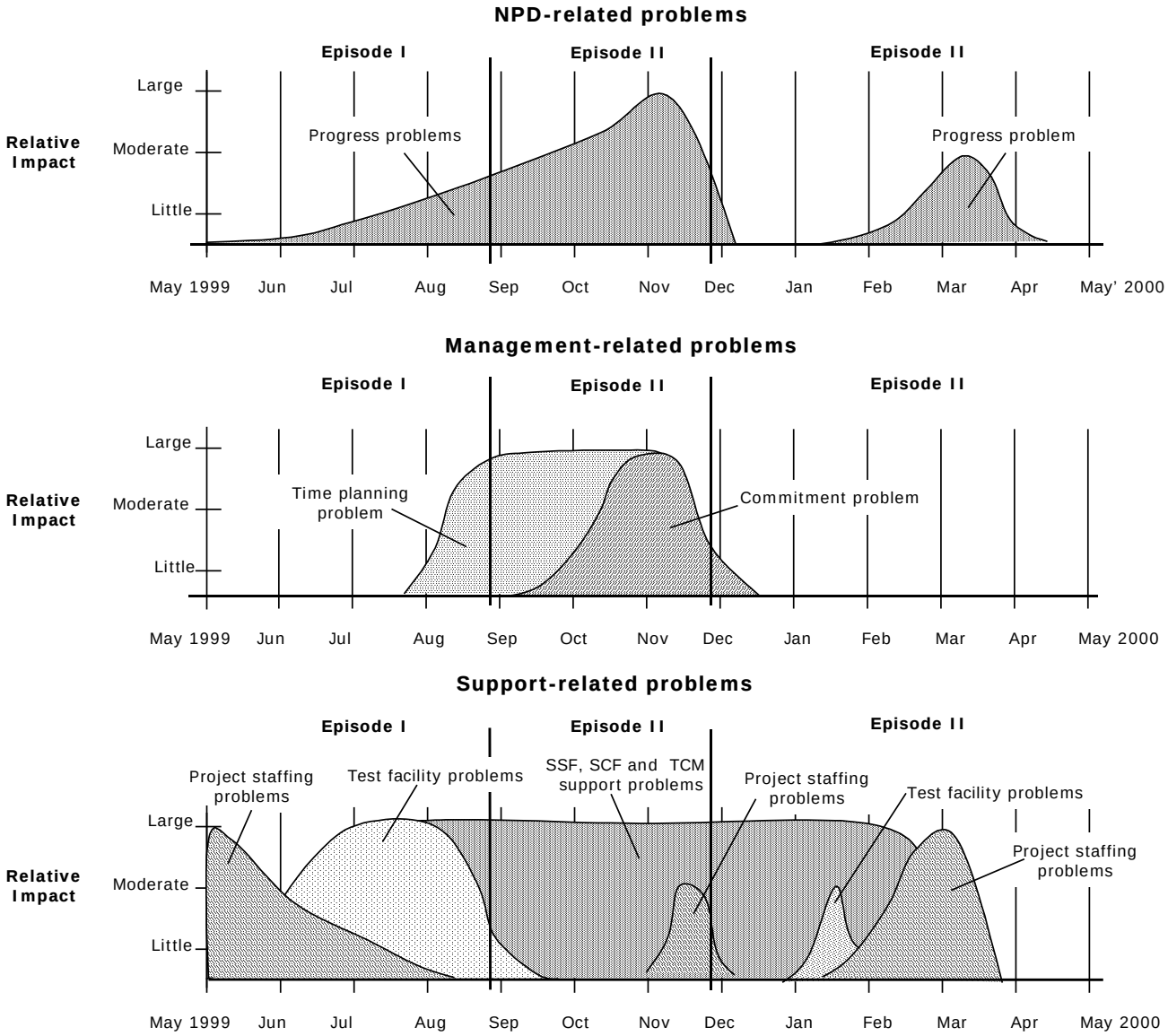

Figure 26: overview of problems observed during the ISPV project

Episode I, which comprises fragments 1 to 6, marks off a period in which the project was executed at two locations. This episode was characterised

[66] Questions on the impact of the problems observed were not part of the process interviews. By the time the researcher realised that this could yield valuable information it was already too late to collect this data.

by all kinds of start-up problems. During this episode the project ran into an initial delay, which could not be compensated for during the rest of the project. Episode II, which comprises fragments 7 to 16, marks off a period in which the project team tried to speed up test activities to compensate for the initial delays in test preparation. This episode was characterised by various support problems and a commitment problem. Finally, episode III, which comprises fragments 17 to 21, starts after the scope of the project is reduced and the project team is downsized, and ends with the conclusion of the project. This episode was characterised by various problems that impacted progress and which induced the project manager to prematurely stop the project. Each episode will be summarised and discussed in more detail below.

Episode I

Episode I was dominated by various support problems. A lot of valuable time and money was wasted in the early phases of the project due to the various start-ups and closedowns of the project (Fragment 1). Another important consequence of the late start-up of the project was that TDA had already finished their ISPV project and were therefore not really committed to support the ISPV project at TNL (Fragment 2). Due to the scarce resource situation at the IN development department of TNL, it was decided to work with TMX testers and with part-time testers from a customer support department at TNL. At TMX test preparation progressed very slow due to the status of the test facilities and the limited TCM support (Fragment 3-4). The contribution of the part-time testers at TNL was very limited because ISPV was just one of the project they have to support (Fragment 6). Because the part-time testers were costly and did not contribute much the project manager decided to move the project to TMX and to release the part-time TNL engineers from the project. Just before this, several FOA customers were found who were willing to try out the new IN 3.0 platform. The project was re-planned with the FOA delivery dates as deadlines of the project (Fragment 5). By that the time to newly developed time plan seemed reasonable. However, lateron in the project it became clear that the project scope could not be conducted within this planned time frame.

The critical incidents that emerged in episode I are summarised in Figure 27.

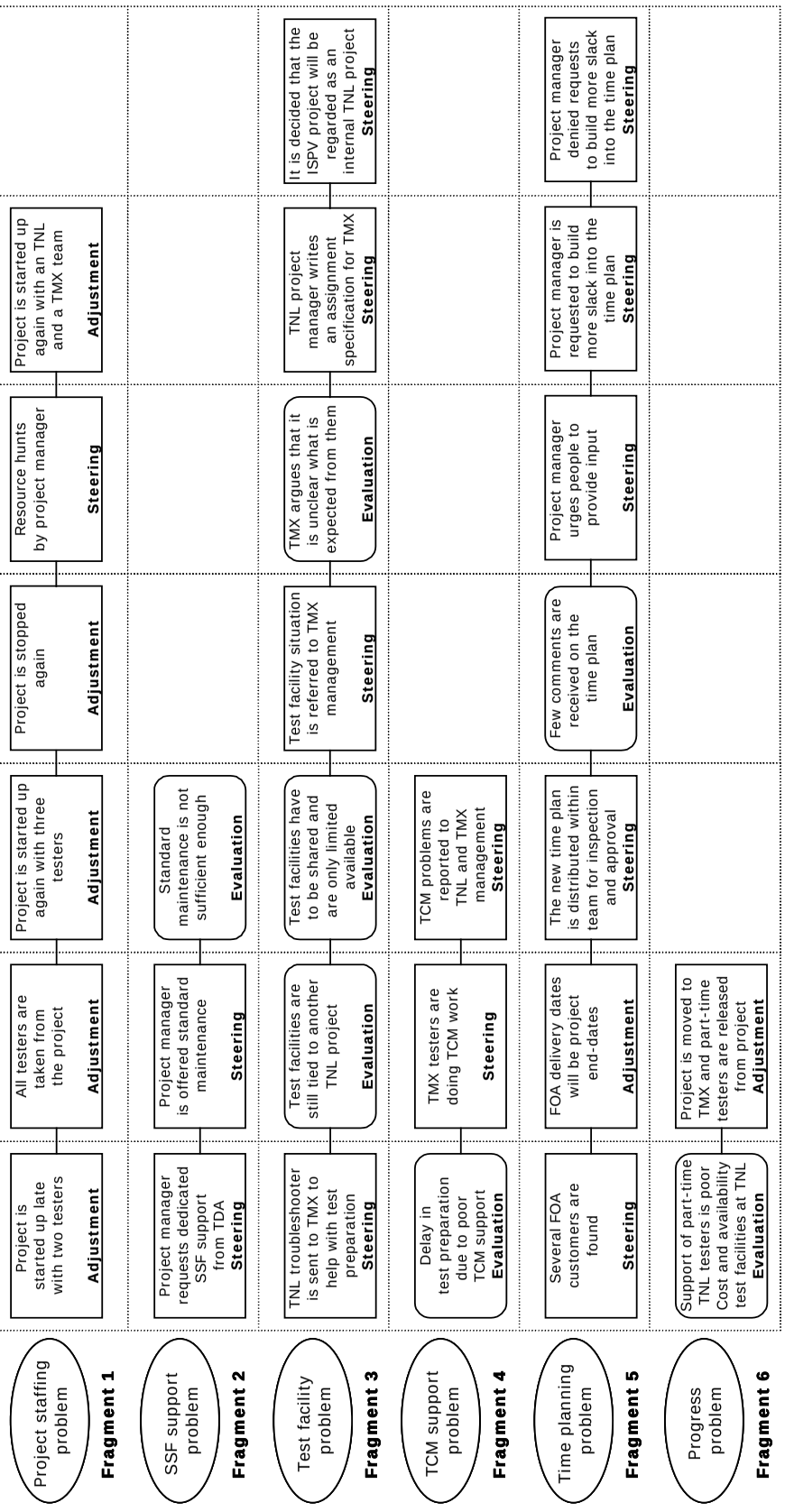

Figure 27: critical incidents episode I

Episode II

Episode II was characterised by various NPD, management and support problems. During this episode the project team tried to speed up test execution in order to compensate for the initial delay in episode I. In order to regain control over the project the project manager decided to set up individual planning and tracking meetings (Fragment 7). Furthermore, to relieve testers from doing test configuration work the project manager tried to arrange dedicated test support from the TCM department at TMX (Fragment 8). This had little effect because of the limited IN knowledge and skills of the TCM department at TMX. In order to speed up it was decided that the project team would do overtime shifts. The project manager, however, noticed that the TMX testers did not work for the committed hours. He urged them to stick to the work shifts, however with little result (Fragment 9). During test execution the project team kept on finding SSF-related faults, which were not really the area of expertise of TNL. Since solving these faults would take testers quite a lot of time, the project manager requested for dedicated SSF support from TDA (Fragments 2 and 10). These requests, however, were not granted by TDA. Also, additional SCF support was considered to speed up test activities (Fragment 12). However, the conditions under which TNL was willing to send an experienced tester were not acceptable for the project manager. One month before the delivery date, more pressure was put on the project team by TNL management (Fragment 14). TMX management was urged to improve the "sense of urgency" of the TMX testers and TMX testers were urged to report problems immediately and to stick to the overtime shifts and other appointments with the project manager. By that time TNL and TMX were starting to blame each other for the problems. A workshop was organised for TNL and TMX management in which the problems were discussed (Fragment 15). This improved the understanding of each other's organisations and the collaboration problems. Shortly after that the workshop it became clear to TNL management that the project team could not meet the first deadline. Consequently, it was decided to reduce the scope of the project (Fragment 16). This scope reduction came rather late.
The critical incidents that emerged in episode II are summarised in Figure 28.

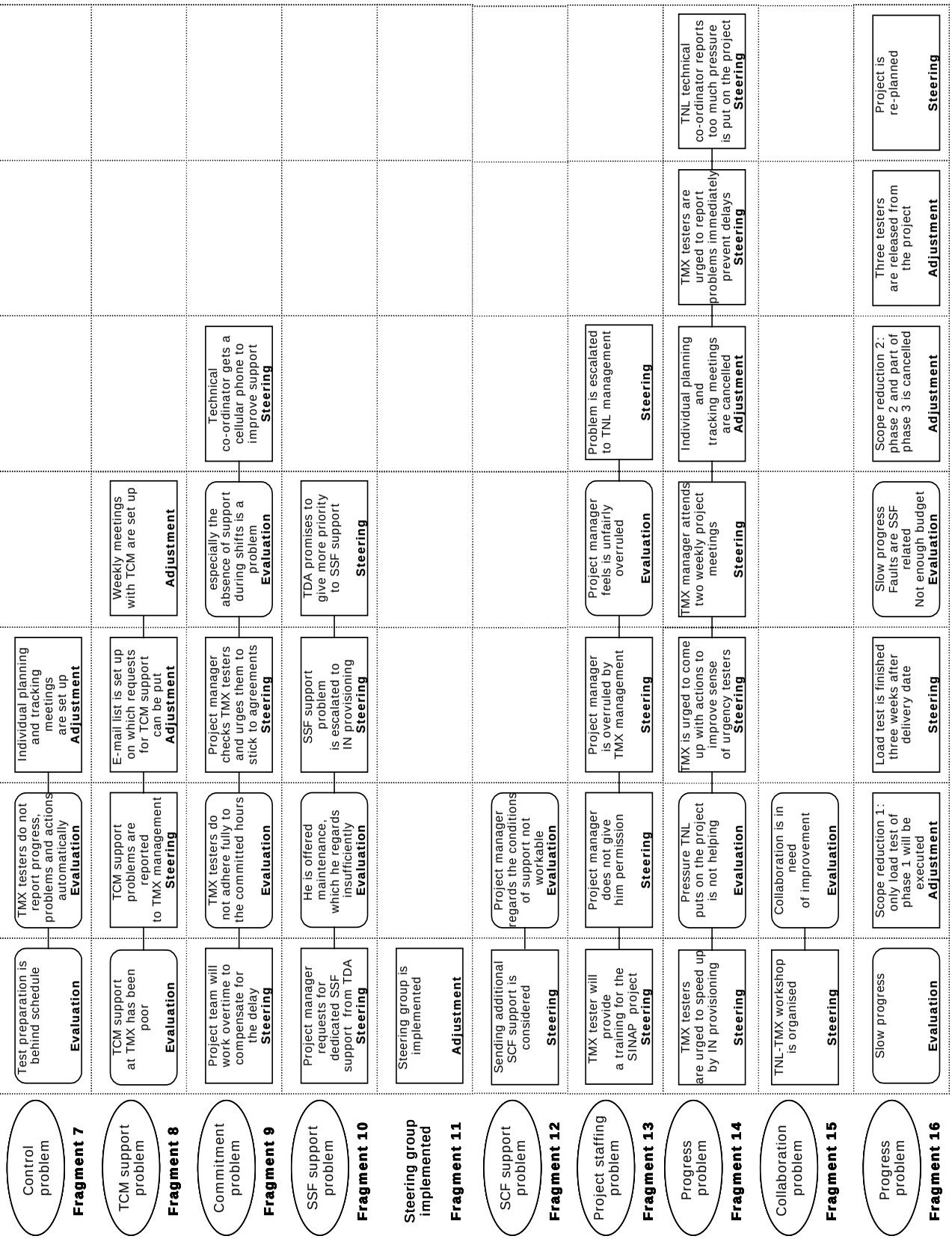

Figure 28: critical incidents episode II

Episode III

Episode III was characterised by NPD and support problems. During this episode the remaining two TMX testers and the TNL technical co-ordinator tried to finish the remaining test activities. Initially, the test activities were progressing above expectation of the project manager, yet progress slowed down considerably when the availability of the test facilities dropped (Fragment 18), one tester is released from the project (Fragment 19), and the technical co-ordinator ended his contract at TMX (Fragment 20). The project manager's request for a replacement for the TNL technical co-ordinator was not granted. However, it was decided that he would try to provide remote support to the only remaining TMX tester. It proved to be too complex to provide remote support. The project manager decided to prematurely close down the project because there was little prospective that the remaining test activities could be finished. The remaining test activities would be made part of another project.

The critical incidents that emerged in episode III are summarised in Figure 29.

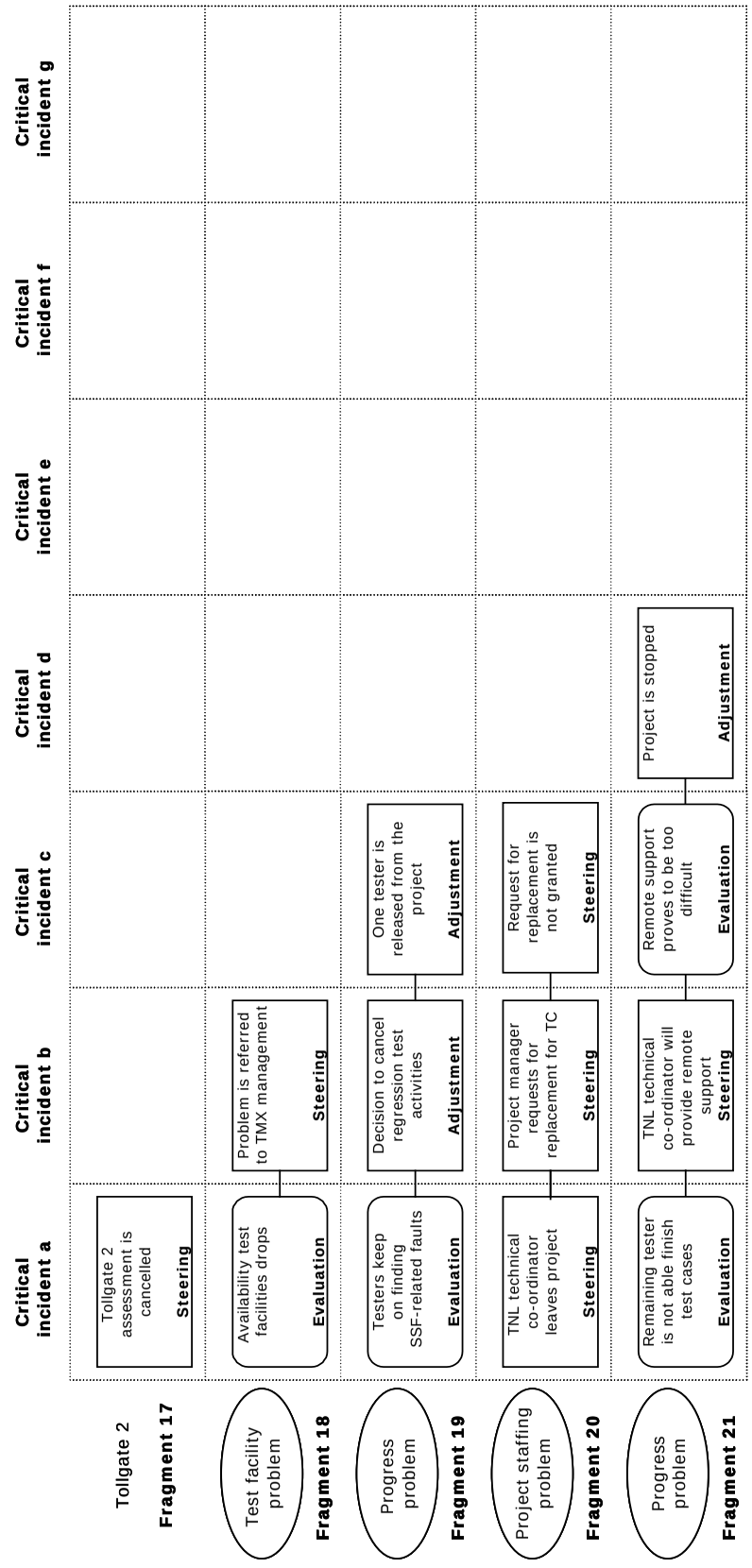

Figure 29: critical incidents episode III

7.2.4 Project outcomes

In this section the outcomes of the ISPV project are discussed in terms of operational effectiveness and perception of collaboration.

Operational effectiveness

The load test of project phase 1 (scope reduction 1) was ready by week 99-50. Although the deadline was week 99-46, this did not cause major problems, since the FOA customer was delayed, too. Project phase 2 and some test activities from project phase 3 were cancelled (scope reduction 2). Regression test activities were stopped end of February because no more budget was available and testers kept on finding new SSF-related faults. The remaining measurement activities of project phase 3 never got finished. The project manager envisioned that the remaining activities would not take more than two days of work to be finished and hoped that these activities would be executed in another project. The actual project hours exceeded the planned project hours (including scope reductions) by more than 50%. Both TNL and TMX were not satisfied with the performance of the ISPV project.

Perception of collaboration

Many people at TNL and TMX regarded the collaboration between TNL and TMX in the ISPV project as a negative experience. TNL was not satisfied with how TMX dealt with commitments regarding test facilities, time plans and work shifts, and with the reporting of disappointing progress and problems of TMX testers. TMX on the other hand, was not satisfied with the communication in the ISPV project. Test facilities were arranged in one telephone conference, which they regard as insufficiently. Furthermore, TMX management was initially not involved in the steering group. The TNL project manager initially only reported to TNL management and not to TMX management. Furthermore, TMX disliked the idea of not being responsible for the project execution.

7.3 Context analysis

In this section the results of the context analysis are discussed. The purpose of the context analysis is to gain insight into the causes of the problems that emerged during the collaboration and into the effects of management interventions (steering of project activities and adjustment of project organisation).

The causes of problems are sought in the strategic and cultural context of partners, project organisation design and preceding incidents. Problems trigger management interventions, which produce desired and undesired effects. In the analysis two types of causal relationships are distinguished. Firstly, influence relationships describing the influence of collaboration conditions on project (management, NPD and support)

activities or vice versa. Secondly, triggers describing the temporal relationship between incidents (evaluation, steering and adjustment). In line with the conceptualisation of processes as discussed in section 3.3.1, problems have been divided into NPD-, management-, and support-related problems.
In section 7.3.1 the NPD-related problems are discussed. In section 7.3.2 the management-related problems are discussed. Finally, in section 7.3.3 the support-related problems are discussed.

7.3.1 NPD-related problems

In this section the NPD related problems that emerged during the collaboration are discussed.

Progress problems

During virtually the whole course of the project test activities were behind schedule. Due to the late start-up and the tight delivery schedule to the customer the project was on a time critical path from the beginning. At the end of August there was already a delay of 6 weeks in test preparation. The delay in test preparation can be mainly attributed to the project staffing, test facility and TCM support problems, which will be discussed in more detail elsewhere. Although the project team worked overtime during October and November the project team was not able to compensate for this initial delay. Moreover, working overtime induced a commitment problem.
Important sources of these progress problems are differences in the partners' strategic context and the project organisation. Both are discussed below.

- *Strategic context*. The limited priority the ISPV project received from TNL, TDA and the TCM department at TMX resulted in project staffing (Fragment 1), SSF and SCF support (Fragment 10 and 12), and TCM support (Fragment 8) problems, which in turn significantly slowed down the project.

- *Project organisation*. Firstly, due to the limited experience of the project team with Integration & Verification (I&V) activities progress was slow. Secondly, the time plan was tight and the project scope was unfocused. Due to the late start-up, the test preparation problems and slow progress in test execution, test activities were behind schedule during virtually the whole project.

In order to cope with the progress problems, management interventions were undertaken. These are discussed below.

- *Adjustment 6b*. The contribution of the part-time testers at TNL was limited. At TMX full-time testers are available. Therefore, the project manager decides to move all project activities to TMX and to work with

TMX testers. However, the TMX testers are not really qualified to perform the system test activities.

