Strategic momentum in virtual R&D project teams
a complement to management

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Strategic momentum in virtual R&D project teams
a complement to management

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de
Technische Universiteit Eindhoven, op gezag van de
rector magnificus, prof.dr.ir. C.J. van Duijn, voor een
commissie aangewezen door het College voor
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door

Raymond Julius Gerardus Opdenakker

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Preface

"Writing a book about someone is like dealing with a good friend: you have to go along with someone for a long time", according to the German philosopher Rüdiger Safranski at the end of December 2004 at the International School of Philosophy. These wise words also apply to the creation of a thesis. You need a more than average interest in the domain and the angle from which you study the domain. In my case it became not only a good friendship, but a passion. I hope this thesis will make this point clear.

This is the result of a long journey that has cost a lot of effort, but also has brought a lot of fun. Indeed, I have enjoyed the many doors that were opened with this endeavour. The many people I have met 'all over the planet', the exciting conferences, especially the congresses in Jiaozuo and Zhengzhou (PR of China), have made pearls at my life chain. Here, I want to thank the people who all in their own way have made their contribution to this endeavour. First Prof. Dr. Ir. Joan Ernst van Aken, who has taken the trouble to accompany this project. The many interesting and inspiring conversations I have had with him, have certainly increased the quality of this project. I also want to thank Prof. Dr. John Rijtman and Dr. Myriam Cloodt. A special word of thanks to Dr. Ir. Drs. Hans Berends who gave me the idea for a template to use for encryption and who pointed to Qualitative Comparative Analysis: ‘a good man at the right place on the right time!’.

Furthermore, I want to thank Prof. Dr. Charles C. Ragin, Prof. Dr. John Gerrichhauzen, Dr. Albert Kampermann, Dr. Maarten Vink, Drs. Olaf Hommel, Prof. Dr. Beatrice van der Heijden, Marion van den Heuvel and Bianca van Broeckhoven. Special thanks to all those people in Europe whom I could interview for this project. Unfortunately, over the years that I worked on this thesis also people physically disappeared out of my life. My mother died in March 2008, and in July 2010 at the age of 56 my talented cousin Peter 'de schrijvenaar' Ramakers died. Luckily, I still carry the memories with me.

Sisyphean has completed his task. He has rolled the stone up the mountain. The stone will role down again. It is time to find a new exciting challenge that motivates Sisyphian to push the stone up to the mountain again. A small 'challenge' can be fulfilled within a short time. In 1984, while traveling through Scotland, I have agreed with myself, when there is an exceptional opportunity to do this, to buy a bottle of whiskey. Not just a whiskey, but a bottle that is bottled on the island of Jura, belonging to the Scottish Hybrids, where Eric A. Blair, better known as George Orwell, in 1948 wrote his famous book "1984" in Barnhill. Now there is an opportunity, and I will open the bottle under appropriate conditions in my favorite hotel in Outre-Meuse in Liège, within walking distance of memorable sights of another great writer, George Simenon, together with my wife, business partner, but most of all my 'buddy' Carin. Many thanks to her for her unconditional support during this process.

The work is finished: "unpull the flags and let the pigeons loose". And please play "La Victoire est à nous"!

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1 ‘La Victoire est à nous’ was played during the Napoleontic Wars, under which the battle of Waterloo. The composer was David Buhl (1781-1860). Buhl wrote primarily for military musicians and, among other things, invented a metronome designed to standardise the tempos used by trumpeters in the French army to avoid confusion on the battlefield. With many thanks to Charles Lister. LinkedIn.
List of abbreviations

SM: Strategic momentum
TTI: Team task insight
E: Empowerment
CC: Collective commitment

leadpar: (absence of) dominant leading partner
CLEARPROP: (presence of) clear project proposal
PARTDEC: (presence of) participative decision making
know: (absence of) differences in knowledge
natcult: (absence of) difference in national cultural background
prof: (absence of) difference in professional background
fup: (absence of) follow up project
ORGSOC: (presence of) organisation of social activities
FEED: (presence of) feedback
TARE: (presence of) task reallocation
# Table of contents

**Chapter 1 Introduction**  
1. Research domain  
2. Field problem

**Chapter 2 Teams, their effectiveness and strategic momentum**  
1. Introduction  
2. Team definitions  
3. Effectiveness of teams: a definition  
4. Critical success factors for a virtual team  
   4.1. Team inputs  
   4.1.1 Team roles  
   4.1.2 Team composition  
   4.2. Team processes  
   4.2.1 Team building  
   4.2.2 Process losses  
   4.2.3 Trust  
   4.2.4 Life cycle  
   4.2.5 Communication  
   4.2.6 Knowledge transfer  
   4.2.7 Management  
   4.2.8 Team cohesiveness  
   4.3. Team outcomes  
   4.4. Moderators of virtual team performance  
   4.4.1 Team tasks  
2.5. Conclusions

**Chapter 3 Research model, question and design**  
1. Introduction  
2. Strategic momentum  
   2.1. History of the concept of momentum  
   2.2. The origins of the concept momentum  
   2.3. Strategic momentum in the academic management literature  
   2.4. Strategic momentum in virtual teams  
   2.5. Measuring strategic momentum  
   2.6. A special case of momentum: team flow  
3. Research model  
4. Research questions  
5. Design science research  
   5.1. Definition  
   5.2. Historical background  
   5.3. Paradigmatic starting points  
   5.4. Design propositions  
6. Research strategy  
   6.1. Scoping  
   6.2. Strategy for within-case analyses  
   6.3. Strategy for cross-case analysis  
   6.4. Validation  
7. The case studies  
8. The within-case analysis  
9. The cross-case analysis  
   9.1. Introduction
Chapter 4 Case studies

4.1. Introduction

4.2. Dewey case

4.2.1. Project structure

4.2.2. Within-case analysis: The emergence and sustenance of strategic momentum

4.2.3. Commentary

4.3. Goa case

4.3.1. Project structure

4.3.2. Within-case analysis: The emergence and sustenance of strategic momentum

4.3.3. Commentary

4.4. Print case

4.4.1. Project structure

4.4.2. Within-case analysis: The emergence and sustenance of strategic momentum

4.4.3. Commentary

4.5. Berlin case

4.5.1. Project structure

4.5.2. Within-case analysis: The emergence and sustenance of strategic momentum

4.5.3. Commentary

4.6. Paris case

4.6.1. Project structure

4.6.2. Within-case analysis: The emergence and sustenance of strategic momentum

4.6.3. Commentary

4.7. Lisbon case

4.7.1. Project structure

4.7.2. Within-case analysis: The emergence and sustenance of strategic momentum

4.7.3. Commentary

4.8. Jiaozuo case

4.8.1. Project structure

4.8.2. Within-case analysis: The emergence and sustenance of strategic momentum

4.8.3. Commentary

4.9. Groningen case

4.9.1. Project structure

4.9.2. Within-case analysis: The emergence and sustenance of strategic momentum

4.9.3. Commentary

4.10. Conclusions

Chapter 5 Emergence and sustenance of strategic momentum

5.1. Introduction

5.2. Presentation of hypotheses

5.3. Description of the projects

5.4. Relation Team task insight, Empowerment and
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

6.1. Introduction

6.2. Emergence of team task insight, empowerment and collective commitment
   6.2.1. Team task insight
   6.2.2. Empowerment
   6.2.3. Collective commitment

6.3. Sustenance of team task insight, empowerment and collective commitment
   6.3.1. Team task insight
   6.3.2. Empowerment
   6.3.3. Collective commitment

6.4. Conclusions concerning the research question in this chapter

6.5. Design proposition

Chapter 7 Conclusions and discussion

7.1 Conclusions
   7.1.1. Research questions and answers
   7.1.2. Conclusions concerning strategic momentum and team objectives

7.2 Practical implications

7.3 Discussion

7.4 Final remark

Appendices

References

Samenvatting (in Dutch)

Summary

Author's Curriculum Vitae
Chapter 1 Introduction
Chapter 1 Introduction

1.1. Research domain
Teams are important in and between organisations for a long time. The importance was for example stressed by the research in the Bethlehem Steel Company in the thirties of the twentieth century, the so-called Hawthorn experiments. It became clear in these studies that employees need a group identity and social relations in their worksituation (Kampermann, 1992). This group identity is an important factor concerning work motivation and productivity (McGregor, 1960). So, by paying attention to and/or forming a team, the management could increase productivity. During the eighties and nineties of the last century, the popularity of teams increased once again. Prime reason for this revival was that organisations wanted to contend with the growing complexity of the environment in which their employees operate (Salas, E., Sims, D.E., & Burke, C.S., 2005). A complex environment can create complex problems. Solving complex problems is done in teams where team members (can) have a variety of backgrounds and/or points of view, education, expertise, or political/social orientation (Beers, 2005). Furthermore, teams have the potential to offer greater adaptability, productivity, and creativity than any one individual can offer (Gladstein, 1984; Hackman, 1987) and provide more complex, innovative, and comprehensive solutions to organisational problems (Sundstrom, DeMeuse, & Futrell, 1990). Of course, the over all factor of establishing teamwork is to get results, c.q. being effective.