- *Steering 9a*. In order to compensate for the time losses in test preparation the project team agrees to work overtime during October and November. During these months the project management encountered difficulties to have TMX testers to work for the agreed overtime work shifts (see commitment problem).

- *Steering 14a& f*. During November 1999 a lot of pressure was put on the project team by TNL management to finish before the first delivery date to the customer. Besides this TMX management was urged to improve the sense of urgency of the TMX testers. Both the TNL project manager and the TNL technical co-ordinator felt that too much pressure was put on the project. They felt that there was little recognition for what the project team achieved under the difficult circumstances. Due to continuous negative feedback cycles, the motivation of the project team was low. In order to release the pressure somewhat from the TMX testers, the individual planning and tracking meetings were cancelled.

- *Adjustment 16b& e*. In November 1999 the steering group realised that it was impossible to execute all test cases within the given time frame and with the current technical competencies. The scope was defined too broadly. The scope problem can be attributed to the limited experience at TNL with this kind of system activities. At the start of the project nobody really knew on what test cases to concentrate. Consequently, it was decided to try to execute all test cases. In order to cope with the scope problem the steering group decided to reduce the scope of the project. Two scope reductions were issued to achieve this. Furthermore, it was decided to start working on the most important test cases and to leave the less important test cases for the end of the project (if time permitted). The scope reductions came far too late. More attention to the project scope in the beginning of the project could have prevented much of the problems encountered.

The progress problems outlined above and their causes, as well as the management interventions aimed at solving these problems and their effects are summarised in Figure 30.

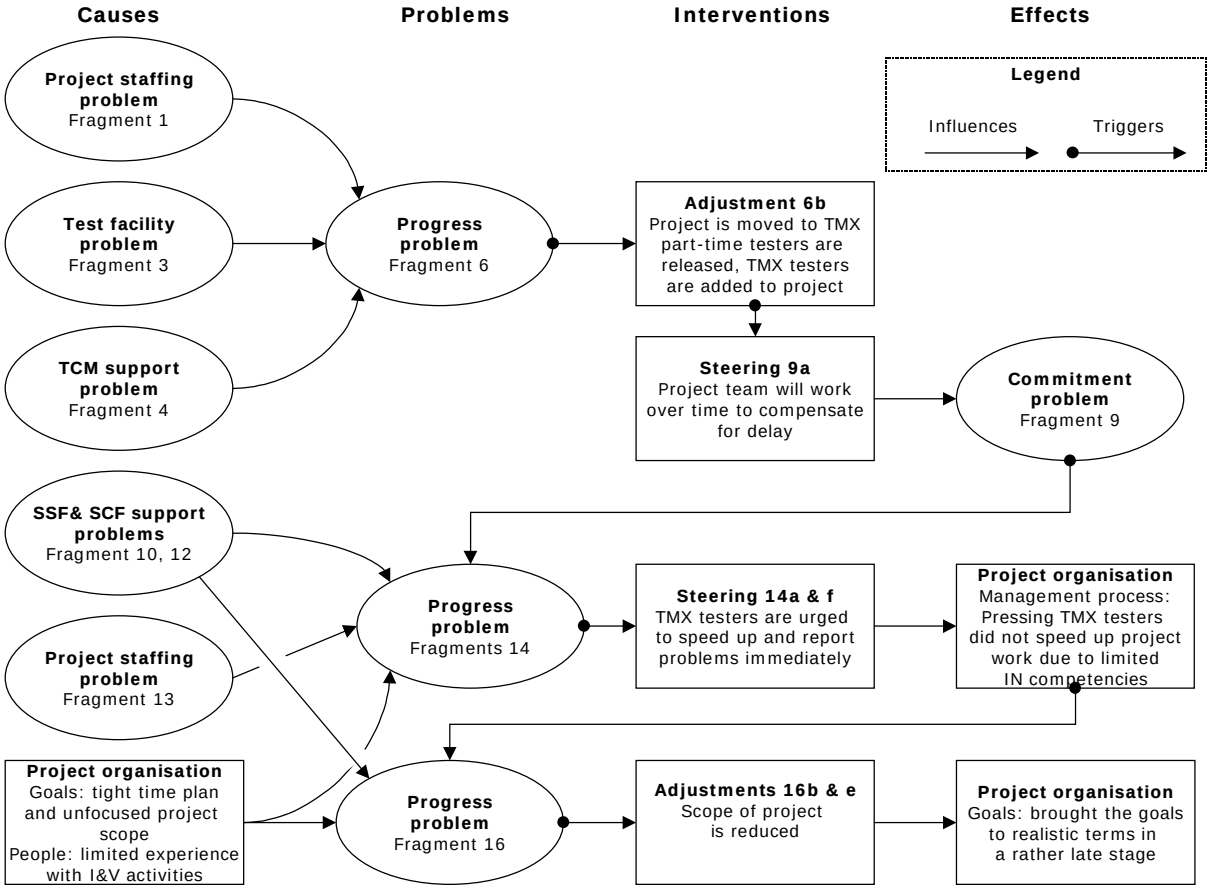

Figure 30: progress problems

After the scope was reduced, the project was re-planned and re-started. Towards the end of the project several progress problems were encountered again due to the limited technical competencies of the project team and the support problems, caused by the lack of priority partners attached to the project, as discussed above. In order to cope with these progress problems the following actions were undertaken.

- *Adjustment 19b*. However, towards the end of the project progress was slow because the project team kept on finding SSF-related faults, which were difficult to solve without the support of TDA. It was decided to cancel the regression test activities and to release one tester from the project.

- *Adjustment 19c*. The TNL technical co-ordinator and the only remaining TMX tester would perform the remaining test work. However, when the TNL technical co-ordinator left the project and the availability of the test facilities was dropping, progress virtually stopped.

- *Steering 21c*. The only remaining TMX tester was not able to finish the project without the help of TNL. TNL management did not grant request for replacement for the TNL technical co-ordinator. To solve

the problem it was decided that the TNL technical co-ordinator would try to support the TMX tester remotely. This proved to be very difficult. The project manager therefore closed down the project.

The progress problems outlined above and their causes, as well as the management interventions aimed at solving these problems and their effects are summarised in Figure 31.

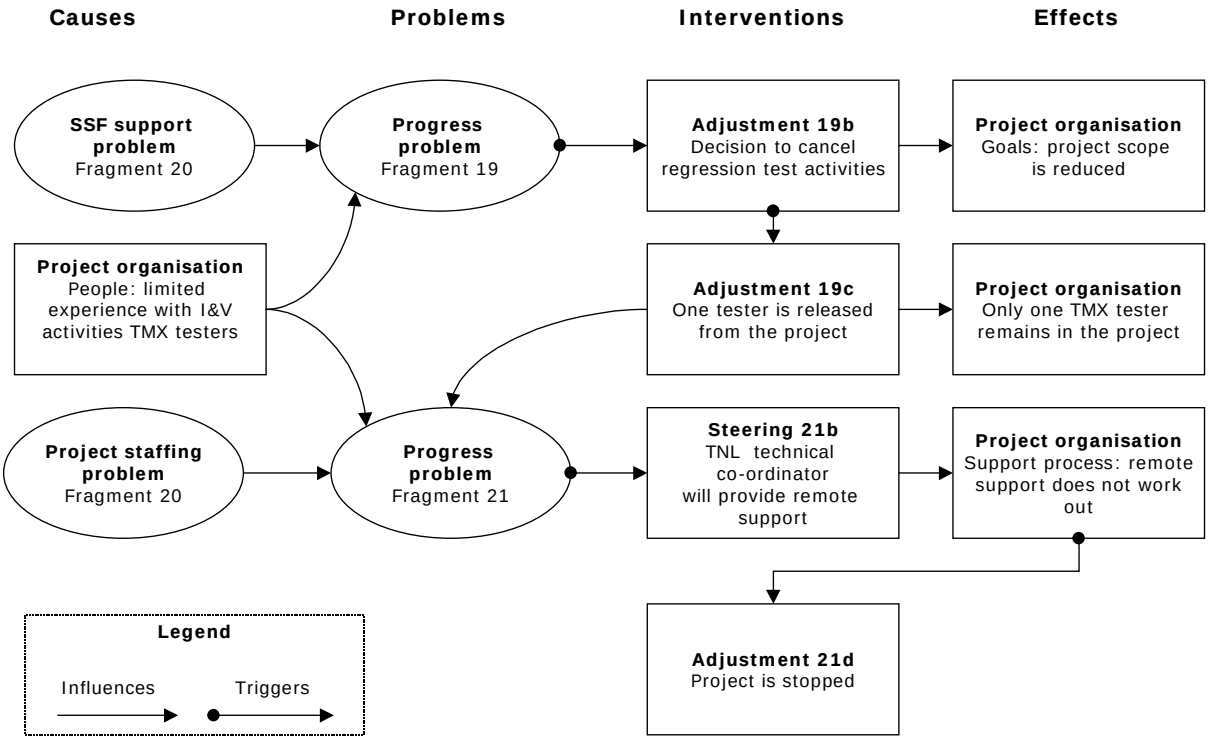

Figure 31: progress problems (continued)

7.3.2 Management-related problems

Time planning problems

At the end of August 1999 the project manager and a TNL line manager thought of ways to regain control over the project. One of the ideas was to raise the commitment of TMX management and testers to the existing time plan by asking them to inspect and comment on the time plan. Much in line with conventional project management wisdom they assumed that a good time plan is worth nothing without the commitment of team members in terms of involvement and responsibility. To make sure everybody would read the time plan the project manager asked the TMX testers to "sign" for approval of the time plan (*steering 5e*). Both TMX management and testers hesitated to give their commitment to the time plan. Although the project manager asked to provide their feedback within a week, it took months to receive all comments and commitments.

Moreover, both TMX testers and management did not have many comments on the time plan.
The reluctance of TMX management and testers to comment on the time plan can be understood if one considers the project organisation design and the differences between the partners' cultural context.

- *Project organisation*. Firstly, TMX managers and testers could not really judge the feasibility of the time plan due to their limited experience with integration and verification activities. Secondly, the project was treated as an internal TNL project, which reduced the commitment of TMX management somewhat.

- *Cultural context gap*. TMX testers (except for test leaders) are not really used to being asked for planning input, which is related to their cultural values with respect to the respect for authority. It is not uncommon at TMX that managers instruct them what to do. Now they were asked to comment on and commit to the time plan. Thirdly, TMX management felt that they were not responsible for checking the time plan because they were only responsible for delivering the people and the means.

Over time, when the delays became visible, and TMX testers and management lost their confidence in the time plan, the project manager was asked to revise the time plan (*steering 5f*). The project manager, however, did not want to build more slack into the time plan every time delays became visible. The unwillingness of the project manager to build more slack into the time plan can be understood if one considers the following conditions.

- *Project organisation*. Firstly, progress of test execution was very slow. The project manager tried to motivate the testers to speed up by means of negative feedback. However, this did not motivate the TMX testers to speed up, rather it reduced the motivation of the TMX testers because they felt they were on a "mission impossible". Secondly, the project did have a fixed end-date. Delaying the project was not an option for TNL management. Therefore the project manager tried to hold on to the end-date until the very last moment, just before the delivery date to the FOA customer.

The time planning problems outlined above and their causes, as well as the management interventions aimed at solving these problems and their effects are summarised in Figure 32.

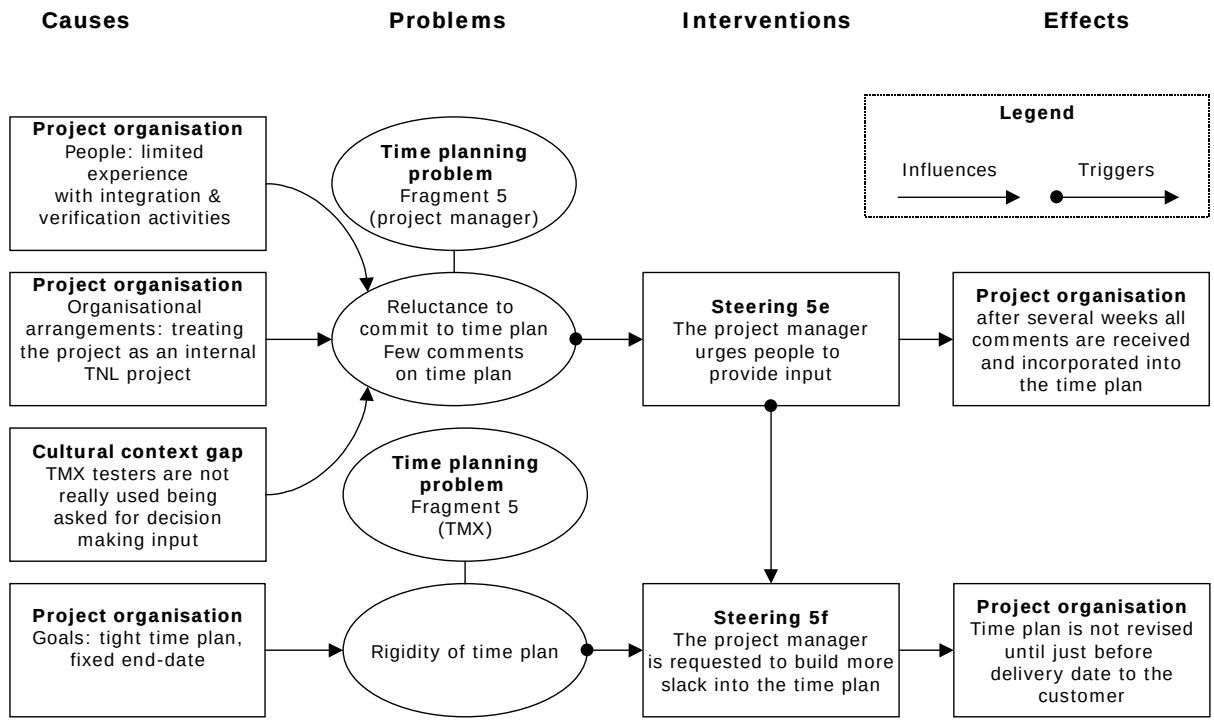

Figure 32: time planning problems

Commitment problem

TMX testers were asked to work overtime to compensate for the delay, which was largely caused by the slow progress of the test preparation. However, the commitment to these overtime shifts was below the expectation of the project manager. Testers appeared reluctant to work overtime and did not follow up appointments made with the project manager to the full extent. Moreover, people came late or did not show up at all at meetings and inspections. This commitment problem can mainly be attributed to the project organisation and differences in the partners' cultural context. Both are discussed below.

- *Project organisation*. Firstly, TMX testers argued that especially the absence of support (of the technical co-ordinator) when working overtime frustrated them. TMX testers felt it was of no use to stay until the end of their work shifts when they could not work further. In order to cope with this situation the project manager made sure that the TNL technical co-ordinator could be reached permanently by giving him a cellular phone. Secondly, TMX testers had limited experience with conducting Integration and Verification (I&V) activities and had limited IN knowledge and skills. Therefore it was difficult for the testers to estimate how much time they would need to complete certain test cases. Furthermore, the instability of the test facilities further complicated the estimation of the time needed to complete test cases.

- *Cultural context gap*. Whereas at TNL appointments tend to be kept strict, at TMX appointments tend to be flexible. For instance, at TMX it is more common than at TNL to arrive late at meetings and that meetings have flexible endings. Moreover, appointments at TMX tend to be seen as desirable objectives and not so much as strict commitments, as tends to be the case at TNL. These cultural values and practices sharply contrast with the detailed tracking and the focus on following up on commitments of the TNL project manager. In other words, the leadership behaviour of the TNL project manager sharply contrasted with the cultural context of his subordinates.

In order to solve the commitment problem, the following actions were undertaken.

- *Steering 7d*. One of the first things the project manager did when he arrived at TMX was to set up weekly individual planning & tracking meetings. These meetings did not have the desired effect because they induced permanent negative feedback cycles mainly because of the limited technical competencies of the TMX testers and the strict tracking of the TNL project manager.

- *Steering 9c*. When the project manager noticed that the testers did not exactly work for the hours they agreed upon, he asked them to report to him when and why they could not work for the agreed hours. Furthermore, he adopted a more behavioural control strategy. He started to check if people were present at overtime shifts. Furthermore, he made sure that whenever testers would work overtime he or the technical co-ordinator was present at TMX or could be reached on their cellular phones in case of problems. This did not really improve the situation. The TMX testers did not really change their work behaviour. The project manager got very annoyed by this.

- *Steering 14d& e*. The project manager referred the problems to TMX management. The TMX testers were urged to stick to the appointment they made with the project manager and a TMX line manager was present at a couple of project meetings to check how things were going. All this did not improve the situation. Ultimately, the individual planning and tracking meetings were cancelled because they reduced the motivation of the testers.

The commitment problem outlined above and the causes of this problem, as well as the management interventions aimed at solving this problem and their effects are summarised in Figure 33.

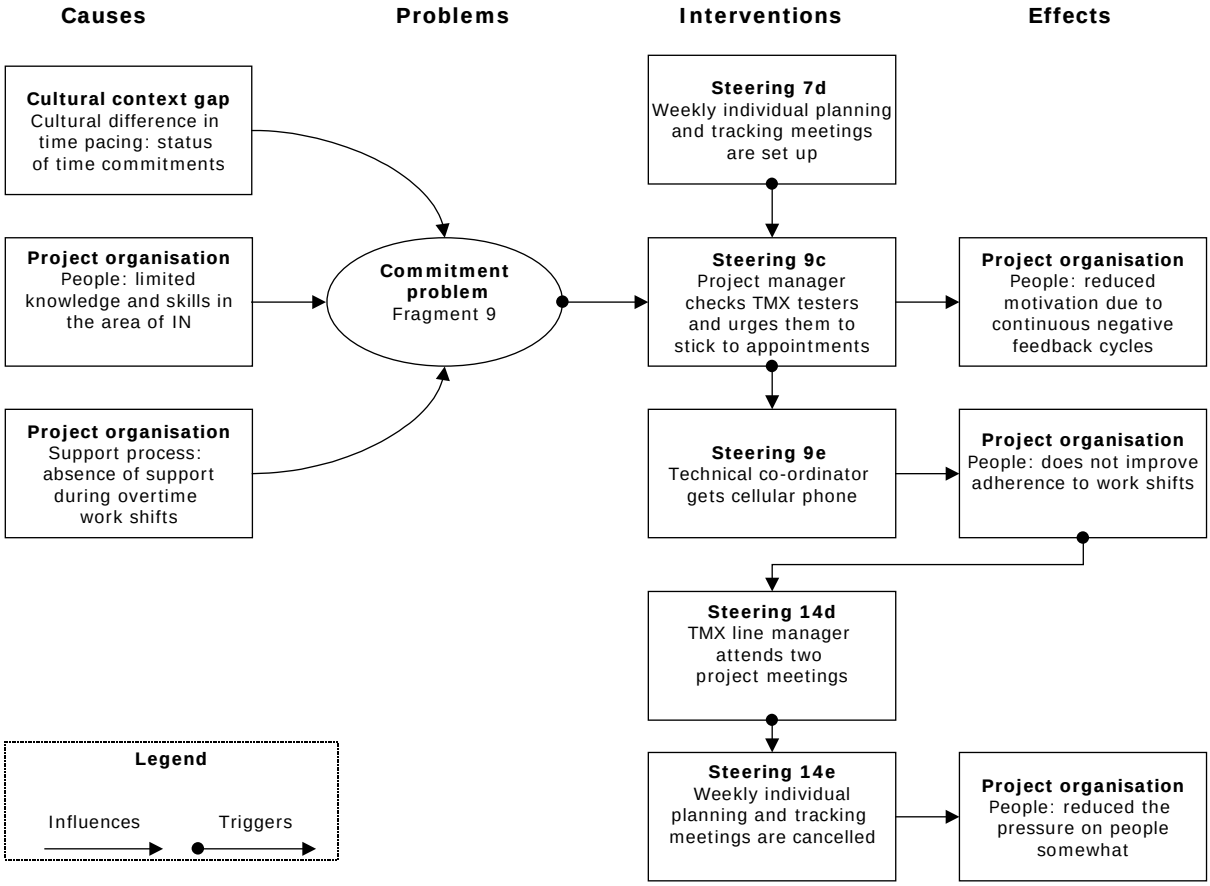

Figure 33: commitment problem

Collaboration problem

On November 17, a workshop was organised for TNL and TMX managers at TNL. During the workshop it became clear that the collaboration between TNL and TMX was in need of improvement. Both partners were not really working together to solve the encountered problems but were pointing fingers to each other. Explanations for this collaboration problem can be found in the project organisation and the management process. Both are discussed below.

- *Project organisation*. A first explanation for the collaboration problem can be found in the limited history of collaboration between TNL and TMX. The ISPV project was among the first projects in which TNL and TMX collaborated. TNL did not really know how to organise and manage the collaboration with TMX. A second explanation for the collaboration problem can be found in the management process. Both TNL and TMX poorly managed the expectations with respect to the collaboration. TNL assumed that TMX could execute the project relatively independently of TNL because it committed itself relatively easy to the project goals. TMX, on the other hand, assumed that TNL would support them to execute the project.

- *Preceding problems*. The collaboration problem can be seen as an aggregate of the preceding problems encountered. These problems shaped the perceptions of each other, which form the collaboration problem.

The TNL-TMX workshop had a positive effect on the collaboration relationship between TNL and TMX managers. It allowed managers to share their perceptions of the collaboration and to think of solutions to improve the collaboration. Furthermore, it improved the understanding of each other's strategic and cultural context.
The collaboration problem outlined above and the causes of this problem, as well as the management intervention aimed at solving this problem and its effect are summarised in Figure 34.

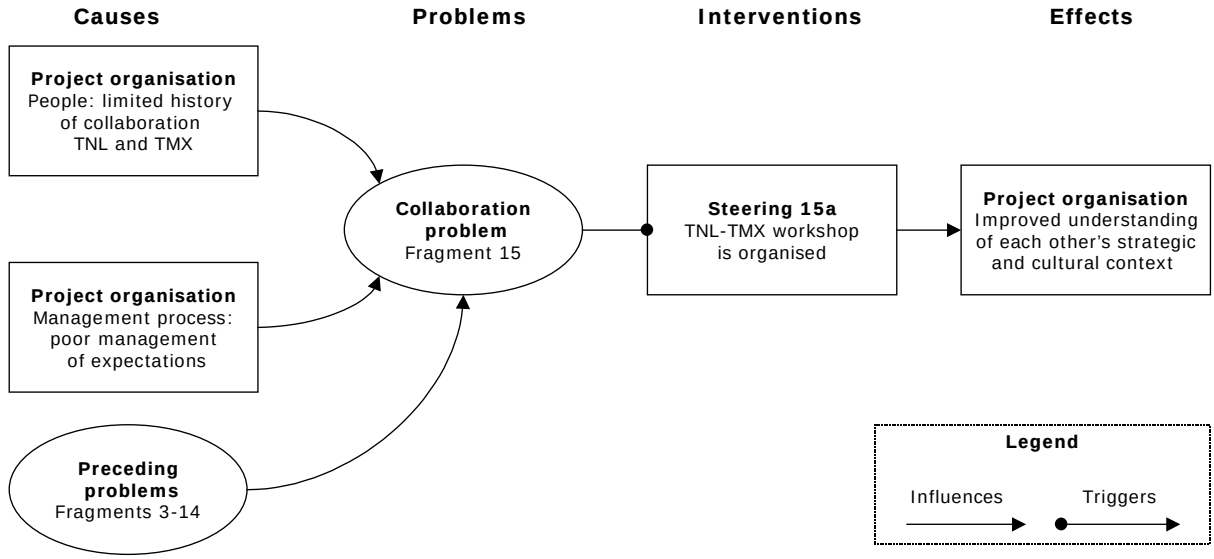

Figure 34: collaboration problem

7.3.3 Support-related problems

Project staffing problems

Due to the priority shifts of TNL management testers were allocated and withdrawn from the project. The ISPV project was started up and stopped three times before it was actually started up. The project manager put in a lot of effort to get people from other departments for the project. The project manager managed, besides a TNL technical co-ordinator, to get three part-time testers from a TNL support department and three full-time testers from TMX. The contribution of the part-time TNL testers was below the expectation of the project manager. The personal priority setting of the part-time testers was clearly in favour of regular support work for their department. Therefore the project manager decided to release these testers from the project and among other things to move the project to TMX. Requests for additional test engineers at TMX were rewarded.

In November 1999 a TMX tester informed the project manager that he was asked to give a course on using a simulated test environment to the testers of the SINAP project. The project manager did not give him permission to provide this course. The resource owner (TMX general manager), however, overruled the decision of the project manager. The TNL project manager in turn, informed TNL line management about the situation and they also tried to convince TMX management that pulling a tester from an already endangered project was a great risk. This did not induce TMX management to turn back their decision. The cause of this project staffing conflict can be found in the partners' strategic context.
Finally, towards the end of the project the TNL technical co-ordinator was pulled from the ISPV project because he was needed in another TNL project and because his contract at TMX had ended.
The project staffing problems described are caused by differences in partner's strategic context. These differences will be discussed below.

- *Strategic context gaps*. The first project-staffing problem illustrates that TNL did not attach much priority to the ISPV project. Consequently the project manager was forced to work with less qualified TMX testers and part-time testers from a support department of TNL. The second project-staffing problem illustrates that TMX attached more priority to the SINAP project than to the ISPV project. Finally, the third project-staffing problem illustrates that towards the end of the ISPV project TNL did not attach much priority to the ISPV project anymore.

The project manager tried to solve the project staffing problems by finding additional test engineers (*steering 1g and 20b*) and to refer to line management, when test engineers were pulled from the project (*steering 13b*). All these actions had little effect mainly because the lack of priority given to the project.
The project staffing problems outlined above and the causes of these problems, as well as the management interventions aimed at solving these problems and their effects are summarised in Figure 35.

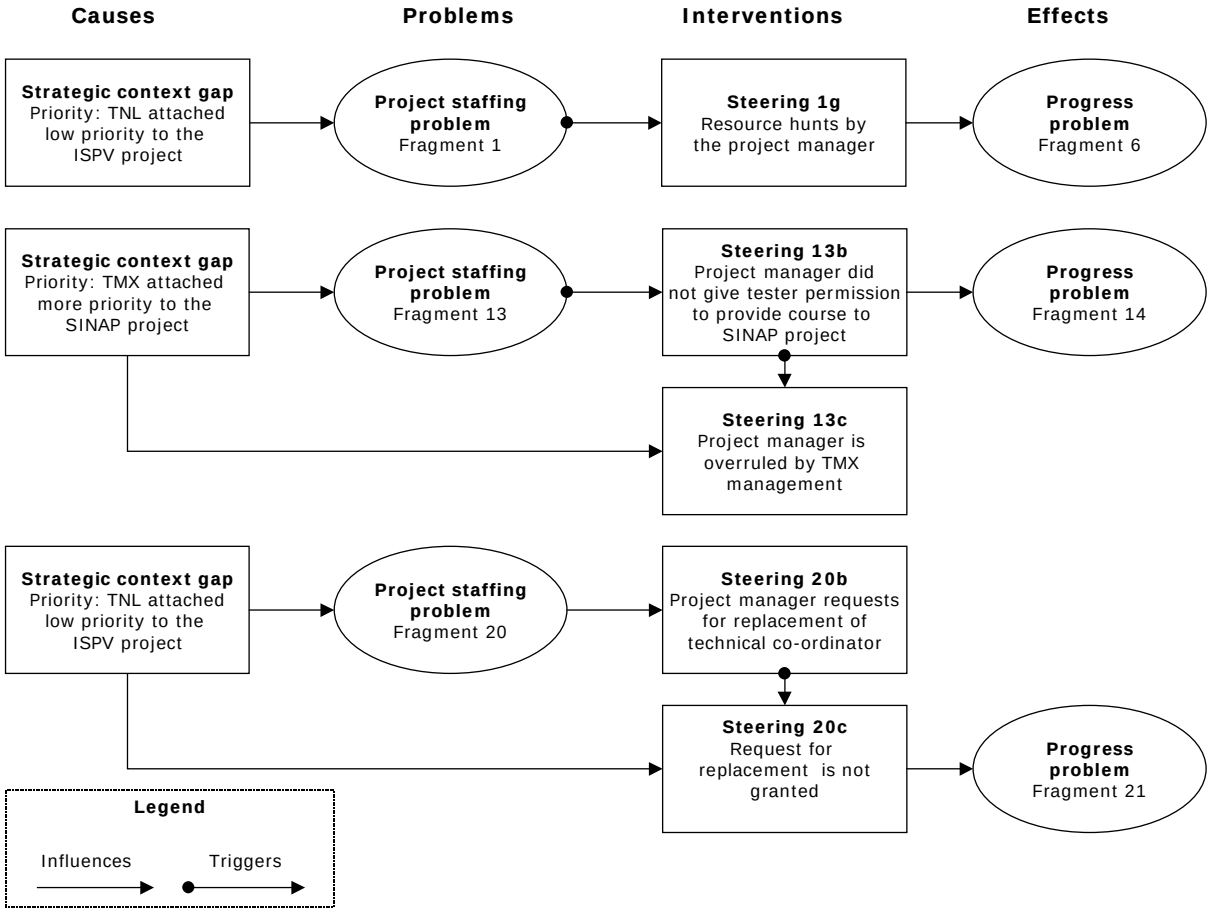

Figure 35: project-staffing problems

SSF support problem

During the project a lot of SSF-related faults were found in the IN system tested. This significantly delayed the project because the project team lacked the SSF knowledge and skills needed to solve these faults. The following conditions induced the SSF support problems.

- *Strategic context gap*. The ISPV project at TNL did not have much priority for TDA. ISPV was originally intended as a joint effort between TDA (SSF part) and TNL (SCF part). However, the ISPV project of TDA had already finished when the ISPV project of TNL was started up. By the time TDA started up their ISPV project TNL could not arrange enough testers to start up their ISPV project.

- *Project organisation*. Firstly, the outcomes of the ISPV project of TDA were not well documented and therefore of little use to the project members of the ISPV project at TNL and TMX. Secondly, during test execution the project team predominantly found SSF-related faults. Thirdly, the project team tried to solve these faults, but lacked the SSF knowledge and skills to do so.

In order to cope with the SSF support problems, the project manager undertook the following actions.

- *Steering 2a and 10a*. At several times the project manager asked for dedicated SSF support from TDA. The project manager appealed to the fact that ISPV was originally meant as a joint project of TNL and TDA and that they were solving SFF-related problems, which were actually under TDA's responsibility. However, these requests for more support from TDA were not granted due to the low priority TDA attached to the ISPV project. The project manager was offered standard maintenance, which he regarded as not fast enough.

- *Steering 10c*. Referral of the support problem to the next management layer in the corporate organisation resulted in a promise from TDA to give the ISPV project more priority, but in reality this did not result in more SSF support. A better co-ordination of the ISPV test activities conducted at TNL and TDA, for instance through the main project, could have prevented the SSF support problems.

The SSF support problems outlined above and the causes of these problems, as well as the management interventions aimed at solving these problems and their effect are summarised in Figure 36.

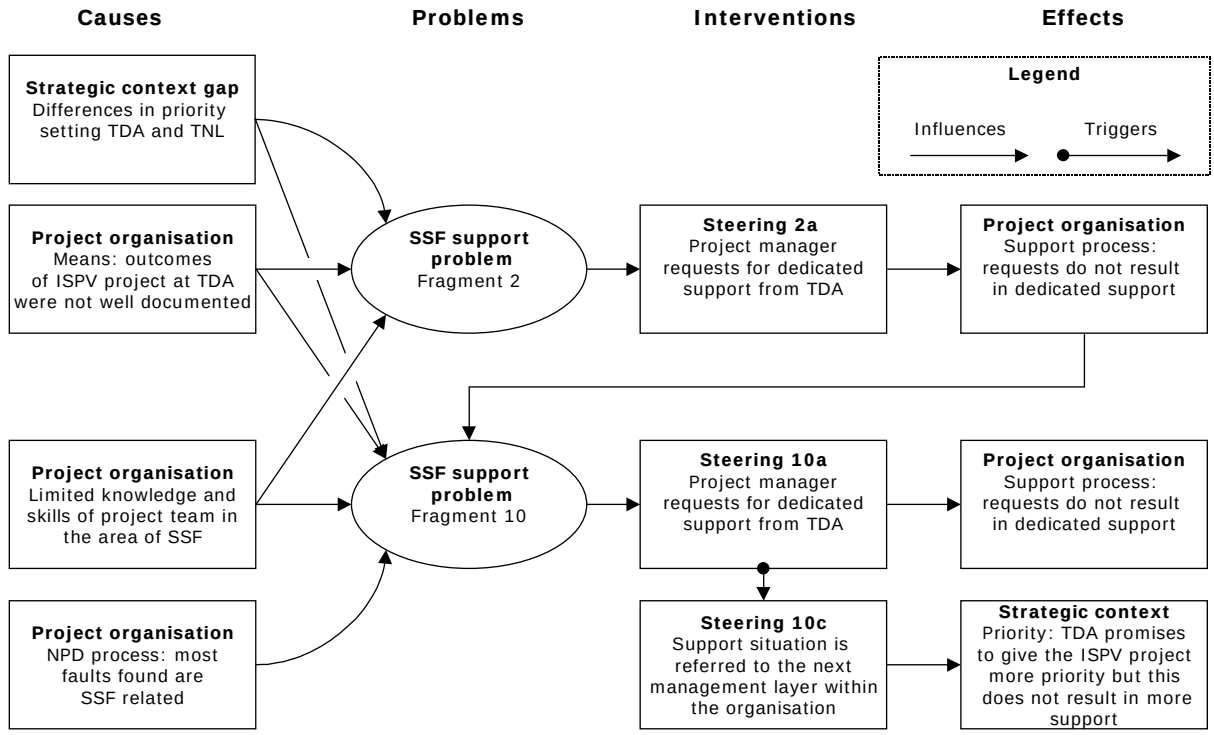

Figure 36: SSF support problem

Test facility problem

Early in the project it became clear that test preparation at TMX was progressing slow due to the status of the test facilities. Important sources of this test facility problem were the project organisation, more specifically the communication between the project manager and TMX, and the status of test facilities at TMX. Both are discussed in more detail below.

- *Means*. Firstly, important hardware parts of the test facilities were missing and had to be ordered, which took quite some time. Secondly, the test facilities had to be shared with other projects. At the start of each work shift the test configuration had to be installed and at the end of each work shift the test configuration had to uninstalled, which gave rise to installation problems and significant time losses. Thirdly, when the ISPV project started at TMX the test facilities were still being used by another TNL project.

- *Management process*. The test facility problem could have been detected much earlier if the TNL project manager and the TMX test leader had communicated their expectations about the test facilities. The project manager verified if there were test facilities available at TMX. When the TMX test leader said it had two test facilities available, he assumed that these test facilities would be up and running, as is normally the case at TNL. When the project started at TMX, however this was not the case. The TNL project manager projected the TNL situation onto TMX and concluded from the conversations with TMX that everything was arranged. TMX management was surprised by the fact that everything was arranged in one telephone conversation. The project manager asked if people and test sites were available, but never asked about the status of these test sites. Remarkably, however, neither the TNL project manager nor TMX checked what was expected from the test sites. In the INMQA project, which was a predecessor of the ISPV project, similar test preparation problems were encountered (see section 5.3.3). Apparently nobody did learn lessons from these problems.

In order to cope with the test facility problems the project manager undertook the following actions.

- *Steering 3a*. Sending a TNL troubleshooter to TMX did not improve the test preparation at TMX. The TNL troubleshooter could not do much because another TNL project (INMQA project) was delayed and still occupied the test facilities. Moreover, important hardware parts were missing and had to be ordered. Inspection of the test facilities by the TNL troubleshooter, however, improved the knowledge of the project manager about the test facility situation at TMX.

- *Steering 3d and 3f.* The TNL project manager referred the test preparation problem to TMX management. They claimed that it was not clear what was expected from them and urged the TNL project manager to write an assignment specification. This assignment specification clarified what was expected from TMX.

The test facility problem and the cause of this problem, as well as the management interventions to cope with this problem and their effects are depicted in Figure 37.

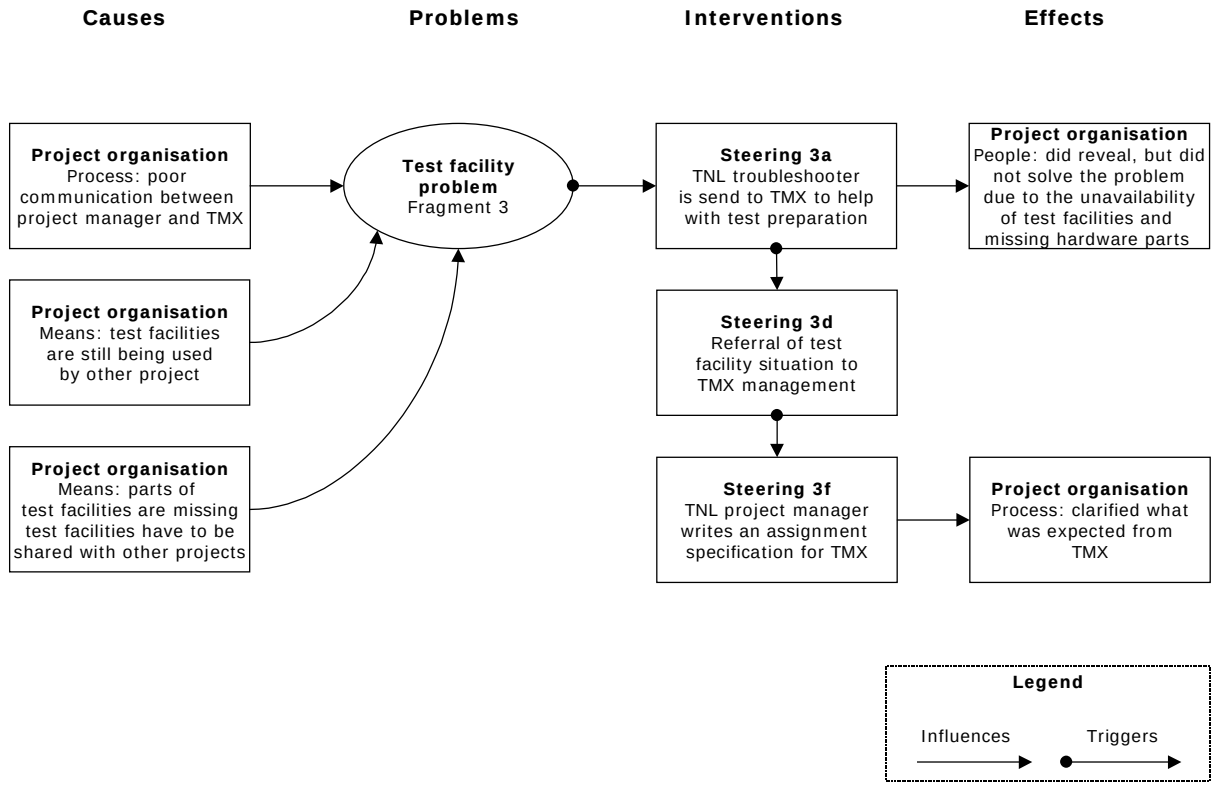

Figure 37: test facility problem

SCF support problem

In November 1999 the project manager started to realise that despite of the presence of the TNL technical co-ordinator at TMX, too few competent test engineers were allocated to the ISPV project to finish the test activities on time. Therefore, the project manager requested TNL for an additional experienced tester (*steering 12a*). However, the conditions under which TNL was willing to send an experienced tester was not acceptable for the project manager. It appeared that this person needed to be available for problem solving activities for other projects at all time. The project manager did not regard this kind support as workable. Apparently, TNL attached higher priority to the other projects in which the TNL tester was needed.

The SCF support problem and the cause of this problem, as well as the management intervention to cope with this problem and its effects are depicted in Figure 37.

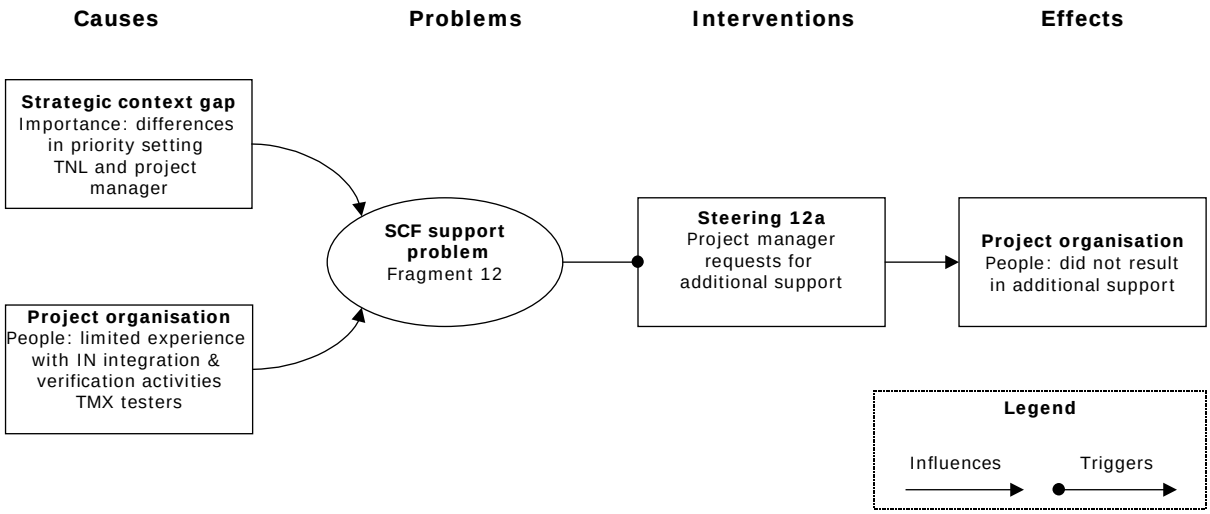

Figure 38: SCF support problem

TCM support problem

During the ISPV project Test Configuration Management (TCM) support at TMX was limited. Consequently, instead of TCM specialists, project members with little TCM experience had to set up the test sites and solve the test configuration problems themselves. The sources of the TCM support problem can be found in the differences in the partners' strategic context and the project organisation.

- *Strategic context gap*. Especially in the beginning of the ISPV project the TCM department attached low priority to the ISPV project. This changed for the good when TMX management urged the TCM department to improve the support to the ISPV project.

- *Project organisation*. Firstly, the TCM department did have limited experience with IN integration & verification activities. Consequently it was difficult for them to effectively support the ISPV project. Secondly, test facilities had to be shared with other projects. Consequently, test software needed to be re-installed and uninstalled every test shift. This did not contribute to the stability of the test facilities and increased the need for effective TCM support.

In order to cope with the TCM problems, the project manager undertook the following actions.

- *Steering 4c and 8b*. The project manager referred the TCM situation to TMX and TNL management. This did not really solve the TCM problems. Therefore the project manager again referred the TCM

situation but now only to TMX management. This triggered a TMX line manager to take up the problem.

- *Adjustment 8c and 8d*. The TMX line manager agreed with the TCM department to set up an e-mail list for support requests to the TCM department and to set up weekly meetings with the TCM department. Although this improved the communication with the TCM department it did not really improve the situation because of the limited knowledge and experience of the TCM department in the field of IN integration & verification activities. The relatively inexperienced TMX testers had to do most of the TCM work during virtually the whole of execution of test work.

The TCM support problems and the causes of these problems, as well as the management interventions to cope with these problems and their are depicted in Figure 39.

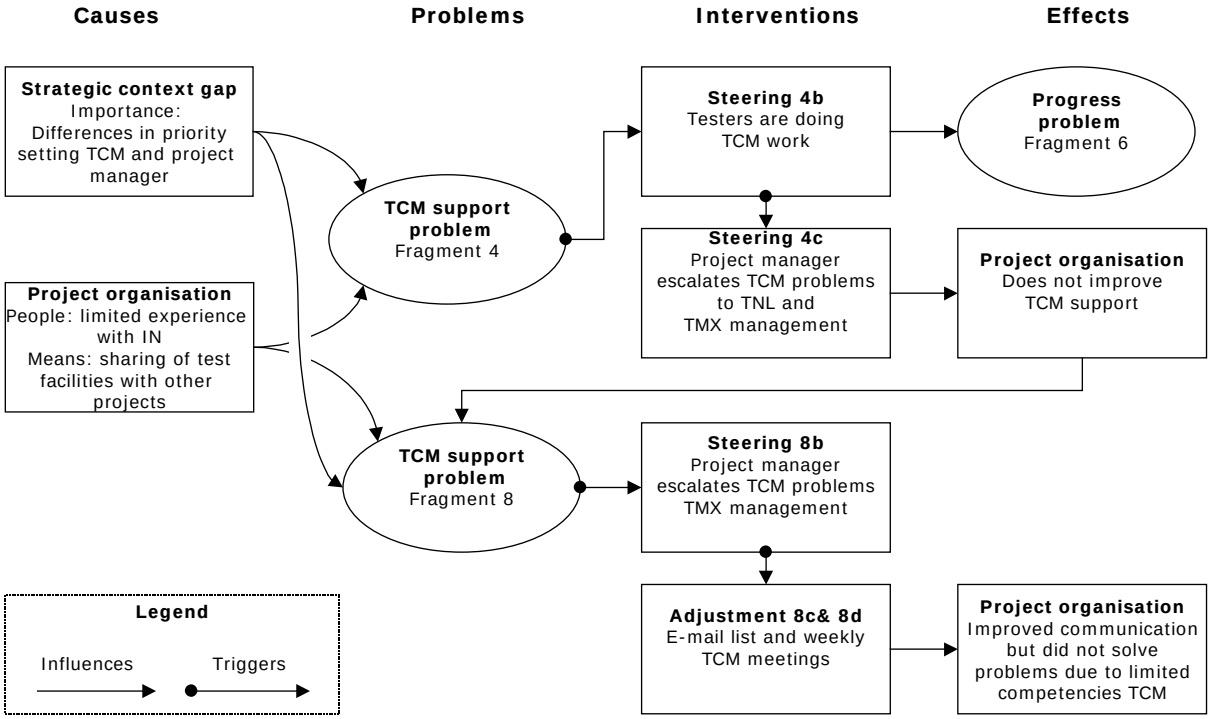

Figure 39: TCM support problems

7.4 Concluding remarks

The ISPV project started up[67] with low management commitment of TNL and TDA, large differences in cultural values, and TMX testers with limited experience with Integration & Verification (I&V) activities. From these initial conditions one would expect that the project would not run well. Indeed the ISPV project did not run well both in terms of operational effectiveness and perception of collaboration. The progress on passing test cases was very slow compared with TNL standards. A large part of the project was cancelled due to the slow progress. Moreover, the remaining part could not be finished completely during the project.