Since some time, there is also a movement from face-to-face (also called real or collocated) teams to virtual (also called distributed) teams within and between organisations. Virtual teams (or as will be specified below: virtual R&D project teams consisting of team members from different organisations) form the domain of this research. Virtual teams are not new. Think for example about the cooperation between universities on scientific projects, for which telephone and traditional post was used mostly for communication. But virtual teams are becoming more popular. According to Townsend, DeMarie, and Hendrickson (1998) this movement to virtual teams, or their increasing popularity, is primarily caused by five specific factors, which are as follows:

1. the increasing prevalence of flat or horizontal organisational structures.
2. the emergence of environments that require interorganisational cooperation.
3. changes in workers' expectations of organisational participation. This needs some more explanation. More and more, people do not see why they have to travel to and be in the office every day, as they can do their work from another place – for example home - too. One of the ways to establish this is to make it possible for these employees to participate in virtual teams.
4. a continued shift from production to service/knowledge work environments.
5. the increasing globalisation of trade and corporate activity.

Beside these causes, we can also mention some specific benefits (without being exhaustive) that have a positive influence on the use of virtual teams. In the first place, when team members work mostly from their own home (teleworking), using virtual teams can cut office-space costs (Cascio and Shurggailo, 2003). In the second place it can cut time and travel costs (Cascio and Shurggailo, 2003). In the third place the team can get access to and therefore consist of experts, distributed all over the world (Konradt and Hertel, 2002). And in the fourth place the potential to produce high-quality, innovative solutions at lower costs by using virtual teams offers organisations a competitive advantage (Cohen and Gibson, 2003). It is obvious that virtual teams are becoming even more popular during the coming years, because ‘so rapid has been the evolution of this approach to working that it has been recently estimated that upward of 60% of managers spend time working as part of a geographically separated virtual team’ (Cordery and Soo, 2008, p. 487).
But not every team is equal to any other team. A management team differs significantly from a team of operators in a plant. So, different types can be distinguished, depending on the criterium one uses for making the distinction. Distinguishing different types of virtual teams, Duarte and Tenant Snijder (2001) present seven basic types of virtual teams. These are as follow:

- **Networked teams**
  A networked virtual team consists of individuals who collaborate to achieve a common goal or purpose. There typically is a lack of clear definition between a network team and the organisation, in that membership frequently is diffuse and fluid, with team members rotating on and off the team as their expertise is needed. Team members may not even be aware of all the individuals, work teams, or organisations in the network.

- **Parallel teams**
  Parallel virtual teams carry out special assignments, tasks, or functions that the regular organisation does not want or is not equipped to perform. A parallel team is a different form of a networked team because it has a distinct membership that identifies it from the rest of the organisation. It is clear who is on the team and who is not.

- **Project or product-development teams**
  Virtual project and product-development teams can also cross time, distance, and organisational boundaries. Team members conduct projects for users or customers. Their tasks usually are nonroutine, and the results are specific and measurable. A typical result is a new product, information system, or organisational process. The difference between a project team and a parallel team is that a project team usually exists for a longer period of time and has a charter to make decisions, not just recommendations.

- **Work or production teams**
  Virtual work teams and production teams perform regular and ongoing work. Such teams usually exist in one function, such as accounting, finance, training, or research and development. They have clearly defined membership and can be distinguished from other parts of the organisation.

- **Service teams**
  Virtual service teams have as an objective to provide service of sufficient quality that customers, who have a choice of providers, will continue to do business with the team and the organisation. Team members have to be very attentive to and concerned with the satisfaction of their customers with their services (Hackman, 1990).

- **Management teams**
  Today, many management teams are dispersed across a country or around the world but work collaboratively on a daily basis.