The unfavourable initial conditions were almost entirely responsible for the poor project outcomes. The project manager was on a "mission impossible". Unfocused project scope, limited senior management commitment, limited technical competencies and little time slack did have significant impact on the project outcomes.

Unforeseen differences in setting up and using test facilities between TNL and TMX caused a major delay in test site preparation and complicated execution of test work. The project manager tried to recover for the initial delays in test preparation by getting more support, by having people working overtime and by adopting a strict control regime towards the testers. Moreover, TNL and TMX management pressed the TMX testers to speed up. All this could not speed up project work. The project team could not compensate for the initial delays and their motivation reduced due to continuous negative feedback they received on their progress.

Efforts to cope with the unfavourable initial project conditions were complicated by the cultural differences between TNL and TMX. The project manager was severely confronted with the cultural differences between TNL and TMX. The project manager had to deal with differences in communication (e.g. reporting of progress and status of commitments) and time pacing behaviour (e.g. punctuality and sense of urgency). In order to cope with these differences, the project manager tried to adopt a more directive "Mexican" leadership style. This did not produce the desired effect because of the emphasis on control and the neglect of the more soft-relational aspects of the "Mexican" leadership style.

The strategic context also significantly influenced the project. TNL attached low priority to the ISPV project. Consequently, it was extremely difficult for the project manager to staff the project with dedicated and competent testers. Moreover, priorities shifted frequently especially in the initial stages of the project consequently the project started up late. By the time the project really started TDA had already finished their ISPV project. Understandably TDA also attached little priority to the related ISPV project at TNL. This resulted in poor SSF support from TDA during

[67] The ISPV project was started and stopped several times. Here we mean when the project was started up for the last time.

the project. However, most faults that were found in system test were related to SSF and not SCF. In spite of the lack of SSF support the project team tried to solve these faults. Consequently, progress on these test cases was low.

8

CROSS-CASE ANALYSIS

Letter from Sr. González

"[..] It was certainly interesting to hear that you are thinking of joining a U.S. firm. If it is not presumptuous of me, I wonder if it might be helpful if I give you a few pointers which, if I'd had them a year ago, would have saved a lot of anguish. [..] And beware what you say about when the job will be done. He will hold you to do it, down to the last detail. Make sure you are always on the safe side when estimating the time a task should take. Allow yourself a cushion in case of unforeseen setbacks. Also if you run into any delays, be sure to tell him *immediately*. In most cases he will be quite considerate and gladly help you with the problem. But never come with an excuse after the fact- he will be furious! [..] I guess the final thing to remember is that North Americans, even though they seem cold and hard to get to know, can be OK guys – just like Mexicans! – when you get below the surface."

Eva S. Kras, 1989, 'Management in Two Cultures: Bridging the problem between U.S. and Mexican managers', p.79-80

8.1 Introduction

In the previous two chapters the findings of the within-case analysis were presented. This chapter concentrates on the cross-case analysis. The cross-case analysis is performed to assess the similarities and differences in the impact of initial conditions and the effects of steering and adjustment interventions. On the basis of this comparison propositions are developed, which can be tested in future research. Propositions are divided into context and process propositions. Context propositions are concerned with the relationship between collaboration conditions, which comprise the strategic and cultural context of partners and the project organisation, and the outcomes of collaborative NPD. Process propositions are concerned with the relationship between management interventions and the outcomes of collaborative NPD. The reader should bear in mind that these propositions are based on the findings of two case studies. In order to get a first impression of the generality of the propositions, they will be confronted with theory.
Section 8.2 analyses if the operational effectiveness and relational performance of both projects could have been predicted from the initial conditions. In section 8.3 the impact and handling of differences in the partners' strategic context are compared and analysed. In section 8.4 the impact and handling of differences in partners' cultural context are compared and analysed. In section 8.5 the impact of the project organisation design and interventions aimed at resolving problems induced by the project organisation are compared and analysed. In section 8.6 context and process propositions are developed. This chapter ends in section 8.7 with some concluding remarks.

8.2 Initial conditions and project outcomes

The main assumption throughout this thesis has been that if we want to increase our insight into the factors contributing to the success and failure of cross-cultural collaboration on NPD, researchers need to gain insight into the development of collaboration. This assumption will be tested below, by exploring if the outcomes of both case projects could have been predicted from the initial project conditions.

Initial conditions

If one considers the ISPV project, it can be concluded that the project was executed under relatively unfavourable initial conditions. The ISPV project started up[68] with differences in priority setting, communication and time pacing values, limited technical competencies, a tight time plan and unfocused project goals. Managers were not aware of these

[68] The ISPV project was started and stopped several times. Here we mean when the project was started up for the last time.

conditions, except for the limited technical competencies, at the start of the collaboration.
The SINAP project was started up with conflicting development strategies among partners, differences in communication and time pacing values, limited technical competencies, a tight time plan and relatively focused but ambitious goals. Managers were not aware of these unfavourable conditions at the start of the collaboration. In other words, the initial conditions under which both projects were started up are characterised by strategic and cultural misfits and other unfavourable initial conditions, such as limited technical competencies and a tight time plan. From these initial conditions one would expect that both projects would not perform well.

Project outcomes

If one considers the ISPV project it can be concluded that it did not perform well both in terms of operational effectiveness and relational performance. The progress on passing test cases was very slow compared to TNL standards. Furthermore, a large part of the test activities was cancelled due to the slow progress. The remaining test activities could not be completely finished within the project. Both TNL and TMX regard the ISPV project as a "worst practice" project. Besides this, the collaboration was regarded to be poor by both TNL and TMX. If one considers the SINAP project it can be concluded that it performed reasonably well. The final delivery deviated three weeks from the revised time plan. But this did not really pose a problem for TDA. Both TNL and TMX regarded the SINAP project as a "best practice" project. Furthermore, both TNL and TMX regarded the collaboration as very pleasant. The initial conditions and project outcomes are summarised in Table 17 below.

Table 17: Comparison of initial conditions and outcomes

Initial conditions & outcomes	SINAP project	ISPV project
Strategic context		
Conflicting development strategies	**X**	**-**
Differences in priority setting	**-**	**X**
Asymmetric dependencies	**X**	**-**
Cultural context	*	**
Differences in power distance	**X**	**X**
Differences in uncertainty avoidance	**X**	**X**
Differences in time orientation	**X**	**X**
Project organisation		
Goals	▪ Tight time plan ▪ Focused goals	▪ Tight time plan ▪ Unfocused goals
People	▪ Limited IN competencies ▪ Mexican project manager ▪ Mexican project workers	▪ Limited IN competencies ▪ Dutch project manager ▪ Dutch and Mexican project workers
Means	▪ Simulated test environment	▪ Regular test facilities
Processes	▪ Standard work processes	▪ Standard work processes
Organisational arrangements	▪ Subcontracting ▪ One local team	▪ Insourcing ▪ Two dispersed teams
Project outcomes		
Operational effectiveness	Good	Poor
Relational performance	Good	Poor

X Negative effect **-** Not an issue * Steering level ** Execution level

From the initial conditions and outcomes of the ISPV project one might conclude that initial project conditions heavily impacted the project outcomes. However, the SINAP project provides a different view. Despite the unfavourable initial conditions, the SINAP project was successful both in terms of operational effectiveness and relational performance. Apparently, initial conditions did have a different impact in the case projects. How is this possible? This difference in the impact of initial conditions will be explored in the next sections.

8.3 Strategic context and managing collaborative NPD

In this section the impact of the strategic context in the ISPV and SINAP project will be assessed. The strategic context of partners had significant impact on both the SINAP and ISPV project. However, the projects differed with respect to the elements of the strategic context that caused problems. In the SINAP project especially, conflicting development strategies and to a lesser degree asymmetric dependencies were important causes of problems. In the ISPV project, on the other hand, differences in priority setting were an important cause of problems. The mentioned elements of the strategic context are discussed in more detail below.

8.3.1 Conflicting development strategies

Conflicting development strategies between TNL and TDA induced control, quality and co-ordination problems in the SINAP project. TNL suspected that TDA was trying to steer the project at TMX behind their backs. By implementing a steering group TNL could solve this control problem. However, the tensions between TDA and TNL enlarged when the steering group decided to send technical support to cope with the competence problem (Fragment 3). TDA sent a technical co-ordinator to TMX who over time became the informal technical co-ordinator, because of his technical expertise and because he represented the customer. The TDA technical co-ordinator neglected many comments regarding technical solutions of TNL system management, because these comments were interpreted as attempts of TNL to steer the project into the direction of their desired standard development strategy. TDA referred the development strategy issue to strategic product management. Strategic product management agreed with TDA that the project would only implement customer requirements and agreed with TNL that the corporate quality standards could not be compromised. Ultimately, TNL accepted that the product would be a custom- made product and TDA accepted TNL's concerns for quality. The findings are summarised below.

Table 18: Conflicting development strategies

Aspect	SINAP project	ISPV project
Context	TNL pursued a standard development strategy whereas TDA pursued a custom-specific development strategy	
Impact	▪ Steering problem (Fragment 4) ▪ Quality problem (Fragment 11) ▪ Co-ordination problem (Fragment 12)	
Interventions	▪ Implementation of steering group (adjustment 4d) ▪ Referral to strategic product management (steering 11b) ▪ TDA technical co-ordinator is urged to comply with quality standards Telco (steering 12b)	**No differences found**
Effects	Ultimately TNL accepted that the product would be a custom-made product TDA accepted the concerns of TNL with respect to product quality	

To sum it up, conflicting development strategies induced steering, quality and co-ordination problems in the SINAP project. Efforts to cope with these problems were eventually successful. However, the problems could probably have been prevented if partners had assessed their differences at the start of the collaboration. From these observations the following conclusions were drawn.

Context conclusions	
Conclusion 1	When not recognised and acted upon conflicting development strategies among partners increase the likelihood of steering and co-ordination problems
Process conclusions	
Conclusion 2	Implementation of a steering group in which all parties are represented provides a platform to resolve differences of opinions among partners about the development strategy to be followed
Conclusion 3	Criticism on each other's development strategy may induce partners to cling more tightly to their own development strategy
Conclusion 4	Higher management bodies are used to mediate in disputes between partners on development strategies

Conclusion 1 extends the findings of researchers studying collaboration from a system perspective as discussed in section 2.3.1. Researchers such as Niederkofler (1991) and Douma (1997) assert that successful collaboration is characterised by strategic fit, which is understood as mutually dependent and compatible strategies and goals of partners. The case study findings reveal *how* conflicting development strategies affect the process of collaboration. In order to resolve conflicts on development strategies it is important to have a platform on which partners can discuss their differences of opinion, as denoted by Conclusion 2. Depending on the severity of the conflict providing a platform may not be enough. Conclusion 3 denotes the mechanism that hindered partners to resolve strategic conflicts on development strategies. This bears a similarity with the concept of cognitive fixation put forward by researchers studying collaboration from an actor perspective (see Von Raesfeld Meijer, 1997). Partners are not able or willing to change their cognition, which may disrupt their collaboration. Conclusion 4 provides a way to resolve such a deadlock situation. This is in line with Voogt (1990), who found that third parties can play an important role in resolving cognitive fixation among actors by introducing a "third meaning" to the social interaction of actors.

8.3.2 Differences in priority setting

Differences in priority setting between partners induced SSF, TCM and SCF support problems in the ISPV project. During virtually the whole project the TNL project manager tried to get more technical support from TDA and TNL. These requests were rejected. The unwillingness of line management to allocate people to the project is both an indication for and a result of the priority partners attached to the project. From the project manager's point of view it would make sense to stop the project in such a situation, instead of trying to do the impossible. Furthermore, the project manager referred the TCM support problems to TMX management. TMX management arranged weekly meetings with the TCM department and an e-mail list for TCM problems. This improved the

communication with the TCM department, but it did not solve the problem due to the limited IN competencies of this department. The findings with respect to impact and handling of differences in priority setting are summarised below.

Table 19: differences in priority setting

Aspect	SINAP project	ISPV project
Context		TMX attached medium priority to the project whereas TNL and TDA attached low priority to the project
Impact	**No differences found**	▪ SSF support problems (Fragments 2 and 10) and SCF support problem (Fragment 12) ▪ TCM support problems (Fragment 4 and 8)
Interventions		▪ Requests for dedicated SSF and SCF support (steering 2a, 10a and 12a) ▪ Referral to TMX management (steering 4c and 8b)
Effects		▪ Requests for SSF and SCF support were not granted ▪ Referral resulted in more support but this did not solve the TCM problems

To sum it up, differences in priority setting among partners induced technical support problems in the ISPV project. Requests for additional technical support from TDA and TNL and referral to line management of TMX did not resolve the technical support problems. From these observations the following conclusions were drawn.

Context conclusions	
Conclusion 5	Differences in priority setting among partners increase the likelihood of technical support problems
Process conclusions	
Conclusion 6	Technical support problems induce project managers to intensify communication with external stakeholders

Conclusion 5 confirms the findings of Harrigan (1988) and Doz (1988). Harrigan (1988) asserts that a joint venture should be of at least medium strategic importance for both partners. Harrigan argues that when this is not the case, managers will not give the joint venture the attention it needs to thrive to its best abilities. According to Doz (1988) the lack of what he calls strategic commitment, considerably reduces the chance of alliance objectives being realised. This is particularly a problem when partners attach different importance to alliance activities. Ideally partners should assess each other's strategic importance to the collaborative NPD project before it is being started up. However, gaps may exist between word and deed making real time assessment of commitment necessary.

Conclusion 6 nuances the findings of Allen (1971 & 1977) as discussed in section 2.4.2 who found that successful NPD teams were

characterised by intensive external political communication by project leaders. In the rather unsuccessful ISPV project intensive external communication was induced by technical support problems, which in turn were brought about by differences in priority setting. In this particular case extensive external political communication was a sign of failure instead of success. Thus external communication can be seen as both the cause and effect of collaborative NPD outcomes.

8.3.3 Asymmetric dependencies

Asymmetric dependencies induced a competence problem in the SINAP project and were not an issue in the ISPV project.

In the SINAP project TMX felt more dependent on TNL than vice versa. As a result TMX management felt it had no other choice than to commit themselves to the assignments of TNL. By promising more than they could fulfil TMX oversold its competencies to TNL, which raised unrealistic expectations and led to conflicts between partners. TNL interpreted TMX' overselling of competencies as a form of opportunism. It diminished their trust in TMX as a sincere and competent partner. During the start-up of the SINAP project TNL and TDA started to doubt the TMX's technical competencies. The TNL and TDA steering group managers decided to send technical support to TMX, which increased the technical competence level of the project team considerably but also induced co-ordination problems.

The findings with respect to asymmetric dependencies are summarised below.

Table 20: Asymmetric dependencies

Aspect	SINAP project	ISPV project
Context	TNL feels less dependent on TMX than vice versa	**No differences found**
Impact	Competence problem (Fragment 3)	
Interventions	Sending technical support to TMX (adjustment 3b)	
Effects	Increased competence level of project team but induced co-ordination problems (Fragment 9 and 12)	

To sum it up, asymmetric dependencies induced TMX to oversell its competencies to TNL, giving rise to expectation gaps with respect to TMX's technical competencies. From these observations the following conclusions were drawn.

Context conclusions	
Conclusion 7	Asymmetric dependency among partners induces the less powerful partners to oversell their competencies

Process conclusions	
Conclusion 8	Overselling of competencies is influences relational performance negatively
Conclusion 9	Joint planning of partners reduces the risk of overselling of competencies

Conclusion 7 seems to contradict with the findings of Nooteboom (1998) who asserts that power, which is inversely related to dependence[69], can serve as a mechanism to prevent opportunistic behaviour of partners. However, despite TNL's relative power TMX oversold their technical competencies. TNL regarded this as a form of opportunistic behaviour. Hence, the findings suggest that opportunistic behaviour was not reduced but enlarged by the asymmetric dependency among partners. This can be understood if one considers the cultural context of collaboration. Stephens (1995) found that in Mexico there is an unwillingness to disappoint, which induce people to make unrealistic agreements. Thus the overselling of competencies can also be seen as a social desirable behaviour of TMX induced by the cultural context. An important lesson that can be derived from this is that what people regard as opportunistic behaviour could very well be culturally dependent. As denoted by Conclusion 8 overselling of competencies can harm the relationship between partners because partners feel that the other cannot be trusted. An important means to reduce the risk of overselling of competencies is to perform the planning stage together, as denoted by Conclusion 9. During planning activities the most powerful partner should not ask the less powerful partner if it can do a particular task (the answer would probably be 'yes'), but rather the partner should ask how to the less powerful partner thinks to accomplish a particular task.

8.4 Cultural context and managing collaborative NPD

In this section the impact of the cultural context in the ISPV and SINAP project is assessed. Cultural differences invoked rather similar problems in both the SINAP and ISPV project. However, the impact of cultural differences varied because of the difference in project organisation. The SINAP project started off with a Mexican project manager and Mexican project workers. Cultural differences were mainly an issue at the project steering level. The Mexican project manager effectively adapted his way of working to the requirements of the steering group managers and could translate cultural sensitive decisions of the steering group managers to the Mexican project team. The ISPV project was moved to TMX during the collaboration. From that moment on the Dutch project manager was working with Mexican testers and a Dutch technical co-ordinator in Mexico. Cultural differences significantly influenced project execution by

[69] The greater the dependence of B on A, the greater the power of A over B. Without B being dependent on A, A has no basis on which to exercise power because B has alternative options to turn to.

inducing time planning and commitment problems. These problems negatively influenced the motivation of the Mexican testers and the Dutch project manager. The findings with respect to the impact of project manager's nationality are summarised below.

Table 21: Nationality of project manager

Aspect	SINAP project	ISPV project
Context	Local project manager	Expatriate project manager
Impact	Cultural sensitive steering group decisions were translated to the local culture of the project workers	Time planning and commitment problems
Interventions	The TMX project manager attempts to adapt his work behaviour to the requirements of the steering group	The TNL project manager attempts to adapt his leadership behaviour to the Mexican culture
Effect	The TMX project manager managed to adapt to the leadership style of the TNL and TDA steering group managers	The TNL project manager did not succeed in adapting his leadership behaviour to the local context

To sum it up, the ISPV findings suggest that it is very difficult for an expatriate project manager to adapt his or her leadership style to the local culture. The SINAP findings indicate that cultural conflicts can be reduced, or at least restricted to the management level, by using a local project manager. From these observations the following conclusions were drawn.

Process conclusions	
Conclusion 10	Local project managers can be used to translate cultural sensitive steering group decisions to the project team
Conclusion 11	Use of local project managers reduces the risks of cultural frictions

Conclusions 10 and 11 shed a different light on how cultural differences are related to collaboration success. As discussed in section 2.3.1 there is considerable debate in system-oriented collaboration literature if cultural differences influence collaborative NPD outcomes negatively or positively. For instance, whereas Harrigan's (1985) findings suggest that cultural similarity between partners is positively related to alliance success, the findings of Saxton (1997) suggest that cultural similarity is negatively related to alliance success. The case study findings suggest that the impact of cultural differences on collaborative NPD outcomes is moderated by the organisation of collaborative NPD. Thus the organisation of collaborative NPD is an important intervening variable in the culture – outcome relationship.
In the following sections the impact of cultural differences is discussed in more detail.

8.4.1 Cultural differences in communication

In this section the impact of cultural differences in communication, more specifically differences in respect for authority and reporting are discussed.

Respect for authority

Differences in respect for authority between TNL and TDA on the one hand, and TMX on the other hand induced time planning problems in the SINAP and ISPV project.

In the SINAP project TMX respected the authority of TDA and hesitated to criticise the end-date, which already was committed to the customer. TNL intervened in the time planning activities of TMX and defended the need to build more slack into the time plan towards TDA. By doing so, TNL bypassed TMX's respect for authority towards TDA. In the ISPV project TMX testers were reluctant to provide decision-making input. According to the TNL project manager it took several weeks before he received comments from the TMX testers. This was also related to the technical competencies of the testers (see section 8.5.2). The findings with respect to differences in respect for authority are summarised below.

Table 22: Differences in respect for authority

Aspects	SINAP project	ISPV project
Context	TNL and TDA: low respect for authority TMX: high respect for authority	TNL and TDA: low respect for authority TMX: high respect for authority
Impact	Time planning problems (Fragments 2, 5 and 8)	Time planning problem (Fragment 5)
Interventions	▪ TNL inspects time plan of TMX (steering 5e) ▪ TNL defends time plan to TDA (steering 8b)	▪ The project manager urges people to provide input (steering 5e)
Effects	Respect for authority of TMX is bypassed by TNL	Few comments on time plan

To sum it up, differences in respect for authority between partners induced time planning problems in both the SINAP and ISPV project. These differences manifested themselves in TMX's refraining of critical comments on the end-date and content of the time plan, and in TNL's expectation of receiving critical feedback on the end-date. From these observations the following conclusions were drawn.

Context conclusions	
Conclusion 12	Unacknowledged differences in respect for authority among partners increase the likelihood of time planning problems

Process conclusions	
Conclusion 13	The higher the respect for authority of subordinates the less likely they are to give critical comments on time plans

Conclusions 12 and 13 confirm the findings of Hofstede (1980a and 1994), Kras (1989) and Stephens (1995). Hofstede (1994) found that Mexicans are much more willing to accept power distance than the Dutch[70]. According to Hofstede power distance manifests itself in the unwillingness of subordinates to disagree with their superiors and in the paternalistic or autocratic decision-making style of superiors. Kras (1989) found that compared to American executives[71], Mexican subordinates never question or even comment on a decision of their superiors, even if they totally disagree with it. Similarly Stephens (1995) found that Mexican subordinates are more deferential and less likely to challenge or oppose ideas and directives of superiors.

Reporting practices

Cultural differences in reporting practices induced control problems in both the SINAP and ISPV project.

In the SINAP project the TNL and TDA steering group manager felt that the TMX project manager reported disappointing progress at a stage that was too late. Local troubleshooters informed the steering group managers about the situation at TMX. Whenever the project manager reported a delay, they intensified their progress tracking. This temporarily improved the reporting of the project manager, but it did not motivate the project manager to report problems earlier when the steering group managers loosened the tracking of progress. In the ISPV project it was difficult for the TNL project manager to get an accurate impression of the status of project activities. TMX testers did not report progress, problems and actions automatically, which is a standard operating procedure at TNL. Therefore, he decided to set up individual planning and tracking meetings. These meetings did not have the desired effect, because they induced continuous negative feedback cycles due to the direct questioning by the project manager, the limited IN competencies of TMX testers and the tight time plan. These negative feedback cycles reduced the motivation of the TMX testers over time.

The findings with respect to differences in reporting practices are summarised in the next table.

[70] On the power distance index of Hofstede (1994) ranging from 0 to 100, Mexico scored 81 (high power distance), whereas the Netherlands scored 38 (low power distance).