- **Action teams**
  Such teams offer immediate responses, often to emergency situations.

In this research, we focus on project or product-development teams, or better: the domain of this research is virtual R&D project teams consisting of team members from different organisations. With a virtual R&D project team we mean a virtual team that deals with a R&D project, characterised by a fixed deadline and the creation of new knowledge. We have chosen for this domain because of the following reasoning. A stand still in our economic system is seen as going backwards. Therefore, continued innovation is an important force behind economic progression. Nowadays, innovation is more and more accomplished in settings of multidisciplinar cooperation. A virtual research and development project team is a
form of cooperation that plays an important role in these innovation processes, because the outcome of research and development is often an innovation.

1.2. Field problem
Management at a distance is of all times. During the Dark ages, in what we now call to a great extent ‘Germany’, there was the phenomenon of the ‘Reisekönigtum’ (Bernhardt, 1993; Hermann, 2000). In those times there was no capital, as we know it now, from which the emperor could rule his empire. Instead, the emperor, for example Charlemagne, went to different places in his empire to rule. At these places, palaces were built (the ‘Pfalz’). The ‘Reisekönigtum’ led to a better overview over the empire. At the same time it gave the possibility to manage the local rulers. In this way, the empire could be held together. The emperor had to go to the local rulers, because in those days ruling was established by personal interaction. In this way, the emperor hoped that the local rulers would do something with the instructions given at their meetings. But he could only control this when he was back visiting the local ruler again. And this was certainly not done on a monthly basis! Not only, because the emperor had to visit at least sixty local rulers, but also because it was only possible during a short period each year to feed all the people that accompanied the emperor from ‘Pfalz’ to ‘Pfalz’. Another example of management at a distance in history is the Dutch East India Company, the VOC. As van Aken et al (1998, p. 306) state ‘It was founded in 1602 as a Virtual Company, in which the trade interests of the various partner-towns were combined and their power carefully balanced’. The VOC was governed by the ‘Heeren XVII’. The meetings of these ‘Heeren XVII’ were first held twice a year, and later three times a year. These meetings lasted for some weeks (!), in which the ‘Heeren XVII’ made a list of products which had to be imported from Asia, the number of ships that would be send to Asia, the amount of goods used for trade in Asia etc. In Batavia (Indonesia), the VOC was governed by the ‘Hooge Regering’. This was a sort of management layer functioning under the ‘Heeren XVII’. On the basis of the fact that it lasted for about nine months before instructions from the ‘Heeren XVII’ arrived at Batavia, the ‘Hooge Regering’ was to a great extent autonomous.

This research is inspired by a field problem. Van Aken (forthcoming, p. 610) defines a field problem as ‘a situation in reality which, according to influential stakeholders, can or should be improved.’ So, what is the field problem concerning virtual project teams? To explain this problem, just look at the examples mentioned before. In those times (at the ‘Reisekönigtum’ and the VOC), the ruler(s) hoped that the local rulers would do something with the instructions given. Nowadays, managers who have to manage their (team) members from a distance implicitly think that their instructions are certainly acted upon by their (team) members. The distance between the manager and his (team) members should not be a problem. But it does!

Konradt and Hertel (2002, p. 9) say that there is sceptis among middle- and linemangement concerning virtual cooperation, because ‘they complain about the absence of instruments for leading and steering of the ‘invisible employees’. A survey concerning problems of managers and employees after implementation of teleworking made clear that 53% of the managers had difficulties with leadership (Konradt and Hertel, 2002, p. 28). Although this survey was about managing teleworkers, I suppose that for ‘managing teleworkers’ one can also read ‘managing (a) virtual team (members)’, because in both cases we can talk about ‘invisible employees’. So, it is difficult for a manager to manage the team from a distance, because the manager has to deal with ‘invisible employees’ whom he only sees face-to-face to a limited extend, on the basis of the geographical distance. Moreover it is more difficult to mutually adjust the work-at-hand from a distance, when two or more people who are geographically dispersed are working together. An important consequence is decreased effectivity. It also increases vulnerability of such a team.

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2 The word ‘Pfalz’ is derived from the Latin word paladium, which means ‘Palace’.
Virtual teams are especially difficult to manage when interferences occur. In virtual teams, interferences of all kinds can occur. For example when:
- a team member can not do his task on the basis of illness.
- a team leader has to be replaced.
- a team member has to be replaced.
- an organisation goes bankrupt (in case of a multi-organisational virtual team).
- a part of the team is developing a tool that does not fit with the project description.

These interferences can frustrate the continuity of a project, which is under construction of a virtual team, and therefore its effectivity. In the most negative case these interferences can lead to a cancelling of the virtual team, before the project has ended successfully. This problem is probably higher for a virtual team than for a collocated team, on the basis of a lack of face-to-face interactions between virtual team members and the team manager or as stated before, on the basis of the ‘invisible employees’.

Therefore, the field problem in this thesis is as follows:

*How can a virtual R&D project team become more effective, although it has to be managed from a distance?*

This problem was also (and already!) acknowledged by Kerr and Jermier (1978) in their ‘substitutes for leadership’ theory. In this theory, they make a distinction between ‘neutralizers’ and ‘substitutes’ for leadership. They defined leadership neutralizers as moderator variables which ‘…paralyze, destroy, or counteract the effectiveness of something else. In the context of leadership this term may be applied to the characteristics, which make it effectively impossible for relationships and/or task-oriented leadership to make a difference (Kerr and Jermier, 1978, p. 395). Unlike substitutes, neutralizers do not replace the leader’s behavior and, as a result, may be said to produce an ‘influence vacuum’” (Podsakoff et al, 1993, p. 2). A neutralizer makes leadership in part or totally ineffective. An important neutralizer Kerr and Jermier distinguish is that the influence of the leader is neutralised when located apart from his/her subordinates (with only limited communication possible), producing an ‘influence vacuum’ (Podsakoff et al, 1993).

Kerr and Jermier (1978, p. 395) defined leadership substitutes as ‘a person or thing acting or used in place of another. In context, this term may be used to describe characteristics, which render relationship and/or task-oriented leadership not only impossible but also unnecessary’. A leadership substitute replaces in part or totally the function of leadership. Therefore, I emphasize the word ‘unnecessary’ strongly above the word ‘impossible’ in the definition of Kerr and Jermier.

In table 1.1, the substitutes and neutralizers are presented, based on the work of Kerr and Jermier (Yukl, 1989, p. 109).
In this research the main question is how a virtual R&D project team can become more effective. A possibility to increase the effectivity of a virtual R&D project team is to create and sustain a team that is ‘self-propelled’ and resilient. A team that knows exactly what the objectives of the project are and is committed (motivated) and empowered to such an extent that they don’t stop until they have reached these objectives successfully. To make a team more ‘self-propelled’ and resilient, I introduce strategic momentum, which can be defined as ‘perseverance of goal-oriented behavior’. This strategic momentum can be seen as a new ‘substitute for leadership’, which is not mentioned by Kerr and Jermier (see table 1.1).

In this study, I analyse how virtual R&D project teams can become more effective. A possibility to increase the effectivity of a virtual R&D project team is to create and sustain a team that is ‘self-propelled’ and resilient. A team that knows exactly what the objectives of the project are and is committed (motivated) and empowered to such an extent that they don’t stop until they have reached these objectives successfully. To make a team more ‘self-propelled’ and resilient, I introduce strategic momentum, which can be defined as ‘perseverance of goal-oriented behavior’. This strategic momentum can be seen as a new ‘substitute for leadership’, which is not mentioned by Kerr and Jermier (see table 1.1).

Applied to virtual R&D project teams strategic momentum, as a substitute for leadership, can help to decrease or even solve the field problem by increasing the effectivity of the virtual R&D project team. Research (Podsakoff et al., 1993) indicates that it has become clear that substitutes have a cumulating effect on leadership behavior. So the effect of leadership behavior is increased by the substitutes. Therefore, I see strategic momentum as complementary to management (especially leadership), and not as a pure substitute.

To investigate strategic momentum, I analysed eight virtual R&D project teams as case studies. Six out of these eight case studies are European virtual R&D project teams. Three European case studies (Dewey, Goa and Print projects) are financed by the EU. Three other European case studies (Berlin, Lisbon and Paris projects) are financed by the national governments of their participating organisations. All the former mentioned case studies were ex-post case studies, as was the Jiaozuo case study, which was a Dutch project. The eighth case study (Groningen project) was also a Dutch project, but as opposed to the other case studies this was a longitudinal study. Each case was carefully qualitatively analysed, to obtain

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3 Here, resilience at the level of teams is defined as positive behavioral adaptation of the team with the aim to bounce back to its pre-disruption level after negative ‘critical incidents’.
information concerning strategic momentum. Then, a cross-case analysis was conducted with crisp set Qualitative Comparative Analysis.