[71] Power distance index score of the USA (40) is comparable to the score of the Netherlands (38) and much higher than the score of Denmark (18)

Table 23: Differences in reporting practices

Aspect	SINAP project	ISPV project
Context	Differences in reporting practices	Differences in reporting practices
Impact	Control problem (Fragment 15)	Control problem (Fragment 4)
Interventions	▪ Steering group manager asks local persons for project status (steering 15c) ▪ Daily tracking of steering group (steering 15f)	▪ Individual planning and tracking meetings are set up (adjustment 7d)
Effects	Temporarily improved reporting but did not motivate early reporting of problems in the future	Induced continuous negative feedback cycles reducing the motivation of TMX testers

To sum it up, differences in reporting practices among partners induced a control problem in both the SINAP and ISPV project. TNL and TDA managers encountered problems with obtaining accurate feedback information in a timely fashion. Moreover, strict control produced counter-productive effects. From these observations the following conclusions were derived.

Context conclusions	
Conclusion 14	Unacknowledged differences in reporting practices induce control problems
Process conclusions	
Conclusion 15	The higher the sensitivity of reporting problems, the more careful project managers should be with giving negative feedback and the more emphasis they should put on positive feedback

Conclusion 14 confirms the findings of Stephens (1995) and extends the findings of Hofstede (1980a and 1994).
Stephens (1995) found similar reporting practices in his interviews with American and Mexican executives. American executives argued that there is a tendency of Mexican partners of not telling bad news. Stephens explains this by arguing that Mexican partners feel uncertain how American partners will react. Mistakes are regarded as personal failure and people, therefore, try to keep others from learning of these mistakes. Moreover, the authoritative leadership style of many Mexican managers does not encourage upward communication of subordinates.
Although Hofstede (1980a and 1994) does not explicitly focus on the relationship between culture and reporting practices, his notion of uncertainty avoidance can be used to explain the sensitivity of reporting progress. Hofstede defines uncertainty avoidance as the extent to which members of a culture feel threatened by uncertain or unknown situations. The findings Hofstede indicate that Dutch have less

preference for uncertainty avoidance than Mexicans[72]. Hofstede found that in high uncertainty avoidance cultures people experience more job stress than in low uncertainty avoidance cultures. People try to cope with this by building in more security, which manifests itself in an emotional need for rules and job security. The question that arises is why do people experience more job stress in Mexico? One of the reasons could very well be that subordinates feel (are) more dependent on their superiors for job security than in The Netherlands. A good relationship with one's superior is of paramount importance in Mexico. Subordinates therefore will not seriously contradict their supervisor and are more concerned with leaving a good impression. Reporting disappointing progress is therefore sensitive because it may harm superior's impression of the subordinate.
Conclusion 15 extends the findings of Kras (1989). She observed that controlling progress is sensitive in Mexico. Her findings indicate that Mexican subordinates are relatively sensitive to being checked upon and to negative feedback. This might explain the reduced motivation of the TMX testers in the ISPV project and limited effects of the strict controlling of progress in the SINAP project.

8.4.2 Cultural differences in time pacing

Differences in managing time between TMX on the one hand, and TNL and TDA on the other hand, induced time planning problems in the SINAP project and commitment problems in the ISPV project.
In the SINAP project the TMX project manager was rather surprised by the level of detail TNL and TDA demanded in the time plan. On the other hand TNL and TDA were quite surprised by the global and imprecise nature of the initial versions of the time plan developed by TMX. In other words both partners had different expectations about the content of time plans. In order to cope with the time planning problem, TMX was urged to come with a more precise time plan. This did not have the desired effect because TMX lacked the IN experience to develop such a precise time plan. After several revisions of the time plan, TNL intervened in TMX's time planning activities, which solved the problem. In the ISPV project the TNL project manager agreed with the TMX testers to work overtime for particular hours. However, the project manager soon noticed that testers did not strictly work for the agreed hours (commitment problem). The project manager urged the TMX testers to the agreed work shifts and started to control whether people were working for the agreed hours. This had little effect because the different meanings attached to time commitments.
The findings contradict with the findings of Hofstede (1994) with respect to uncertainty avoidance[73]. Hofstede found that in strong uncertainty

[72] In the research of Hofstede (1980a) Mexico scored medium-high (83), whereas the Netherlands scored medium-low (53) on uncertainty avoidance.
[73] In the research of Hofstede (1980a) Mexico scored medium-high (83) whereas the Netherlands scored medium-low (53) on uncertainty avoidance.

avoidance cultures such as Mexico, punctuality and precision come naturally and time tend to be regarded as money. In contrast, in weak uncertainty avoidance cultures Hofstede found that punctuality and precision do not come naturally and time is not continuously managed. Thus, although indications were found for strong uncertainty avoidance (see section 8.4.1) this did not apply to people's orientation towards time. The findings are more in line with the observations of Lewis (1996). He distinguishes between linear-active, multi-active and reactive cultures. On a linear/multi-active scale Dutch are much more linear-active than Mexicans are (or Dutch are much less multi-active than Mexicans are). Lewis (1996:41) argues that within multi-active cultures people tend to plan the broad outlines only, change time plans frequently, work any hours and are not punctual. In contrast within linear-active cultures people tend to plan ahead methodically, stick to initial time plans, work for fixed hours and are punctual.
The findings with respect to cultural differences in time pacing are summarised in the next table.

Table 24: Differences in managing time

Aspect	SINAP project	ISPV project
Context	Differences in managing time	Differences in managing time
Impact	Time planning problems (Fragments 2, 5 and 8)	Commitment problems (Fragment 9)
Interventions	1. TMX is urged to come up with more detailed time plan (steering 2c) 2. TNL inspects time plan of TMX (steering 5e)	1. Testers are urged to stick to appointments (steering 9c) 2. Project manager controls work behaviour of testers
Effects	1. Did not have the desired effect due to different meaning attached to time plans and the lack IN competencies 2. Solved the problem	Did not have the desired effect due to different meanings attached to time commitments

To sum it up, unacknowledged differences in managing time induced time planning problems in the SINAP project and commitments problems in the ISPV project. TMX was urged to adapt its time planning and commitment practices. This had little success. From these observations the following conclusions were drawn.

Context conclusions	
Conclusion 16	In high uncertainty avoidance cultures people punctuality and precision do not come naturally
Conclusion 17	Unacknowledged differences in managing time among partners increase the likelihood time planning and commitment problems
Process conclusions	
Conclusion 18	Pushing people to come up with a detailed time plan does not work out when people use time plans differently and lack the technical competencies to develop such time plans
Conclusion 19	Emphasising the observance of commitments does not work when people attach a different meaning to time commitments and lack the technical competencies to judge what they commit themselves to

Conclusion 16 contradicts the findings of Hofstede (1980a and 1994) as discussed above. Conclusion 17 confirms the findings of Lewis (1996) as discussed above. Conclusions 18 and 19 denote the ineffectiveness of management interventions that disregard the competence level and cultural values of people. These conclusions are in line with respectively the findings of Hofstede (1980a) on the impact of culture on leadership, and Hersey & Blanchard's (1977) situational leadership theory as discussed in section 2.4.3. It is questionable if project managers are able to adapt their leadership behaviour to the cultural context and maturity level of their subordinates. Using local instead of expatriate project managers (see section 8.4) can reduce the problem of cultural adaptation.

8.5 Project organisation and managing collaborative NPD

In this section the impact of the project organisation in the SINAP and ISPV project is assessed.

8.5.1 Feasibility of project goals

Unrealistic goals were responsible for time-planning problems in both the ISPV and SINAP project.

In the SINAP project an end-date was committed before a thorough feasibility study was performed. According to several managers at TNL it is not uncommon practice at Telco that end-dates are committed based on global estimations and not on a thorough feasibility study. Managers argued that this stems from the poor interface between Sales and R&D., which is a well-documented problem in NPD management literature (see Moenaert & Souder, 1990). The strategic context as perceived by TDA managers set the initial goals of the SINAP project. However, after TMX made several versions of the time plan it became clear that the committed end-date was far too optimistic. Valuable time was wasted by urging TMX to come up with a reliable time plan while it lacked IN competencies and did not dare to challenge the end-date committed by the project sponsor. A more collaborative planning approach could have speeded up the planning activities. Compared to the ISPV project the goals were brought to more realistic terms much earlier in the project. Project workers were highly motivated because they felt they could make a difference.

In the ISPV project the end-dates were dictated by the FOA delivery dates. After these dates system testing would be useless. Thus the strategic context as perceived by TML managers strongly influenced the goal setting process in the ISPV project. The end-dates of the ISPV project were fixed. However, due to the late start-up and the initial delay in test preparation the time plan was rather strict. Moreover, the project scope was defined rather broadly, because by that time nobody really knew on which test cases the project should focus. In other words, there

was much uncertainty about the ends of the project. Such a situation seems to call for a more flexible and iterative time planning process in which uncertainty about goals is gradually reduced. TMX management and testers requested the project manager to build more slack into the time plan. However, the goals were not revised until just before the FOA delivery dates. This had a negative effect on the motivation of the project workers, who felt they were on a "mission impossible". The findings with respect to the feasibility of goals are summarised in the next table.

Table 25: Feasibility goals

Aspect	SINAP project	ISPV project
Organisation	▪ Focused project scope ▪ End-date thought to be realistic at the start	▪ Unfocused project scope ▪ End-date thought to be realistic at the start
Impact	▪ Time planning problems (Fragments 2, 5 and 8)	▪ Time planning problem (Fragment 5)
Interventions	▪ TNL inspected time plan of TMX (steering 5e) ▪ End-date was revised after re-planning early in the project (adjustment 5g) ▪ Many revisions of the time plan	▪ The project manager was requested to build more into the time plan by TMX workers & management (steering 5f) ▪ The end-date was not revised until close before the end-date (adjustments 16b and 16e) ▪ Few revisions of the time plan
Effects	▪ Brought the time plan to realistic terms	▪ Reduced motivation of the project team

To conclude, both projects started with rather optimistic goals. The strategic context of partners influenced the goal setting process strongly. The findings suggest that goals should be brought to realistic terms as soon as possible in the project to avoid motivation problems of project workers. By adopting a more collaborative planning approach could have speeded up time planning activities in the SINAP project. From these observations the following conclusions were drawn.

Context conclusions	
Conclusion 20	The strategic context of partners exerts a strong influence on the goal setting process
Process conclusions	
Conclusion 21	Holding on to unfeasible goals reduces the motivation of project workers
Conclusion 22	Joint planning of partners improves the feasibility of goals and time plans

Conclusion 20 denotes that goal setting in collaborative NPD projects is complicated by the differences in strategic context among partners. Despite the fact that the partners in the case projects were from the same multi-national company, they disagreed about the strategy to be followed. Conclusion 21 denotes why goals should be brought to more realistic terms early in the project. The feasibility of goals and time plans can be greatly improved, if partners collaborate in the planning stage as denoted by Conclusion 22. Joint planning allows partners to share

experiences with respect to planning constants, the content of NPD activities, etc.

8.5.2 Technical competencies

Both in the SINAP and the ISPV project the limited technical competencies of project workers caused problems.

Despite the time pressure of both projects it was decided to work with relatively inexperienced engineers. This decision was dictated by the strategic context of partners. TNL did not have people available to execute the projects and TMX did have people available and wanted to prove themselves as competent IN design centre.

The ISPV and SINAP project differed with respect to the number and competence level of people that were added to compensate for the task-competence misfits. Early in the SINAP project two additional experienced designers were added to the project. TDA sent a technical co-ordinator to help TMX with the functional requirements and TNL did send an experienced designer to act as a troubleshooter. Furthermore, each time delays became visible people were (temporarily) added to speed up project work. This did not always make sense because people had to learn the job from other project members before being able to contribute anything to the project. Nevertheless, the steering group managers insisted to add people to the project. In the ISPV project, on the other hand, no people were added when delays became visible. There are several reasons for this. Firstly, TNL and TDA attached low priority to the ISPV project (strategic context). Secondly, adding testers was limited by the availability of test channels. TNL managers argued that it did not make any sense to add more testers. However, the project could have benefited from one additional experienced technical co-ordinator. The TNL technical co-ordinator was overloaded with work, which reduced the efficiency of problem solving. The findings with respect to the technical competencies are summarised in the next table.

Table 26: Competencies

Aspect	SINAP project	ISPV project
Organisation	▪ Project team was composed of relatively inexperienced engineers in the area of IN	▪ Project team was composed of relatively inexperienced engineers in the area of IN
Impact	▪ Various problems (progress, time planning, competence, collaboration and test facility problems)	▪ Various problems (progress, commitment, SSF support, TCM support, SCF support and collaboration problems)
Interventions	▪ People were added whenever delays became visible ▪ Experienced engineers were send to TMX to support the project ▪ Testers worked overtime for a short period of time	▪ No people were added when delays became visible ▪ Requests for additional experienced engineers were not granted ▪ Testers worked overtime during virtually the whole project
Effects	▪ Operational effectiveness was high ▪ Motivation of project workers was high	▪ Operational effectiveness was poor ▪ Motivation of project workers reduced over time

To conclude, the strategic context of partners influences the possibilities for project managers to staff their project with competent project workers. Task-competence misfits induced various problems in the case projects. The findings suggest that it is important to early acknowledge and handle task-competence misfits. Finally, adding people did not always speed up project work due to the training period needed by these people. From these observations the following conclusions were drawn.

Context conclusions	
Conclusion 23	Task-competence misfits induce progress and various other problems
Conclusion 24	The strategic context of partners influence the possibilities of project staffing
Process conclusions	
Conclusion 25	Task-competence misfits should be acknowledged and handled early in the project
Conclusion 26	The gain of adding people in the case of delays is strongly influenced by the training period needed by these people

Conclusion 23 is in line with the project management approaches discussed in section 2.3.3. It is rather obvious that projects should be staffed with competent people in order to be successful. However, as denoted by Conclusion 24 project managers are dependent for project staffing on the strategic context of partners. The partners' priority setting directly affects the possibility to allocate competent engineers to a collaborative NPD project. As will be argued in section 8.5.5 the partners' priority setting is influenced by the governance structure of the collaboration.
Project managers are sometimes forced to work with task-competence misfits. But project managers should not accept severe task-competence misfits from their line managers, as was the case in the ISPV project. The detection of task-competence misfits is not always easy. As we have seen in section 8.3.3 partner may oversell their technical competencies and sometimes it is rather difficult to judge the complexity of project tasks up front. Task-competence misfits may not reveal themselves until project execution. As denoted by Conclusion 25 it is important that project managers acknowledge and repair tasks-competence misfits as soon as possible in the project execution. In the case projects it was observed that steering group managers often try to cope with delays in project work caused by task-competence misfits by allocating more people to the project. However, as denoted by Conclusion 26 this only makes sense if people are competent enough to contribute without much training.

8.5.3 Technical support infra-structure

An important decision in the SINAP project was to use a simulated test environment, the so-called MGTS database. One of the advantages of using such a test environment is that more people can perform test activities because one is not constrained by the number of available test

channels. Despite of its potential the project team encountered serious problems with installing and preparing the simulated test environment. The version the project team received was not stable and within TMX no person was available who could fix the problems. However, by arranging dedicated support from an Australian subsidiary the problems could be solved rather swiftly. Also, in the ISPV project problems were encountered with the stability of test facilities. The project manager requested for dedicated Test Configuration Management (TCM) support from TMX. However, the TCM department at TMX did not have enough experience with IN systems to solve the problems. Instead of the TCM department TMX testers had to do TCM work themselves. Both the SINAP and ISPV projects illustrate the importance of a good technical support infrastructure. Test facility problems induced significant delays in both projects.
An important decision in the ISPV project was to cancel the test facilities at TNL and to use the test facilities at TMX. The project manager did not know at that time that the test facilities at TMX would not be operational at the start of the project at TMX, and that the facilities had to be shared with other projects. The project manager expected that the test facility situation at TMX would be same as at TNL. He projected his own situation onto the collaboration, giving rise to misunderstandings.
The findings with respect to the test facilities are summarised in the next table.

Table 27: Test facilities

Aspect	SINAP project	ISPV project
Organisation	▪ Simulated test environment was used	▪ Physical test environment was used
Impact	▪ Test facility problem	▪ Test facility problem ▪ Progress problems
Interventions	▪ Dedicated TCM support requested from Australian subsidiary (steering 17c)	▪ Dedicated support requested from TCM department at TMX (steering 4c and 8b)
Effects	▪ Request was granted after referral to next management level and the problem was solved quickly by Australian TCM department	▪ Request was granted but support did not solve the problem due to limited experience with IN systems ▪ Testers were doing TCM work themselves

To conclude, both projects illustrate the importance and dependence of collaborative NPD projects on the technical support infrastructure. Unacknowledged differences in technical infrastructure were responsible for various problems in the ISPV project. Early assessment of differences and management of expectations could have prevented these problems. From these observations the following conclusions were derived.

Context conclusions	
Conclusion 27	(Collaborative) NPD projects are dependent on the competence and priority setting of support departments
Conclusion 28	Unacknowledged differences technical infrastructure among partners increases the likelihood of test facility and progress problems
Process conclusions	
Conclusion 29	Assessment of organisational differences at the start of the collaboration and management of expectations during the collaboration reduce the likelihood of test facility problems

Conclusion 27 extends the findings of strategic fit researchers (see Douma, 1997) as discussed in section 2.3.1. The findings indicate that the priority setting of support departments within a partner organisation may influence the process and outcomes of collaborative NPD. Thus external strategic fit (fit between partners) is dependent on internal strategic fit (fit between departments within partner organisation).
Conclusion 28 confirms the findings of Doz & Hamel (1998). They found that each partner projects onto the alliance his/her own "way of doing things," a set of tacit and accepted behaviours, norms, procedures and routines, which give rise to misunderstandings and conflicts. In the ISPV case the project manager projected the TNL test facility situation onto TMX. He assumed that things would work the same at TMX. This shows the importance of assessing organisational differences at the start of the collaboration and continuous management expectations during the collaboration as denoted by Conclusion 29.

8.5.4 Adherence to standard work processes

At Telco standard design and project management processes are being used. These processes provide partners within Telco with a joint frame of reference and terminology, which eases the collaboration between partners.

Standard design processes

At TNL standard design processes tend to be used more loosely than at TMX. Explanations for the differences found can be found in the cultural context and the competence level of partners. Both are discussed below.
Firstly, the found differences in adherence to standard design processes seem to be related to differences in the strategic context of partners. Customers in Mexico (and in Latin America) seem to be more willing to accept delays than in the Netherlands. Consequently, TNL engineers are more stimulated to skip or fill in process steps differently in order to speed up the NPD process than their TMX colleagues are.
Secondly, the differences found in adherence to standard design processes seem to be related to the cultural differences in uncertainty avoidance (Hofstede, 1980a and 1994). In high uncertainty avoidance

cultures such as Mexico there is a stronger emotional need for rules and following these rules than in medium uncertainty avoidance cultures such as The Netherlands. This might explain TMX's strict and TNL's loose adherence to standard design processes.
Thirdly, the differences in adherence to standard design processes seem to be related to the differences in technical competence level. TNL has a much longer tradition in and more experience with IN development than TMX. An important consequence of this difference is that TNL engineers seem to know which process steps can be skipped or filled in differently. Several TMX engineers argued that they were disappointed with the process adherence of their TNL colleagues.

Project management processes

In both projects time pressure induced managers to skip process steps of the standard project management process to avoid delays. For instance, in the SINAP project the end-date was committed before a feasibility study was performed, and in the ISPV project no feasibility study was performed at all. All together in the SINAP project there was a strong pressure to get started although input documentation was not yet officially inspected and approved. These findings contradict with the findings of Gieskes & Schuring (1996) who found that the standard project management process was sometimes seen as a goal and not as a means at TNL. In other words following procedures was found to be more important than flexibility. Apparently the situation has changed at TNL in the meantime. The continuous pressure to reduce development lead-times (see Cooper & Kleinschmidt, 1994) and the accompanying time pressure might explain the found looser adherence to project management processes. The findings with respect to the standard work processes are summarised in the next table.

Table 28: Standard work processes

Aspect	SINAP project	ISPV project
Organisation	▪ Standard project management and design processes were used	▪ Standard project management and design processes were used
Impact	▪ Provides a joint frame of reference and terminology	▪ Provides a joint frame of reference and terminology
Interventions	▪ End-date was committed before Tollgate 2 (steering 1a)	▪ Tollgate 2 assessment was cancelled (steering 17a)
Effects	▪ Time planning problems	▪ Late revision of project goals

To conclude, within multi-national companies standard work processes make collaboration between local subsidiaries easier by providing a basis for building mutual understanding. However, these standard work processes may not be used in the same way across local subsidiaries. The findings suggest that the adherence to standard design processes is contingent upon the technical competencies of people and the strategic and cultural context of the local design centres. Time pressure was found to induce partners to deviate from the standard project management

processes. From these observations the following context conclusions were drawn.

Context conclusions	
Conclusion 30	Technical competencies of people and the strategic and cultural context of local subsidiaries influence people's adherence to standard design processes
Process conclusions	
Conclusion 31	Time pressure induces partners to deviate from standard project management processes, which may invoke problems lateron in collaborative NPD projects

Conclusion 30 denotes the possible causes for differences in use of standard work processes among local subsidiaries. To my knowledge these causes are rarely studied in combination. Researchers have predominantly concentrated on the relationship between cultural context and organisational behaviour (see Hofstede, 1980a).
Many NPD researchers point to the strategic importance of rapid NPD and have measured NPD performance in terms of development time (see Clark & Fuijmoto, 1991 and Eisenhardt & Tabrizi, 1995). Hence, time has predominantly been treated as a dependent variable. Little is known about how time pressure affects the process and outcomes of NPD. Gersick (1988) is one of the few researchers who have studied the impact of time on group work. Conclusion 31 can be seen as a contribution to this emerging body of thought.

8.5.5 Organisational arrangements

In this section the impact of organisational arrangements is discussed. Subsequently, governance structure, management involvement, role flexibility and arrangements to speed up project work are discussed.

Governance structure

TMX was made responsible for the execution of project work in the SINAP project. The collaboration was treated as a subcontracting relationship. Goals and ways of achieving these goals were laid down in an assignment specification. No fines were defined in the case of delays and TMX did not bear any financial responsibility[74]. Despite, or maybe due to, the absence of financial incentives TMX felt very committed to the SINAP project. The project was seen as an opportunity to prove themselves as a competent IN design centre and partner of TNL.
The ISPV project started as an internal TNL project with hired testers and test facilities from TMX. However, due to the limited contribution of the part-time TNL testers and the decreasing availability of test facilities at TNL the project was moved to TMX after a couple of months. From that moment on the project was executed at TMX with TMX testers and test facilities. However, the project was still treated as an internal TNL

[74] Please note that in the contract with the customer fines were defined for delays

project. Doz & Hamel (1998) call this a frame gap. They define a frame as a set of definitions, perspectives, rules and assumptions that managers use to make sense of a situation. Doz & Hamel found that past experience leads managers and their companies to frame their relationships with partners in unique ways, and these may be inappropriate for the new situation. This also happened in the ISPV project. At the start the ISPV project was framed as an internal TNL project and this frame was not revised when the project was moved to TMX. TMX management accepted the proposal to move the project to TMX, but was not happy with the fact that the TNL project manager only reported to TNL management. However, not until a workshop for TNL and TMX management was organised (see Fragment 15) did they express their concerns. During this meeting the TMX group manager pointed out that TNL should not treat them as an arbitrary outsource company but as a collaboration partner.
The low commitment of TMX to the ISPV project can be explained if one considers the responsibility and involvement of TMX in this particular project. The governance structure adopted in the ISPV project limited the responsibility of TMX to resource provider. Their only task was to provide the resources (people and means) that were necessary to execute the project. Furthermore, the governance structure did not arrange for reporting towards TMX. TMX managers were not informed about project execution in the beginning. Due to the limited responsibility and involvement TMX did not feel really committed to the ISPV project.
The findings with respect to the governance structure are summarised in the next table.