This thesis is organised as follows. In chapter 2, first definitions are given concerning concepts as ‘team’, ‘virtual team’ and ‘effectivity’. Then, on the basis of a literature study, factors that have their influence on effectivity in virtual (and collocated) teams will be looked at in depth. As a ‘framework’ the input-processes-outcomes (I-P-O) model (Hackman & Morris, 1975) is used. In chapter 3 strategic momentum will be explained in detail. First I will look at the history of the concept of momentum, and what has already been written in academic literature about this concept. Then the concept of strategic momentum will be presented in relation to virtual R&D project teams. After defining the concept of strategic momentum in virtual teams, a way is discussed in which strategic momentum can be measured in virtual teams. After studying and defining strategic momentum, the research model and research questions will be presented. For conducting the research, the used research approach in this dissertation is Design Science Research, which will be introduced in-depth. After explaining the research strategy, the eight forementioned case studies will be presented. Also the methodology of the within-case analysis and the methodology of the cross-case analysis are discussed. The within-case analyses of the eight conducted case studies concerning virtual R&D project teams are presented in chapter 4. Then, in chapters 5 and 6, I present the cross-case analysis. Chapter 7, in the end, deals with the conclusions and discussion.
Chapter 2 Teams, their effectiveness and strategic momentum

2.1. Introduction
In the former chapter we introduced the research domain and the field problem. Emerging and sustaining strategic momentum in a virtual R&D project team can probably solve the field problem I am interested in. Eventually, this strategic momentum can increase the effectivity of the virtual R&D project team. But first I will discuss teams and their definition in this chapter. Second, the concept ‘effectivity’ will be discussed. Third, I will look in the literature which critical success factors are found in research, mainly of virtual teams, having their influence on the effectivity.

This chapter is to a great extent based on literature research. For searching literature, mainly five sources were used. In the first place the PICA system, which is a collaboration in the Netherlands between most university libraries, libraries from universities of applied sciences and public libraries. PICA can also give access to article titles in (international scientific) magazines. Articles can be selected on words in the title, or using keywords. This source was used mostly by me. Keywords as 'virtuele teams' (Dutch), 'virtuelle teams' (German) and 'virtual teams' were used to obtain results concerning virtual teams. The second source was the internet. By using Google, and fill in specified words, I could also find relevant literature, and even whole articles. In the third place by looking at the literature list at the end of relevant scientific articles. In this way, a lot of relevant articles concerning collocated teams were obtained. In the fourth place conference papers and working papers or unpublished papers. And in the fifth place personal requests to knowledgeable researchers and/or practitioners.

2.2. Team definitions
There are a lot of definitions concerning (collocated) teams in literature. Some definitions were analysed in literature to develop my own definition (see table 2.1).
Chapter 2 Teams, their effectiveness and strategic momentum