Table 29: Governance structure

Aspect	SINAP project	ISPV project
Project organisation	▪ TNL sub-contracted the SINAP project to TMX	▪ TNL hired testers and test facilities from TMX ▪ Treated as an internal TNL project
Impact	▪ TMX management was very committed to the project	▪ Limited commitment of TMX management to the project

To conclude, TMX management was far less committed to the ISPV project than to the SINAP project. An important explanation for this is the inappropriate framing of the collaboration. From these observations the following conclusion was drawn.

Process conclusions	
Conclusion 32	Inappropriate framing of the collaboration reduces the partners' commitment to the collaboration

Commitment is often mentioned as a critical success factor in collaboration literature (see Wildeman & Stoffelen, 1996). However, as is the case with the concept of trust, few researchers have studied the

antecedents of the commitment of partners in collaboration. As denoted by Conclusion 32 the findings suggest that the framing of the collaboration influences partner's commitment to the collaboration.

Steering group

Another important difference between the ISPV and SINAP project is the timing of implementing a steering group.

In the SINAP project the steering group was implemented early in the project. The steering group adopted a "hands on" management approach. Consequently problems were detected and solved early in the project. For instance, the project goals were brought to more realistic terms early in the project. This had a positive effect on the motivation of the project workers.

In the ISPV project the steering group was implemented rather late in the project. This had a negative impact on the project. Firstly, line managers of TNL and TMX did not have a reliable picture of the problems encountered in the project. They started to pay attention to the problems when the damage was already done. Secondly, the decision to reduce the scope of the project was taken rather late in the project. This did not contribute to the motivation of the project team because they felt like being on a "mission impossible". The late implementation of the steering group was presumably the result of the lack of commitment of line management to the project. Apparently line managers did not want to get their fingers burned on this project and waited with intervening in the project when it was already too late. The findings with respect to the implementation of the steering group are summarised in the next table.

Table 30: Steering group

Aspect	SINAP project	ISPV project
Interventions	▪ Steering group was implemented early in the project (adjustment 4d)	▪ Steering group was implemented late in the project (adjustment 11a)
Effects	▪ Early revision of project goals ▪ Had a positive effect on time planning and co-ordination problems	▪ Late reduction of project scope

To conclude, the findings show the importance of bringing goals to more realistic terms and to solve problems early in the project and the important role a steering group plays in this process. From these observations the following process conclusion was derived.

Process conclusions	
Conclusion 33	Steering group should be implemented early in the project to facilitate rapid problem detection and solving

Conclusion 33 extends the reasoning of Conclusion 21. Both conclusions are in line with the findings of Doz (1996) and Ariño & De la Torre (1998). These process studies of the development of collaboration indicate that a

failure to learn and to adjust initial conditions, especially in the very early stages of collaboration, induces conflicts and negatively influence alliance success.

Role flexibility

In the SINAP project TMX performed the time planning activities. However, they had serious problems with coming up with a reliable time plan. TNL felt it was TMX's job to develop a reliable time plan and not theirs. Consequently they did not really help TMX with developing the time plan. Only after TMX had developed nine versions of the time plan, TNL as one TNL manager saw it, "intervened" in the time planning activities of TMX. They inspected the time plan and built more slack into it. In other words, TNL stepped out of their role as a main-contractor and helped the sub-contractor TMX with their time planning activities. This had a positive impact on the collaboration between TNL and TMX. The findings with respect to role flexibility are summarised in the next table.

Table 31: Role flexibility

Aspect	SINAP project	ISPV project
Interventions	▪ TNL was unwilling at the start to interfere with TMX time planning activities	**Not found**
Effects	▪ Slowed down time planning process	

To conclude, the findings of the SINAP case suggest that role flexibility allows partners to bridge cultural differences. From these observations the following conclusion was drawn.

Context conclusions	
Conclusion 34	Role flexibility allows partners to bridge cultural differences

Conclusion 34 confirms the findings of Doz & Hamel (1998) who found that managers who have the confidence to step out of their pre-existing roles play an important role in bridging differences between organisations. The authors argue that managers who are at ease in their own organisation are more willing and able to do what is needed to make the alliance work, rather than to stick to pre-existing roles.

Speeding-up project work

In order to speed up it was decided to implement an incentive scheme in the SINAP project and to set up individual planning and tracking meetings in the ISPV project. Both management interventions did not produce the desired effects. The incentive scheme was interpreted as a sign of distrust by TMX workers and did not really speed up project activities. The main reason for this was the timing of the implementation. The incentive plan was implemented when the delays became visible and the TMX project workers interpreted this as a sign of distrust. In the

ISPV project the weekly individual planning and tracking meetings induced continuous negative feedback cycles, which over time reduced the motivation of TMX testers. These meetings did not work because TMX testers found it difficult to estimate how much time was needed to perform tasks, and progress kept on being slow due to the tight time plan and the limited competencies of TMX testers. Moreover, this detailed and confronting way of tracking progress was at odds with the soft tracking Mexican culture (see Kras, 1989), as discussed 8.4.1. The findings with respect to arrangements to speed up project work are summarised below.

Table 32: Arrangements to speed up project work

Aspect	SINAP project	ISPV project
Interventions	• Implementation of incentive scheme (adjustment 6a)	• Setting up of individual planning and tracking meetings (adjustment 7d)
Effects	• Interpreted as a sign of distrust	• Induced continuous negative feedback cycles

To conclude, the findings indicate that organisational arrangements to speed up project work may have counter-productive effects when being implemented too late (incentive scheme), or when neglecting the technical competencies and cultural context of project workers (individual planning and tracking meetings). From these observations the following conclusions were drawn.

Process conclusions	
Conclusion 35	Incentive schemes may be interpreted as a sign of distrust when being implemented shortly after delays become visible
Conclusion 36	Individual planning and tracking meetings only make sense when project workers are competent enough to estimate how much time activities take

Both Conclusions 35 and 36 denote the cultural sensitivity of management interventions. The conclusions extend the findings of researchers who have studied the cultural aspects of leadership (see Hofstede, 1980b).

8.6 Propositions

In the previous sections the impact of the strategic and cultural context and project organisation design have been discussed, as well as the effects of management interventions. Based on these findings conclusions have been drawn. In this section propositions are developed that can be used to guide future research. In contrast to the discussed conclusions, propositions refer to the relationships between collaboration conditions and collaborative NPD outcomes (context propositions) and between management interventions and collaborative NPD outcomes (process propositions). These propositions answer the research questions as formulated in chapter 3.

8.6.1 Context propositions

In this section context propositions are developed based on the findings of the cross-case analysis.

How do the strategic and cultural context of partners influence the process and outcomes of collaborative NPD?

Differences in the partners' strategic context were often not acknowledged at the start of the collaboration. Unacknowledged differences in the partners' strategic context, such as conflicting development strategies, differences in priority setting and asymmetric dependencies were found to disrupt the process of collaborative NPD. These differences induced conflicts between the partners, which, when not being resolved influenced operational effectiveness and relational performance negatively. Differences in the cultural context of partners were also often not acknowledged at the start of the collaboration. Unacknowledged differences in the partners' cultural context such as differences in respect for authority, reporting of progress and managing time were found to disrupt the process of collaborative NPD. These difference invoke expectation gaps between partners, which, when not dealt with adequately, influenced operational effectiveness and relational performance negatively.
Both project organisation design and management interventions were found to moderate the impact of strategic and cultural differences on the outcomes of collaborative NPD. The following moderating factors were found:

Project organisation design

- Implementation of steering group moderates the impact of conflicting development strategies among partners on collaborative NPD outcomes (see Conclusion 2)
- Local project managers moderate the impact of cultural differences on collaborative NPD outcomes (see conclusions 10 and 11)
- Design governance structure moderates the impact of priority setting of partners on collaborative NPD outcomes (see Conclusion 32)

Management interventions

- Referral to higher management bodies moderates the impact of differences between the partners' strategic context on collaborative NPD outcomes (see Conclusion 4)
- Joint planning of partners moderates the impact of cultural and strategic differences on collaborative NPD outcomes (see Conclusion 9)
- Leadership behaviour of managers moderate the impact of cultural differences on collaborative NPD outcomes (see Conclusions 13, 18 and 19)
- Role flexibility of partners moderates the impact of cultural differences on collaborative NPD outcomes (see Conclusion 34)

How does the project organisation influence the process and outcomes of collaborative NPD?

Both projects started up with rather unfavourable project conditions such as unfeasible goals, task-competence misfits, and unacknowledged differences in technical support infrastructure. Unfavourable project conditions were often induced by the strategic context of collaboration. For instance, the dependency of TMX on TNL induced TMX to accept a rather ambitious time plan. Task-competence misfits were accepted because of the scarce resource situation at TNL and because other projects had higher priority. Management interventions were found to moderate the impact of unfavourable project conditions on collaborative NPD outcomes. Management interventions were found to moderate the impact of project organisation design on collaborative NPD outcomes. The following moderating factors were found:

- Joint planning of partners moderates the impact of unfeasible project goals on collaborative NPD outcomes (see Conclusion 22)
- Assessment of differences at the start of the collaboration moderates the impact of unacknowledged organisational differences on collaborative NPD outcomes (see Conclusion 29)
- Management of expectations during the collaboration moderates the impact of unacknowledged organisational differences on collaborative NPD outcomes (see Conclusion 29)
- Early implementation of steering group moderates the impact of unfeasible project goals and task-competence misfits (see Conclusion 33)

To conclude, as suggested by the interactive process perspective (Slappendel, 1996) the findings suggest that the interaction between collaboration conditions and management interventions over time shape the process and outcomes of collaborative NPD. Collaboration conditions were found to disrupt the collaboration, but their impact on collaborative NPD outcomes was found to be moderated by management interventions. Furthermore, the impact of strategic and cultural differences was moderated by project organisation design. Based on these observations the following proposition has been developed.

Context propositions	
Proposition 1	Collaborative NPD outcomes are shaped by the interaction of collaboration conditions and management interventions over time

8.6.2 Process propositions

In this section process propositions are developed based on the findings of the cross-case analysis.

How do management interventions influence the process and outcomes of collaborative NPD?

The findings indicate that differences in the strategic and cultural context of partners were often not acknowledged at the start of the collaboration. Managers dealt with problems caused by differences in strategic and cultural context as they arose. There was little pro-active behaviour of managers. For instance, in both projects the managers did not plan for an assessment of strategic and cultural differences. Indications were found that the re-active mode of problem solving is related to the time pressure under which both projects were executed. There was a strong pressure in both projects to get started. Time pressure induced managers to deviate from standard work processes giving rise to problems lateron in the collaboration. The findings suggest that managers need to resist the pressure to get started and to invest more time to get to know their collaboration partners, to assess the strategic and cultural context of partners, and to collaborate intensively on time planning.

Process propositions	
Proposition 2	Collaborative planning positively influences the process and outcomes of collaborative NPD

The findings also indicate that early detection and bridging of strategic and cultural differences are a critical success factor for collaborative NPD. Failing to bridge these differences can lead to disastrous results, as was the case in the ISPV project. The TNL project manager failed to adapt to the local culture and he tried to execute the project without the indispensable line management commitment. Early detection and bridging of differences can prevent problems from happening, as was the case in the SINAP project. As soon as the steering group managers noticed that TMX was overselling their technical competencies, they decided to send additional technical support to compensate for the lack of competence. Conversely, late detection and bridging of differences may induce conflicts between partners and harm operational effectiveness, as was the case in the SINAP project. The conflicting development strategies of TNL and TDA were acknowledged and bridged rather late in the project at the expense of re-work and conflicts.

Unfavourable project conditions were either taken for granted (e.g. task-competence misfits in the ISPV project), or not acknowledged at the start of the collaboration (e.g. unfeasible project goals at both the SINAP and

ISPV project). Again there was little pro-active behaviour of managers. The findings suggest that early detection and revision of unfavourable project conditions influences collaborative NPD outcomes positively. Late revision of unfavourable project conditions can lead to disastrous results, as was the case in the ISPV project. The unfeasible project goals were not revised until just before the first deadline. This had a negative impact on the commitment of the project team, who felt like being on a "mission impossible". Conversely, early detection and revision of unfeasible goals, as was the case in the SINAP project, was found to influence the process and outcomes of collaborative NPD positively. Based on these observations the following proposition has been developed.

Process propositions	
Proposition 3	Early detection and revision of unfavourable collaboration conditions positively influence the process and outcomes of collaborative NPD

Finally, the findings also illustrate the importance of cultural sensitive leadership in collaborative NPD. Neglect of the cultural aspects of leadership may harm operational effectiveness and relational performance. For instance, in the SINAP project the steering group managers pushed people to come up with a reliable time plan while neglecting that time plans are used differently at TMX. Similarly, in the ISPV project the TNL project manager emphasised the observance of time commitments, while neglecting that people may attach different meanings to these commitments. Cultural insensitive leadership was found to reduce the motivation and commitment of project workers. The impact of insensitive leadership differed in the case projects due to the presence of the local project manager in the SINAP project. The local project manager translated cultural insensitive steering group decisions to the project workers. Role flexibility was found to be an important means to bridge cultural differences. For instance, by stepping out of their role of main contractor, TNL could bypass TMX respect for authority. Based on these observations the following proposition has been developed.

Process propositions	
Proposition 4	Cultural sensitive leadership positively influences the process and outcomes of collaborative NPD

8.7 Concluding remarks

In this chapter the cross-case study analysis has been presented. The similarities and differences in impact of strategic and cultural context of collaboration and design of the project organisation were analysed. Furthermore, the similarities and differences in effects of management interventions were analysed. On the basis of this analysis conclusions were drawn, which in turn were used to develop propositions. In the next chapter conclusions will be drawn with respect to the research problem and objectives, the research will be evaluated and directions will be given for further research.

9

CONCLUSIONS AND EVALUATION

Letter from Mr. Smith

”There are major operational problems which result from Mexican cultural traditions and management practices. But they will not simply go away with the application of the management techniques we’ve been trained in. You got to adapt them to the Mexican scene. Look at all problems from this perspective before you act. [..] Above all, in your everyday work, be flexible and open-minded. Remember, you have to accept that things are done differently here. If you insist on having everything your way, you will seem unreasonable and lose the support of your Mexican managers. Finally, I want to underline the importance of good human relationships in the Mexican work situation. At home we are more willing to work with someone we don’t like provided that person is competent; after all we are paid to do the job. Mexicans, on the other hand, have to feel comfortable with the people they work with if they are to give their best; hence greater importance of human relationships.”

Eva S. Kras, 1989, ‘Management in Two Cultures: Bridging the problem between U.S. and Mexican managers’, p.79-80

9.1 Introduction

This chapter is the last chapter of this thesis. With this chapter the research process aimed at obtaining insight into the success and failure factors of collaborative NPD comes to an end. In this section a brief overview of the arguments presented in this thesis is given.

In chapter 1 the importance of collaboration for today's NPD has been emphasised. NPD has been defined as the set of activities that transform new product ideas into new product designs (de Weerd-Nederhof, 1998). Collaborative NPD has been defined as NPD that is jointly executed by two or more organisations, possibly across boundaries of cultures, time and place. It was argued that managing collaborative NPD is complex due to the diversity and dispersion of the partner organisations involved. Research indicates that 40-60% of all alliances fails. The factors contributing to the success and failure of collaboration are studied extensively. However, there is still limited understanding of these factors. Important reasons for this are the following. Firstly, researchers have paid little attention to the dynamics of collaboration. Most researchers have concentrated on explaining performance from initial conditions without considering the mediating processes. Secondly, little attention has been paid to the practice of collaborative NPD management. Most researchers have concentrated on strategic management issues such as when to collaborate with whom (partner selection). Very few researchers have focused on the operational management of partnerships. From these observations the conclusion has been drawn that if we want to improve our understanding of what contributes to collaboration success and failure, we need to look at the development of collaboration from a managerial perspective.

In chapter 2 organisation theory has been reviewed in search for perspectives on collaborative NPD management. It has been argued that building blocks for collaborative NPD management can be found in collaboration, NPD and (project) management literature. Two main perspectives have been identified in organisation theory: the system and actor perspective. System-oriented theories on collaboration, NPD and project management stress the structural aspects of managing collaborative NPD by drawing attention to issues such as partner selection, design of the collaboration, planning and control. Actor-oriented theories on collaboration, NPD and project management stress the socio-dynamic aspects of managing collaborative NPD by drawing attention to issues such as trust, communication and leadership. Both theoretical perspectives seem to provide a partial yet complementary view on managing collaborative NPD. Individually these theories cannot sufficiently explain the success and failure of collaborative NPD. Therefore a third perspective was introduced, the interactive process perspective (Slappendel, 1996). This perspective can be distinguished

from the other theoretical perspectives by its explicit focus on the interconnection between structure and action over time.
In chapter 3 the interactive process perspective has been used to develop a descriptive process framework for studying the development of collaboration. In chapter 4 this framework has been operationalised and the research methodology has been outlined. The empirical part of this thesis has been presented in chapter 5, 6, 7 and 8. The descriptive process framework has been used to study the development of collaboration in two software development projects jointly executed by a Dutch and a Mexican local design centre within one single multi-national company. In chapter 5 the case companies have been introduced and the context of collaboration has been outlined. In chapter 6 and 7 the development of the collaboration in the two case projects has been described and analysed. The analysis has been divided into a process and context analysis. In chapter 8 the findings of the two case projects have been compared and propositions have been developed.
The purpose of this final chapter is to draw conclusions, evaluate the research and stipulate directions for further research. This chapter is divided into three parts. In section 9.2 the research problem and objectives are discussed. In section 9.3 the theoretical perspective is evaluated. In section 9.4 the research methodology is evaluated. Finally, in section 0 directions for further research are provided.

9.2 Conclusions on research problem and objectives

This section draws conclusions with respect to the research problem and objectives. Section 9.2.1 answers the research problem. Finally, section 9.2.2 draws conclusions about the research objectives.

9.2.1 Answering the research problem

In this section the research problem as formulated in chapter 1 will be answered. The answer is based on the case analyses as discussed in chapter 5,6,7 and 8. The research problem has been formulated as follows.

> *How do initial conditions influence the development of collaboration in NPD and which role do management interventions play in this process?*

Since the findings have been extensively discussed in the previous chapter we will only discuss the main findings here.

Initial conditions necessary but not sufficient

Initial conditions are understood as the strategic and cultural context of partners and project organisation design.
Strategic and cultural differences are often not acknowledged at the start of collaboration projects. Unacknowledged differences disrupt the process of collaborative NPD and when not being acknowledged and

bridged (at least to some extent) influence collaborative NPD outcomes negatively. Managers play an important role in bridging these differences. Firstly, project organisation design may prevent problems from happening. For instance, by hiring local project managers, cultural frictions can be avoided at the project execution level. Moreover, by careful design of the governance structure one can enlarge partners' commitment to the project. Secondly, "hands on management", especially in the early stages of a project and cultural sensitive leadership may reduce the impact of differences on collaborative NPD outcomes. These aspects of management are discussed in more detail in the next sections.
Besides strategic and cultural differences collaborative NPD projects may also suffer from unfavourable project conditions such as unfeasible goals, limited human resources and task-competence misfits. A strong relationship has been found between unfavourable conditions and the strategic context of collaboration. For instance, unfeasible goals may result from early customer commitment. Limited resources may result from the limited priority partners attach to the collaboration. Finally, task-competence misfits may result from partner's overselling of technical competencies. Unfavourable project conditions hamper project work when not being acknowledged and revised at an early stage. Senior management commitment proved to be indispensable in revising unfavourable project conditions.
From these observations two conclusions can be drawn. Firstly, initial conditions are a necessary, but not a sufficient condition for collaboration success. Managers play an important role in shaping collaborative NPD outcomes. Secondly, and maybe even more important, a better understanding of the success and failure of collaborative NPD can be obtained by studying the development of collaboration. As suggested by the interactive process perspective (Slappendel, 1996), collaboration conditions and management interventions mutually influence each other over time and it is exactly this interaction that shapes the outcomes of collaborative NPD.
Based on these observations the following proposition has been developed.

Context propositions	
Proposition 1	Collaborative NPD outcomes are shaped by the interaction of collaboration conditions and management interventions over time

The importance of collaborative project planning

There was little pro-active behaviour of managers in the case projects studied. This finding confirms the findings of Wheelwright & Clark (1994), who have observed that managers often seek to respond to problems when it is already too late to do anything about it. Indications were found that the re-active mode of problem solving is related to time pressure. There was a strong pressure to get started. Time pressure

induced managers to deviate from standard work processes giving rise to problems lateron in the collaboration. Managers need to resist the pressure to get started. They need to invest more time to get to know their collaboration partners and to assess explore the strategic and cultural differences and to collaborate intensively on time planning. Such collaborative project planning allows partners to build shared understanding of each other's ways of working and mutual agreement on what needs to be done. This takes some time but it reduces the likelihood of running into problems at a later stage.
Based on these observations the following proposition has been developed.

Process propositions	
Proposition 2	Collaborative project planning positively influences the process and outcomes of collaborative NPD

The importance of learning and early adjustment

Late revision of unfavourable project conditions (e.g. unfeasible project goals) and late bridging of strategic and cultural differences (e.g. conflicting development strategies) negatively influence collaborative NPD outcomes. Thus especially the early stages of collaborative NPD require management attention and influence. These findings confirm and extend the findings of recent process research of Doz (1996) and Ariño & De la Torre (1998). These studies indicate that a failure to learn and to adjust initial conditions, especially in the very early stages of collaboration induces conflicts and negatively influence alliance success. An important lesson that can be drawn from this research and the mentioned process studies is that the collaboration between partners in the early stages of a collaborative NPD project has a disproportionate impact on performance.
The ability to rapidly detect and bridge differences and detect and revise unfavourable project conditions is influenced by the receptivity and transparency of collaboration partners (see Larsson et al., 1998). Partners may not be able or willing to learn from collaboration partners (low receptivity). For instance, conflicting development strategies may induce partners to cling even more tightly to their own preferred development strategy. Partners may also withhold information from each other (low transparency). For instance, problems may be reported late and partners may oversell their technical competencies. Learning is facilitated by an open attitude towards partners and the intent to learn from and collaborate with partners. However, there is a danger as well. As Hamel (1991) remarked being a "good partner" might actually invite opportunistic behaviour that can undermine the collaboration.
From these observations the following propositions have been developed.

Process propositions	
Proposition 3	Early detection and revision of unfavourable collaboration conditions positively influence the process and outcomes of collaborative NPD

The importance of cultural-sensitive leadership

Finally, the findings also illustrate the importance of cultural sensitive leadership in collaborative NPD. Neglect of the cultural aspects of leadership harms the process and outcomes of collaborative NPD. Cultural insensitive leadership reduces the motivation and commitment of project workers. Making use of local project managers can reduce the danger of cultural insensitive leadership. For expatriate project managers it may be rather difficult to adapt to the local cultural context. Copying leadership styles from local project managers may not produce the desired effect because one easily overlooks the subtleties of leadership. For instance, project managers may adapt a directive leadership style, while neglecting face saving conditions. Role flexibility is an important means to bridge cultural differences. For instance, by stepping out of the role as main contractor a partner can bypass sub-contractor's respect for authority, which may improve the feasibility of time plans.

The importance of cultural-sensitive leadership is widely acknowledged in culture literature (see Hofstede, 1980b). However, still little is known what competencies international managers should possess. Research of Trompenaars & Hampden-Turner (1998) indicates that managers who recognise, respect and reconcile cultural differences perform better than those who do not.

Based on these observations the following proposition has been developed.

Process propositions	
Proposition 4	Cultural sensitive leadership positively influences the process and outcomes of collaborative NPD

Concluding remarks

An important lesson that can be drawn from this research is that companies need to adopt a process view on (managing) collaborative NPD. Collaborative NPD should not be viewed as a "plug and play" process, but rather as an evolutionary process in which trust, commitment and understanding is gradually built. Partners need to invest time in getting to know each other, learn about each other's differences and find ways to bridge these differences.

9.2.2 Conclusions on the research objectives

In this section conclusions will be drawn with respect to the research objectives. The research objectives were formulated in chapter 1 as follows.

1. Contribute to the current knowledge on factors contributing to the success and failure of collaborative NPD by gaining deeper insight into the practice of collaborative NPD management
2. Contribute to the further development of process research on organisational change by developing a descriptive process framework for studying the development of collaborative NPD projects

The first objective: several factors influencing the process and outcomes of collaborative NPD have been found in this research. The main contribution of this research is that we have managed to show *how* the interaction of strategic and cultural contexts of partners and the project organisation on the one hand, and management interventions on the other hand influence the process and outcomes of collaborative NPD. Although many findings confirm existing theories some appear to be new, or new in the context of collaborative NPD. Yet another contribution to the collaboration literature is that several factors were found that moderate the impact of initial collaboration conditions on collaborative NPD outcomes. These moderating factors are amenable to managerial influence and hence contribute to our understanding of the practice of collaborative NPD management.
The second objective: a descriptive process framework has been developed and operationalised. The developed framework is sufficiently generic for studying the development of collaboration in other settings. Given the limited availability of research tools to study change and development processes today (Van de Ven & Huber, 1990), researchers may benefit from the way data has been gathered and analysed in this research (see also evaluation next section).

9.3 Evaluation of interactive process perspective

In this section the interactive process perspective adopted in this research is evaluated.
As discussed in Chapter 2 the interactive-process perspective (Slappendel, 1996) can be distinguished from the other theoretical perspectives by its explicit focus on the interconnection between structure and action over time. The interactive-process perspective has been used in this research to account for the effect of both management interventions (action) and collaboration conditions (structure) on the outcomes of collaborative NPD. The propositions developed in chapter 8 reflect this line of thinking. They either refer to the impact of

collaboration conditions (context propositions) or to the effects of management interventions (process propositions).
The question that arises is if the project outcomes also could have been predicted from the initial collaboration conditions. In other words, is it really necessary to study the development of collaboration? In Chapter 7 we have seen that the outcomes of the ISPV project to a large extent could have been predicted from the unfavourable initial conditions. Despite the efforts of the project manager the unfavourable initial conditions exerted a strong influence on project outcomes. This would plead for what Mohr (1982) calls variable research[75], which is the dominant research mode in collaboration literature. The SINAP project, however, provides a different view. Despite the unfavourable initial conditions, the SINAP project was successful both in terms of operational effectiveness and relational performance. Thus apparently the unfavourable initial conditions were revised during the collaboration. The findings indicate that the interaction between collaboration conditions and management interventions can explain the found project outcomes. For instance, the conflicting development strategies did not severely impact the project because managers were able to resolve their differences of opinion. Thus variable research would be unable to explain the outcomes in this particular case.
To conclude, the interactive process perspective can improve our understanding of the process and dynamics of collaborative NPD. The perspective usefully complements variable research by revealing how collaboration conditions and management interventions influence the process and outcomes of collaborative NPD. This allows us to better understand the factors contributing to the success and failure of collaborative NPD.

9.4 Evaluation of research methodology

In this section the research methodology is evaluated. In section 9.4.1 the data collection is evaluated. In section 9.4.2 the data analysis process is evaluated.

9.4.1 Data collection

In this section the difficulties encountered with the data collection process will be discussed.

Multi-site data collection

A big problem in this research was the tracking of critical incidents in the two case projects. Collaborative NPD by its very nature involves two or more partners possibly located in different cultures and time zones. Since it is physically impossible to be at two places at the same time, the

[75] Variable research aims at statistically explaining variations in some outcome variable (dependent variable) by variations in input variables (independent variables). Variable research attributes causality to variables rather than to the actions of actors.

question arises how to track what is going on in the case projects? In this research the researcher was for the largest part of the time located at TNL in the Netherlands. Steering group meetings, e-mail messages exchanged between project managers and line management of TNL, progress reports and personal talks with managers were an important means to track management interventions.
It would have been better for the research if more time had been spent at TMX in Mexico. Although the two visits were very valuable for gaining insight into the cultural and strategic context of TMX and the process of collaboration, more time at TMX would have deepened my understanding of the cultural context. Furthermore, it would have allowed the researcher to track the interaction between project managers and project workers in real-time. Another option would be to work with research teams, with one researcher working in Mexico and one researcher working in The Netherlands observing the same projects. A disadvantage might be that it requires researchers to align their research strategies. However, such a research strategy would certainly have provided a more thorough understanding of what has happened in both case projects.

Descriptive process framework

Case study research allows researchers to get a thorough understanding of the formal and informal processes that occur in collaborative NPD. It can lead to a greater understanding of the day-to-day work practices in organisations. However, the complexity and dynamics of organisational settings may easily overwhelm researchers. It proved to be very useful to have a descriptive framework specified in advance. The descriptive process framework and its operationalisation greatly structured the data collection and facilitated data reduction. However, it is important not to use the descriptive process framework too rigidly. The framework was adapted at several points during data collection to incorporate emerging insights.

Process and context interviews

In this research two different types of interviews have been held, labelled context and process interviews.
The context interviews have been used to identify the similarities and differences in partner's strategic and cultural context. Questions aimed at identifying similarities and differences in cultural context proved to be sensitive sometimes. It was important to stress that these questions were meant to reveal differences in work practices and not to judge which work practices were good or bad. Process interviews were conducted at the end of both case projects and meant to reconstruct the critical incidents that occurred in the case projects and to identify people's perceptions and evaluations of these incidents. A short-list of critical incidents was prepared which was used to structure the interviews. This list proved to be an indispensable instrument for the process interviews because people sometimes had to be reminded of what had happened in

the project. The interviewees were presented with a description of the incident, which was as neutral as possible, and asked about their perception of the incident. People were also asked if the short list of critical incidents was complete.
Given the high uncertainty avoidance culture in Mexico, it has been expected that it would be rather difficult to get people to express their opinion on process and context matters. Fortunately, this was not the case. Most of the people were quite happy to share their thoughts with me and took all time that was needed to answer my questions. Finally, it is important to bear in mind that the cultural rules of communication should be respected. For a Dutch person in Mexico this would mean that one should not immediately want to do business. Furthermore, interview appointments should not be made days ahead and the interview planning should leave some room for flexible endings of interviews.

9.4.2 Data analysis

In this section the difficulties encountered with the data analysis process will be discussed.

Data reduction

The first step in the data analysis was to construct process descriptions of what had happened in both case projects. The initial process descriptions have been based on the e-mail messages exchanged between managers, observation notes, progress reports and informal talks with managers. It proved to be difficult to code these initial process descriptions in terms of the incidents distinguished in the descriptive process framework. At several times during the coding process the definitions of evaluation, steering and adjustment incidents needed to be reconsidered. The most difficult incidents to grasp were evaluation incidents, because it is physically impossible to read the minds of people. E-mail messages give clues about someone's perception about a situation, but one often lacks the context within which they are written. The easiest to identify were the adjustment incidents because these were well documented in progress reports. Steering incidents were reasonably easy to track by means of analysis of e-mail messages and observation notes. However, during these first coding attempts it became clear that the amount of incidents needed to be reduced. The data set was simply too large to work with.
In order to reduce the complexity a short list of critical incidents was developed for each case project. These lists were tested on key persons before being used to conduct the process interviews. From the data obtained from these process interviews and the initial version of the process description a new process description was constructed. A rather difficult task was to make sense of the perceptions provided by the different interviewees. As much as possible the perceptions of the different actors were included in the process description. However, one cannot escape to include one's own perception as well.

Data display

An important step for data display was to divide the data analysis into a process and a context analysis analogous to Giddens' (1984) idea of methodological bracketing. The purpose of the process analysis was to identify the problems and the associated management interventions. The process description was divided into chronologically ordered fragments. Each *fragment* describes one particular problem that emerged during the collaboration. Fragments contain sequences of evaluation, steering and adjustment incidents (not necessarily in this order). Evaluation incidents denote the managers' perception of the problems at hand. Steering and adjustment incidents denote how managers have dealt with these problems. Further analysis of the fragments revealed that fragments could be clustered in *episodes* in which one particular type of problem dominated. The purpose of the context analysis was to analyse the causes of the identified problems and the effects of the associated management interventions. Each problem was analysed individually, which reduced the complexity of the data analysis and display considerably.

The next step was to try out some of the data displays suggested by Miles & Huberman (1994). The researcher tried out several types of cross-tables. Ultimately, it was decided to display the results of the process analysis in terms of tables per episode. The cross connections between problems are not visualised in these displays but visualised in the displays of the context analysis. This was done because otherwise the displays of the process analysis would have become too complex and hence less informative. The context data were displayed per problem. This greatly improved the readability of the displays. Another important decision was to structure the context analysis in terms of the following scheme: causes (collaboration conditions) -> collaboration problems -> management interventions -> effects (collaboration conditions). This allowed us to visualise the context-process relationships.

Conclusion drawing and verification

The case displays alone were not enough to draw the conclusions developed in this thesis. Drawing conclusions and verifying these were greatly facilitated by the cross-case analysis. It allowed to contrasts the findings of both cases and to look for case specific and more general findings. The cross-case analysis produced valuable conclusions. However, in order to avoid the fallacy of producing an overly complex and idiosyncratic theory (see Eisenhardt, 1989), more generic propositions have been built from these conclusions. These propositions reflect the main relationships found.

9.5 Directions for further research

This research gives rise to a number of questions that could be addressed in further research.

First and foremost, it is worthwhile conducting more process research on the development of collaboration to further reveal the dynamics of collaborative NPD. The type of research described in this thesis could be replicated in other collaborative NPD settings in order to explore the similarities and differences of management processes in different settings. This research has been focused on the NPD projects jointly conducted by a Mexican and Dutch local design centre within a single multi-national company. By carrying out a considerable number of case studies with ample variety in terms of industry, organisation, cultural distance and collaboration history of partners it should be possible to identify successful management practices and NPD configurations. For instance, it would be interesting to compare the findings of this study with the findings obtained in mono-cultural settings.

The second direction is to re-work the formulated propositions into testable hypotheses and to statistically test these hypotheses in order to find out to what extent they are also applicable to other settings. For instance, researchers could test to what extent early detection of the partners' differences in strategic and cultural context explains variations in collaborative NPD outcomes (see Proposition 3). This could improve our understanding of the factors that contribute to the success and failure of collaborative NPD considerably.

The third direction is to further explore the role of project managers in collaborative NPD. As noted in the chapter 1 few studies have focused on the practice of collaborative NPD management. It is worthwhile conducting more case studies that stay close to the practice of collaborative NPD management in order to further explore the factors contributing to success that are amenable to managerial influence. Researchers could, for instance, engage in action research and test some of the process propositions developed in this thesis.

To conclude

Throughout this thesis the collaboration between Mr. Smith and Sr. González has been described. Their story clearly shows that cross-cultural management is basically about acknowledging, respecting and bridging differences between people's values and work practices. This is easier said than done. It seems unavoidable to make mistakes but we should not be too concerned about this. As Trompenaars & Hampden-Turner (1998: 194) put it "The real issue is how quickly we are prepared to learn from mistakes and how bravely we struggle to understand a game in which perfect scores are an illusion, and where reconciliation only comes after a difficult passage through alien territory." Hopefully this thesis provides a small step in the direction of understanding this game.

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SUMMARY

Introduction[77]

Over the past decades, NPD has become a focal point of competition in many industries. Companies have to be fast and responsive to changing customer demands and moves of competitors in order to succeed. It is against this background that companies are increasingly relying on collaboration to develop new products. Research indicates that companies encounter serious difficulties in achieving the anticipated benefits from collaborative NPD. The factors contributing to the success and failure of collaboration are studied extensively. However, there is still limited understanding of these factors. Important reasons for this are the following.

Firstly, it is difficult to define what is meant by collaboration 'success'. Researchers have been using different criteria to judge whether collaboration is successful, which makes it hard to compare findings across studies. Secondly, the "hard" methodological approaches advanced by many researchers are not likely to capture the "soft behavioural" aspects of collaboration such as trust and commitment. Thirdly, collaboration is a highly evolutionary process but rarely studied as such. There is still limited understanding of the mechanisms that mediate between initial conditions and outcomes of collaborative NPD. Finally, little attention has been paid to the practice of collaborative NPD management. Most researchers have concentrated on strategic management issues such as partner selection. Very few researchers have focused on the operational management of partnerships. From these observations the conclusion has been drawn that if we want to improve our understanding of what contributes to collaboration success and failure, we need to look at the development of collaboration from a managerial perspective. In chapter 1 the following research problem has been formulated:

How do initial conditions influence the development of collaboration in NPD and which role do management interventions play in this process?

Initial conditions refer to the structural properties of a partnership and its constituting partners that influence the collaboration. With collaboration the working together of two or more relatively independent organisations is meant. Management interventions refer to the efforts of managers to influence collaborative NPD processes. The research described in this thesis can be characterised as explorative theory-developing research. The aim is to develop theory on the factors that contribute to the success and failure of collaborative NPD. The insights

[77] In order to improve the readability of this summary references have been left out

that are generated in this research will be summarised in propositions, which can be used to guide further research.

Theoretical perspectives and building blocks

In this thesis collaborative NPD has been defined as the product development activities that are jointly executed by two or more relatively independent organisations.

In chapter 2 organisation theory has been reviewed in search for perspectives on and building of collaborative NPD management. It has been argued that building blocks for collaborative NPD management can be found in collaboration, NPD and (project) management literature. Two main perspectives have been identified in organisation theory: the system and actor perspective. System-oriented theories on collaboration, NPD and project management stress the structural aspects of managing collaborative NPD by drawing attention to issues such as partner selection, design of the collaboration, planning and control. Actor-oriented theories on collaboration, NPD and project management stress the socio-dynamic aspects of managing collaborative NPD by drawing attention to issues such as trust, communication and leadership. Both theoretical perspectives seem to provide a partial, yet complementary view on managing collaborative NPD. Individually these theories cannot sufficiently explain the success and failure of collaborative NPD. Therefore a third perspective was introduced, the interactive process perspective. This perspective can be distinguished from the other theoretical perspectives by its explicit focus on the interconnection between structure and action over time. Adopting an interactive process perspective has important consequences. Firstly, researchers need to address the paradoxical relationship between structure and action. Incorporating both structure and action into one coherent theory has not been without problems due to the opposing assumptions lying underneath system- and actor-oriented theories. In this research, time is used to relate structure and action. It is assumed that structure logically predates the actions which transform it. Secondly, researchers need to employ longitudinal research designs. Cross-sectional research designs, which dominate in highly rated journals, are not very suitable to capture the dynamics of collaboration. Researchers are required to search beyond correlated variables and explore what factors and mechanisms drive the process of collaboration.

Descriptive process framework

In chapter 3 the interactive perspective has been used to develop a descriptive process framework for studying the development of collaboration. The framework has been based on Pettigrew's framework for studying organisational change. It is composed of three related elements: the context, process and content of change. The context of change refers to the strategic and cultural context of collaboration. The process of change refers to the development of collaboration. This

process has been conceptualised as sequences of steering, evaluation and adjustment incidents. The content of change refers to the project organisation that is set up to facilitate the collaboration. In chapter 4 this process framework has been operationalised.

Research methodology

In chapter 4 the research methodology has been outlined. Major steps in designing the present research have been the decisions on the research strategy, selection of cases, and focus of data collection.

The research strategy can be characterised as longitudinal case study research. The decision to use this particular research strategy has been based on the following considerations. Firstly, the research problem is explorative in nature. There is still limited understanding of the development of collaboration. Case study research is a suitable research strategy to study such unexplored areas. Secondly, case study research can offer in-depth understanding of the process of collaboration in its context. It offers the opportunity to go beyond the relationships between initial conditions and collaboration outcomes that are found in mainstream collaboration research.

It has been decided to study two collaborative NPD projects jointly executed by a Mexican and a Dutch local design centre within one multi-national company. Studying the development of collaboration between two local design centres within one multi-national company has the advantage that it reduces the complexity of the research design. Given the time constraints and labour intensity of conducting longitudinal case study research, it was decided to study just two cases. The cases have been selected because they represent typical cases for companies starting to collaborate for the first time (or with little experience) across borders of time, place and organisation. Moreover, the cases fall within theoretical categories with respect to how they were organised (subcontracting versus insourcing) and managed (local versus expatriate project manager). The two collaborative NPD projects have been studied over their entire life cycle for a period of approximately one year.

Given the limited attention that has been paid to the practice of collaborative NPD management, it has been decided to study the development of collaboration from the perspective of the managers involved as much as possible. Therefore the data collection focused on the interaction between project managers and steering group managers and between project managers and project workers. Thus the present research stays close to the problems that managers encounter when having to manage a collaborative NPD project.

Data analysis has been divided into *process* and *context analysis*. The purpose of the process analysis is twofold. The first purpose is to identify and typify the problems, which emerged during the collaboration. The second purpose is to identify how these problems have been evaluated (evaluation incident) and managed (steering and adjustment incidents). The development of collaboration has been described in terms of critical

incidents. The purpose of the context analysis is to gain insight into the causes of the identified problems and into the effects of the associated management interventions (steering and adjustment incidents).

Findings

The empirical part of this thesis has been presented in chapters 5, 6, 7 and 8. The descriptive process framework has been used to study the development of collaboration in two software development projects, referred to as the SINAP and ISPV project respectively. In chapter 5 the case companies have been introduced and the context of collaboration has been outlined. In chapter 6 and 7 the development of the collaboration in the two case projects has been described and analysed. In chapter 8 the findings of the two case projects have been compared and propositions have been developed.

The findings indicate that differences in the partners' strategic and cultural context were often not acknowledged at the start of the collaboration. These differences induced conflicts and misunderstandings between the partners, which when not being resolved influenced collaborative NPD outcomes negatively. Several relationships have been found between the strategic and cultural context of collaboration and the observed problems. Managers dealt with these problems as they arose. Indications have been found that the re-active mode of problem solving is related to the time pressure under which both projects have been conducted. There was a strong pressure to get started. Managers had little time to spend on project planning and had to deviate from standard work processes, which gave rise to problems lateron in the projects. Both projects started up with rather unfavourable project conditions such as unfeasible goals and task-competence misfits. Unfavourable project conditions were often induced by the strategic context of collaboration. Unfavourable project conditions were either taken for granted (e.g. task-competence misfits) or not acknowledged at the start of the collaboration (e.g. unfeasible project goals). Again there was little pro-active behaviour of managers.

Conclusions and evaluation

In chapter 9 conclusions have been drawn with respect to the research problem and objectives. Furthermore, the research has been evaluated and directions for further research have been given.

A number of conclusions can be drawn from this research. Firstly, initial conditions are a necessary but not a sufficient condition for collaboration success. Managers play an important role in shaping collaborative NPD outcomes. As suggested by the interactive process perspective collaboration conditions and management interventions mutually influence each other over time, and it is exactly this interaction that shapes the outcomes of collaborative NPD. Secondly, managers need to resist the pressure to get started and need to invest more time on collaborative project planning. This allows partners to build a shared

understanding of each other's goals and work practices, and mutual agreement on what needs to be done. Thirdly, an important lesson that can be drawn from this research is that collaboration between partners in the early stages of a collaborative NPD project has a disproportionate impact on performance. Late revision of unfavourable project conditions and late bridging of strategic and cultural differences negatively influence the process and outcomes of collaborative NPD. Finally, the case projects illustrate the importance of cultural sensitive leadership. Neglect of the cultural aspects of leadership may reduce the motivation and commitment of project workers. Making use of local project managers reduces the risks cultural frictions between project managers and project workers.

The main contribution of this research is that we have managed to show *how* the interaction of strategic and cultural contexts of partners and the project organisation on the one hand, and management interventions on the other hand influence the process and outcomes of collaborative NPD. Although many findings confirm existing theories some appear to be new, or new in the context of collaborative NPD. Yet another contribution to the collaboration literature is that several factors have been found that moderate the impact of initial collaboration conditions on collaborative NPD outcomes. These moderating factors are amenable to managerial influence and hence contribute to our understanding of the practice of collaborative NPD management. Another contribution of this research is that we have managed to develop research tools to study the development of collaboration.

The interactive process perspective proved to be a useful lens to study collaborative NPD. Both the data collection and the data analysis have been evaluated. Several tips have been given for researchers wanting to study the development of collaboration.

This chapter concludes with directions for further research. Three main directions have been identified. First and foremost, it is worthwhile conducting process research on collaboration to reveal its dynamics. The research described in this thesis could be replicated in other settings in order to explore the similarities and differences of collaborative NPD management in different settings. The second direction is to re-work the formulated propositions into testable hypotheses and to statistically test these in order to find out to what extent they are also applicable to other settings. For instance, researchers could test to what extent early detection of the partners' differences in strategic and cultural context explains variations in collaborative NPD outcomes. The third direction is to further explore the role of project managers in collaborative NPD. Few studies have focused on the practice of collaborative NPD management. It is worthwhile conducting more case studies that stay close to the practice of collaborative NPD management, in order to further explore the factors contributing to success that are amenable to managerial influence.

SAMENVATTING

Inleiding[78]

Productontwikkeling lijkt in toenemende mate een concurrentiemiddel te worden in verschillende bedrijfstakken. Om succesvol te zijn, worden bedrijven gedwongen om snel te reageren op veranderende wensen van klanten en initiatieven van concurrenten. Tegen deze achtergrond gaan bedrijven steeds vaker samenwerken om nieuwe producten te ontwikkelen. Onderzoek wijst uit dat bedrijven problemen ondervinden om de voordelen die ze verwachten van samenwerking ook daadwerkelijk te behalen. De factoren die van invloed zijn op het slagen en falen van samenwerking zijn uitvoerig bestudeerd maar nog steeds onvoldoende duidelijk. Belangrijke redenen hiervoor zijn de volgende. Allereerst hebben onderzoekers het slagen en falen van samenwerking telkens weer anders gedefinieerd, wat de onderlinge vergelijking van onderzoeksresultaten bemoeilijkt. De tweede reden is dat onderzoekers overwegend "harde" en statische onderzoeksmethoden hebben gebruikt om "zachte" procesmatige aspecten, zoals betrokkenheid en vertrouwen, te onderzoeken. Bovendien waar samenwerking bij uitstek een proceskarakter heeft, hebben onderzoekers relatief weinig aandacht besteed aan het proces van samenwerking. Tenslotte hebben onderzoekers weinig aandacht besteed aan het operationeel management van samenwerkingsprojecten. Het merendeel van het onderzoek is gericht op de strategische aspecten van samenwerken zoals in welke gevallen gaan bedrijven samenwerkingsverbanden aan en met wie? Op basis van deze observaties hebben we geconcludeerd dat als we het slagen en falen van samenwerking beter willen begrijpen we de ontwikkeling van samenwerking moeten bestuderen vanuit het perspectief van de betrokken managers. De probleemstelling is in hoofdstuk 1 als volgt geformuleerd:

Hoe beïnvloeden initiële condities de ontwikkeling van samenwerking in nieuwe productontwikkeling en welke rol spelen managementinterventies in dit proces?

Met initiële condities worden de karakteristieken van het samenwerkingsverband en de deelnemende partners die de samenwerking beïnvloeden bedoeld. Met samenwerking wordt het met elkaar werken van twee of meerdere onafhankelijke organisaties bedoeld. Tenslotte met managementinterventies worden de acties van managers gericht op het beïnvloeden van het proces van samenwerking bedoeld.

[78] Om de leesbaarheid te vergroten zijn de referenties weggelaten

Theoretische perspectieven

In hoofdstuk 2 is de organisatieliteratuur bekeken op theoretische perspectieven op het managen van gezamenlijke productontwikkeling. Perspectieven op gezamenlijke productontwikkeling kunnen worden gevonden in literatuur over samenwerking, productontwikkeling en (project)management. Er kunnen twee dominante theoretische perspectieven worden onderkend binnen de organisatieliteratuur: het systeem- en het actorperspectief.

Systeem-georiënteerde theorieën over samenwerking, product–ontwikkeling en management benadrukken de structurele aspecten van het managen van gezamenlijke productontwikkeling zoals partner–selectie, inrichting van de samenwerking, planning en beheersing ervan. Actor-georiënteerde theorieën van samenwerking, productontwikkeling en management benadrukken de sociaal–dynamische aspecten van het managen van gezamenlijke product–ontwikkeling zoals vertrouwen, communicatie en leiderschap. Beide theoretische invalshoeken bieden een partieel perspectief op het managen van gezamenlijke productontwikkeling. Afzonderlijk kunnen deze theorieën niet afdoende het slagen of falen van gezamenlijke productontwikkeling verklaren. Daarom is een derde theoretisch perspectief geïntroduceerd, die in navolging van Slappendel het interactief procesperspectief wordt genoemd. Dit perspectief kan worden onderscheiden van de eerder genoemde perspectieven door de expliciete focus op de wederkerige relatie tussen structuur (samenwerkingscondities) en handelen (managementinterventies). Het toepassen van dit perspectief heeft ingrijpende consequenties. Ten eerste dient de paradoxale relatie tussen structuur en handelen te worden geadresseerd. Het inbedden van zowel structuur als handelen in één coherente organisatietheorie is problematisch door de tegenstrijdige assumpties die aan systeem- en actor-georienteerde theorieën ten grondslag liggen. In dit onderzoek wordt verondersteld dat structuur voorafgaat aan het handelen van actoren, die de structuur vervolgens kunnen wijzigen of instandhouden. Verder dient de variabele 'tijd' in het onderzoeksontwerp te worden ingebracht. De interactie tussen structuur en handelen kan alleen zichtbaar worden gemaakt door organisatieprocessen gedurende een bepaalde periode te bestuderen. Daarom is in dit onderzoek gekozen voor een longitudinaal onderzoeksontwerp.

Beschrijvend proceskader

In hoofdstuk 3 wordt het interactief procesperspectief gebruikt om een beschrijvend proceskader te ontwikkelen voor de bestudering van de ontwikkeling van samenwerking. Het raamwerk is gebaseerd op Pettigrew's schema om organisatieverandering te bestuderen. Het schema is samengesteld uit drie aan elkaar gerelateerde elementen: de context, het proces en de inhoud van de verandering. In dit onderzoek heeft de context van verandering betrekking op de strategische en culturele context van samenwerking. Het proces van verandering heeft de

betrekking op de ontwikkeling van samenwerking. Dit proces is opgevat als sequenties van sturings-, evaluatie- en aanpassingsincidenten (niet noodzakelijkerwijs in deze volgorde). Tenslotte heeft de inhoud van de verandering betrekking op de projectorganisatie die de samenwerking zou moeten ondersteunen. De verschillende elementen van dit raamwerk worden in hoofdstuk 4 geoperationaliseerd.

Onderzoeksmethodologie

In hoofdstuk 4 wordt de onderzoeksmethodologie beschreven. Belangrijke stappen in het onderzoeksontwerp waren de beslissingen die betrekking hadden op de onderzoeksstrategie, selectie van de gevallen, dataverzameling en data-analyse.

De onderzoeksstrategie kan worden omschreven als longitudinaal gevalstudie-onderzoek. De keuze voor deze onderzoeksstrategie is ingegeven door de volgende overwegingen. Op de eerste plaats is het onderzoeksprobleem exploratief van aard. Er is tot op heden een beperkt begrip van de ontwikkeling van samenwerking. Bovendien is een gevalstudie bij uitstek geschikt om niet eerder onderzochte gebieden te bestuderen. Ten slotte, biedt een gevalstudie de mogelijkheid om het proces van samenwerking diepgaand en in zijn context te bestuderen en zo een beter begrip te krijgen van de relaties die bestaan tussen samenwerkingscondities en de uitkomsten van samenwerking.

Vanwege het complexe en tijdrovend karakter van het onderzoeksontwerp is besloten om slechts twee productontwikkelings–projecten, gezamenlijk uitgevoerd door een Nederlandse en een Mexicaanse productontwikkelingsafdeling van dezelfde multinational te bestuderen. De projecten zijn geselecteerd omdat ze typische voorbeelden zijn van bedrijven die met geringe ervaring gaan samenwerken over grenzen van tijd, plaats en organisatie. Bovendien vallen de projecten in contrasterende theoretische categorieën met betrekking tot de organisatie (uitbesteden van productontwikkeling versus inhuren van mensen) en het managen (locale versus externe projectmanager) van gezamenlijke productontwikkeling.

Vanwege de geringe aandacht voor het operationeel management van gezamenlijke productontwikkeling is besloten om de ontwikkeling van samenwerking te bestuderen vanuit het perspectief van de betrokken managers. De dataverzameling is daarom gericht op de interacties tussen projectmanagers en lijnmanagers, en tussen projectmanagers en projectmedewerkers. Dit onderzoek blijft dus dicht bij de problemen die managers ondervinden als ze een gezamenlijk productontwikkelings–project moeten leiden.

In de data-analyse is onderscheid gemaakt tussen *proces*- en een *contextanalyse*. Het doel van de procesanalyse is tweeledig. Het eerste doel is de problemen die zich gedurende de samenwerking voordoen te identificeren en te karakteriseren. Het tweede doel is het in kaart brengen van de evaluatie van problemen (evaluatie-incidenten) en aanpak daarvan (sturings- en aanpassingsincidenten) door de betrokken

managers. Het doel van de contextanalyse is inzicht te krijgen in de oorzaken van de geïdentificeerde problemen en in de effecten van de aanpak (management interventies) van deze problemen door managers.

Empirische bevindingen

De empirische bevindingen worden beschreven in hoofdstukken 5, 6, 7 en 8. Het beschrijvend proceskader is gebruikt om de ontwikkeling van samenwerking te bestuderen in twee software-ontwikkelingsprojecten, het SINAP- en het ISPV-project. In hoofdstuk 5 worden de bedrijven die betrokken zijn in de genoemde projecten geïntroduceerd en wordt de strategische en culturele context van de samenwerking beschreven. In hoofdstuk 6 en 7 wordt de ontwikkeling van samenwerking in het SINAP- en het ISPV-project beschreven en geanalyseerd. Tenslotte, worden in hoofstuk 8 de verschillen en overeenkomsten tussen de projecten geanalyseerd en proposities met betrekking tot het managen van gezamenlijke productontwikkeling ontwikkeld.

De bevindingen wijzen uit dat aan het begin van de samenwerking de verschillen tussen de strategische en culturele context van de partners vaak niet worden opgemerkt. Deze verschillen veroorzaakten daardoor conflicten en misverstanden tussen de partners, die het proces en de uitkomsten van samenwerking negatief beïnvloeden. We hebben verschillende verbanden gevonden tussen de geconstateerde problemen en de strategische en culturele context van samenwerking. Deze verbanden worden uitvoerig beschreven in hoofdstuk 6, 7 en 9. Problemen werden vaak pas aangepakt als ze zich voordeden. Dit reactieve probleemoplossend gedrag van managers lijkt samen te hangen met de tijdsdruk waaronder beide projecten werden uitgevoerd. Managers gunden zichzelf weinig tijd om de samenwerking goed voor te bereiden en weken af van standaard werkprocessen om tijdswinst te boeken, wat tot problemen leidde verderop in het project. Beide projecten werden opgestart met relatief ongunstige projectcondities zoals onrealistische doelen en taak-competentie misfits. Deze ongunstige projectcondities waren vaak ingegeven door de strategische context van de samenwerking. De condities werden ofwel geaccepteerd (bijvoorbeeld taak-competentie misfits) ofwel niet onderkend bij de start van de samenwerking (bijvoorbeeld onrealistische doelen). Ook hier was er sprake van gering pro-actief probleemoplossend gedrag van managers.

Conclusies en evaluatie

In hoofdstuk 9 worden conclusies getrokken met betrekking tot het onderzoeksprobleem en de onderzoeksdoelstellingen. Verder wordt het onderzoek geëvalueerd en worden richtingen voor vervolgonderzoek aangegeven.

Uit dit onderzoek kunnen een aantal conclusies worden getrokken. Op de eerste plaats zijn initiële samenwerkingscondities een noodzakelijke maar geen afdoende voorwaarde voor succesvolle samenwerking. Managers leveren een belangrijke bijdrage aan de uitkomsten van

gezamenlijke productontwikkeling. Samenwerkingscondities en managementinterventies beïnvloeden elkaar wederzijds en het is juist deze interactie die de uitkomsten van gezamenlijke productontwikkeling vormgeven. Ten tweede dienen managers de verleiding te weerstaan om aan tijdkritische projecten te beginnen zonder een gedegen voorbereiding. Managers zouden meer tijd moeten investeren in wat ik gezamenlijke projectplanning noem. Dit betekent het leren kennen van de partners, het in kaart brengen van de strategische en culturele verschillen, en het gezamenlijk voorbereiden van het productontwikkelingsproject. Dit stelt de partners instaat om kennis op te doen over elkaars strategische doelen en werkpraktijken, en wederzijdse overeenstemming te bereiken over de projectaanpak. Een derde belangrijke les die getrokken kan worden uit dit onderzoek is dat met name de samenwerking in de startfase van een project van cruciaal belang is voor het verdere verloop van de samenwerking. Een late onderkenning en verandering van ongunstige projectcondities en een late onderkenning en overbrugging van strategische en culturele verschillen beïnvloedt het proces en de uitkomsten van gezamenlijke productontwikkeling negatief. Tenslotte illustreren de gevalsstudies het belang van cultureel-sensitief leiderschap. Te weinig aandacht voor de culturele aspecten van leiderschap kan een desastreuze uitwerking hebben op de motivatie en betrokkenheid van projectmedewerkers. Door gebruik te maken van locale projectmanagers kan men dit probleem tegengegaan.

De belangrijkste theoretische bijdrage van dit onderzoek is dat we hebben kunnen laten zien *hoe* de interactie van samenwerkingscondities en management interventies het proces en de uitkomsten van gezamenlijke productontwikkeling beïnvloeden. Hoewel de bevindingen vaak bestaande theorie bevestigen, zijn sommige bevindingen nieuw, of nieuw in de context van gezamenlijke productontwikkeling. Een andere belangwekkende theoretische bijdrage is dat verschillende factoren zijn gevonden die de impact van initiële samenwerkingscondities op uitkomsten modereren. Deze modererende factoren zijn te beïnvloeden door managers en vergroten daarmee ons inzicht in de praktijk van productontwikkelingsmanagement. Een methodologische bijdrage is dat in het onderzoek methoden zijn ontwikkeld voor het bestuderen van de ontwikkeling van samenwerking. Zulke onderzoeksmethoden zijn nog steeds nauwelijks voorhanden.

Het interactief procesperspectief was van toegevoegde waarde voor de bestudering van de ontwikkeling van samenwerking in de projecten. De uitkomsten van het SINAP-project zouden niet verklaard kunnen worden, indien een meer statisch onderzoeksontwerp was gekozen. Verder zijn zowel het proces van dataverzameling als van data-analyse geëvalueerd en verschillende verbeterpunten in kaart gebracht.

Hoofdstuk 9 eindigt met richtingen voor verder onderzoek. Drie belangrijke richtingen worden geïdentificeerd. Op de eerste plaats onderstreept dit onderzoek het belang van longitudinaal gevalstudie-

onderzoek naar de ontwikkeling van samenwerking. Het onderzoek, zoals dit wordt beschreven in dit proefschrift, zou kunnen worden herhaald in andere samenwerkingssituaties om beter begrip te krijgen van de overeenkomsten en verschillen in het managen van gezamenlijke productontwikkeling in verschillende situaties. Een tweede richting voor verder onderzoek is om de geformuleerde proposities om te werken naar toetsbare hypothesen en die vervolgens statistisch te toetsen. Dit om beter inzicht te verkrijgen in de geldigheid van de geformuleerde proposities. Een derde richting voor verder onderzoek is de rol van projectmanagers in gezamenlijke productontwikkeling verder te onderzoeken. Relatief weinig aandacht is besteed aan de praktijk van het managen van dit soort projecten. Het is zinvol om meer gevalsstudie-onderzoek te doen naar de praktijk van het managen van gezamenlijke productontwikkeling om zo een beter inzicht te verkrijgen in de factoren die bijdragen aan het slagen en falen van samenwerking, waar managers invloed op kunnen uitoefenen.

APPENDIX A:
LIST OF ABBREVIATIONS

FOA:	First Order Applicant
IN:	Intelligent Network
INAP:	Intelligent Network Application Part
ISPV:	Integrated System Part Verification
Mesa:	Multinational telecom company (fictitious name)
NPD:	New Product Development
PC-SCF:	Product Committee of Service Control Functionality
SCE:	Service Creation Environment
SCP:	Service Control Point
SCF:	Service Control Functionality
SDP:	Service Data Point
SMS:	Service Management System
SSF:	Service Switching Functionality
SSP:	Service Switching Point
TAS:	Telco Australia (fictitious name)
TCM:	Test Configuration Management
TDA:	Telco Denmark (fictitious name)
TED:	Danish Telecom Operator (fictitious name)
Telco:	Multinational telecom company (fictitious name)
TG:	Tollgate
TMX:	Telco Mexico (fictitious name)
TNL:	Telco the Netherlands (fictitious name)
Y2K:	Year 2000

APPENDIX B:
EXCERPT OF INCIDENT LIST

Incident list SINAP project			
Date	**Steering incident**	**Evaluation incident**	**Adjustment incident**
August 6, 1999	The TNL operational manager informs strategic product management on actions to shorten the planning to a maximum	The TNL operational manager concludes that with the extra resources and parallel working the project can gain some weeks. He regards the deadline of mid-November not feasible. Lucien wants to wait for TMX's feasibility outcome on next week Tuesday, before he can do any commitment.	TMX succeeded in assigning more two more engineers to the project One experienced TNL designer is added to the project (50% basis),
August 9, 1999	The TNL operational manager asks the TMX project manager for input for the Tollgate 2 meeting		
August 10, 1999	The TMX project manager faxes a preliminary version of the time plan		
August 10, 1999	The time plan of TMX is discussed in a telephone meeting.	General impression of the steering group managers is that the planning is now compressed to an absolute maximum. Quality will be under constant pressure and a longer lead-time will be required.	It is decided that a TNL and a TDA troubleshooter will be send to TMX
August 16, 1999	TDA receives the time plan from TMX by fax		
August 20, 1999	The TNL operational manager officially invites people to participate in the SINAP steering group.		
August 26, 1999			Steering group is implemented ▪ The steering group is scheduled weekly, every Monday at 17.00-18.00 CET ▪ The chairman will call for the meeting and distribute the minutes in advance ▪ The steering group will run according to a fixed agenda
August 28, 1999	The TMX project manager reports progress (progress report 1)	Project goals ▪ Lead time: blue, some activities are behind schedule ▪ Quality: blue ▪ Cost: green	
September 4, 1999	The TMX project manager reports progress (progress report 2) A new planning has been issued	Project goals • Lead time: red, because of re-planning • Quality: blue • Cost: blue, because of re-planning	New end-dates: • Pre-delivery, January 12, 2000 • Final delivery, February 14, 2000

APPENDIX C:
CONTEXT QUESTIONNAIRE

In this appendix the questionnaire used for conducting context interviews is outlined.

Introduction

These interviews are part of a case study aimed at obtaining insight into managing collaborative NPD. In this interview the focus is on the impact of strategic and cultural differences on the collaboration between TNL and TMX. The results of the interviews will be made anonymous and used to stimulate discussions on how to improve the collaboration between TNL and TMX. This interview is structured around four themes:

- Personal characteristics
- Organisational characteristics (only asked to managers)
- Differences between TNL and TMX with respect to their strategic context (only asked to managers)
- Differences between TNL and TMX with respect to their cultural context

Do you have any questions before we start?

Personal characteristics

- Name?
- Function?
- Experience and previous functions?
- Educational background?
- Involvement in case projects in terms of task, activities and responsibilities?

Organisational characteristics

Strategy and goals

- Strategy, mission, aims for the future?
- Main products and services of the department?
- Core competencies/ weaknesses of the department?

Organisational arrangements

- Place in corporate organisation?
- Structure of the organisation and department?
- To what extent is authority concentrated at higher levels of management?
- To what extent are job behaviours and requirements written down into policies, rules and procedures?

People
- Number of employees working at the organisation and department (full time equivalent)?
- What is the average education level of these people?
- What is the nationality of these people?

Means
- What techniques, tools and methods are used at the department for software development?
- What techniques, tools and methods are used at the department for acquiring management information?

Activities
- In how many projects is the department involved in on average?
- In how many projects is the department involved in today?
- How is project work supported (technical, quality, competence)? What processes are in place? What is the CMM level of these processes?
- How is project work being evaluated/ rewarded? Which aspects of work are emphasised (quality, quantity, cost, speed and innovativeness)?

Differences in cultural context

For this question I would like you to think of the differences between TNL and TMX with respect to their way of working. What is different and how do these differences influence the collaboration?

- Communication values and practices
  - Are there differences in how subordinates report progress, problems and actions to superiors?
  - Are there differences in how managers lead subordinates?
  - Are there differences in the sensitivity of people to being checked upon or criticised?
  - Are there differences in the importance attached to courtesy (proper behaviour) in communication?
  - Are there differences in the issues that are normally reported?
  - Are there differences in the precision of work instructions?

- Time pacing values and practices
  - Are there differences in the planning horizon of managers?
  - Are there differences in the duration of meetings? Are meetings open-ended or do meetings have a fixed length?
  - Are there differences in status of commitments (deadlines)?
  - Are there differences in the punctuality of people?
  - Are there differences in the use of time plans?

Differences in strategic context

For this question I would like you to think of the differences between TNL and TMX with respect to their strategies and goals with the collaboration. What is different and how do these differences influence the collaboration?

Strategic goals

- Motives for the collaboration?
- Goals with the collaboration?
- Expectations of the collaboration?

Strategic significance

- What is the priority of the case projects in relation to other projects performed at the department?

Relative dependency

- How indispensable is one's partner for achieving one's goals?
- How complementary is one's partner with respect to technical competencies, availability of competent resources, access to markets and networks?

Closure

- Are there important things I have overlooked?
- Are there any other people you think I should talk to about this topic?

Thank you very much for your co-operation. At short notice the results of this research will be reported back to the company.

APPENDIX D:
PROCESS QUESTIONNAIRE

In this appendix the questionnaire used for conducting process interviews is outlined.

Introduction

These interviews are part of a case study aimed at obtaining insight into managing collaborative NPD. In this interview the focus is on the collaboration between TNL and TMX in the [project name]. The results of the interviews will be made anonymous and used to stimulate discussions on how to improve the collaboration between TNL and TMX. The main purpose of this interview is to gain insight into how the different project members and stakeholders view incidents that I believe significantly influenced the course of the [project name]. The structure of this interview is as follows. I will summarise an incident that I believe significantly influenced the course of the project. Subsequently I will ask you to comment on the questions I have related to this incident.

Do you have any questions before we start?

Critical incidents

The critical incidents listed in Table 33 below have been discussed with the project members and stakeholders of the case projects. The interviewees were presented with a description of the incidents, which was as neutral as possible.

Table 33: critical incidents discussed with project members

SINAP project	ISPV project
▪ Time planning problems ▪ Competence problems ▪ Steering problem ▪ Incentive problem ▪ Co-ordination problems ▪ Quality problem ▪ Collaboration problem ▪ Progress problems ▪ Control problem ▪ Test preparation problem	▪ Project staffing problems ▪ SSF support problems ▪ Test facility problems ▪ TCM support problems ▪ SCF support problems ▪ Time planning problem ▪ Collaboration problem ▪ Progress problems ▪ Control problem

- Is the description of the incident an accurate description of what has happened?
- How do you feel about what happened?
- How did this incident influence the project outcomes and collaboration?

Closure

- Are there any important incidents I have overlooked?

Thank you very much for your co-operation. At short notice the results of this research will be reported back to the company.

ABOUT THE AUTHOR

Edward Faber was born on 25 May 1969 in Nijmegen, the Netherlands. He received his secondary education at the Scholengemeenschap in Wijchen, Intermediate Technical College (MTS) in Nijmegen, and Higher Technical College (HTS) in Arnhem. He obtained his bachelor's degree in Mechanical Engineering in 1992. In the same year he started studying Technology and Society at the Eindhoven University of Technology. His master's thesis subject was in the field of public adminstration, studying the use of policy research conducted in European framework programmes by policy makers and advisors. In 1995 he obtained his master's degree in Technology and Society. From September 1995 to February 1997 he worked as a junior researcher at the Eindhoven University of Technology. He participated in several research projects, among which an explorative network study in the field of imaging technology for the Dutch Ministry of Economic Affairs. In February 1997 he started working as a Ph.D. researcher at the department of Technology and Organisation of the University of Twente. Apart from the research presented in this thesis he participated in the ESPRIT research project called FREE. Recently he joined the Telematics Institute, where he will work as a scientific researcher focusing on the organisational aspects of information and telecommunication technology.