<table>
<thead>
<tr>
<th>Source</th>
<th>Definition and characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sundstrom et al. (1990)</td>
<td>The definition of a team is a collection of individuals who interact more extensively than group members to produce a deliverable, who are evaluated based on the team outcome, and who are accountable as a team (instead of or in addition to individual accountability) for team outcomes.</td>
</tr>
<tr>
<td>Adair (1987)</td>
<td>Fulfilling a common task where (the team) members are complementary to each other.</td>
</tr>
<tr>
<td>Amelsvoort, Pierre van et al. (2003)</td>
<td>Common responsibility: the team is at issue and not the individual. Result oriented: the responsibility of the team is not expressed in terms of a task, but in the result, which is a product or service with demands made by the customer.</td>
</tr>
</tbody>
</table>
| Kapteyn, L.J. (1992)                        | - Team members maintain direct contact with each other concerning important questions. They form a group.  
  - This group is a deliberate cooperation with a certain objective: she forms an organisation entity.  
  - The members of a team are as a collective responsible for the way in which the common objective is achieved. There is a small distance between control and implementation.  
  - Mutual task division and thereby the necessary coordination come about by direct communication and demand the necessary mutual adaptation. |
| Arnold, J. et al. (1998)                    | A group of people who work together towards group objectives                                                                                                                                                                  |
| Katzenbach, J.R. and D. Smith (1998)        | A team is a small number of people with complementary skills who are committed to a common purpose, performance goals, and working approach for which they hold themselves accountable.                                               |
| Martin Cruz, Natalia (2005)                 | 'Team' refers to individuals with very structured tasks. Their roles are completely specified and their interactions too.                                                                                                     |
| Vermeulen and van Hooft (1997)              | Organisational aspects of teams  
  - A team has its own task domain. Within this domain one can speak of a strong interrelationship between the activities which take place. Within the boundaries of the task domain the team can operate relatively autonomous, and one can speak about one or more collective end products.  
  - A team is to a minimal extent dependent of a direct manager and all kinds of preparative and supportive departments.  
  - In a team, team members can be put on different tasks  
  - A team needs a minimal number of members, for not being too vulnerable. As a norm a minimum of six and a maximum of twelve members is normal. A precondition for the good functioning of teams is the ‘multi-deployability’ of team members.  
  - Social-psychological aspects of teams  
  - The team members feel together responsible for their tasks  
  - Team members solve their own conflicts. Interpersonal skills are of a high level and members give each other feedback concerning their attitude and behaviour  
  - There is a high amount of cohesion between the team members  
  - Decision making takes place on the basis of consensus  
  - The teams also solve conflicts with other teams or departments |
| Guzzo & Dickson (1996)                      | A work team is a group of individuals with shared responsibilities who work interdependently to solve problems or carry out tasks                                                                                               |

Table 2.1. Overview of definitions and characteristics of teams
Concerning the definitions of teams, the characteristics that are mentioned above are as follows:

- A collection of individuals.
- Individuals are complementary to each other.
- The interaction is more extensively than group members (or better: ‘out-team’ members).
- A deliberate cooperation.
- Team members solve their own conflicts.
- Interpersonal skills are of a high level and members give each other feedback concerning their attitude and behaviour.
- It has its own task domain.
- Fulfilling a common task.
- Individuals with very structured tasks.
- To produce a deliverable.
- Result oriented.
- Evaluated based on the team outcome.
- Accountable as a team (instead of or in addition to individual accountability) for team outcomes.
- To a minimal extent dependent of a direct manager and all kinds of preparative and supportive departments.
- There is a high amount of cohesion between the team members.
- Decision making takes place on the basis of consensus.
- The teams also solve conflicts with other teams or departments.

The characteristics 'fulfilling a common task', 'to produce a deliverable', and 'result oriented', refer to the same: 'to fulfil a common task (or objective)'.

The characteristic ‘individuals are complementary to each other’ is not a defining characteristic, because team members who are not complementary can still form a team.

The characteristic ‘a high amount of cohesion between the team members’ is not a defining characteristic, because between group members – whereas the definition of a (face-to-face) group is ‘two or more individuals who interact and influence each other’ (Smith and Mackie, 2000, p. 330) - there can also be a high cohesion (for example football supporters of one football team), and between team members there can also be a low cohesion.

Concerning this discussion, the definition of a team to be used in this thesis is:

A team is a cooperation between a collection of individuals that is oriented to fulfil a common objective, for which they are accountable as a whole instead of or in addition to individual accountability.

Additional characteristics that can occur, but do not determine a team, are as follows:

Organisational aspects of teams
- Minimally dependent of a direct manager and all kinds of preparative and supportive departments (especially when dealing with a self-steering team)

Social-psychological aspects of teams
- Decision making takes place on the basis of consensus
- The interaction is more extensively than ‘out-team’ members
- Team members solve their own conflicts
- The teams also solve conflicts with other teams or departments

As we have seen in chapter 1, there is also a movement from face-to-face (also called real or collocated) teams to virtual (also called distributed) teams.
Chapter 2 Teams, their effectiveness and strategic momentum

As is the case with (collocated) teams, there are a lot of definitions concerning virtual teams in literature. Also in this case some definitions were analysed in the literature to develop my own definition (see table 2.2).

<table>
<thead>
<tr>
<th>Source</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bosch-Sijtsema, Petra M. and Sonja Rispens (2003)</td>
<td>Virtual Teams (VT) are characterized by geographical dispersion, use of IT for communication, the members have little history, the members have organisational and cultural heterogeneity and members have lateral and weak relationships (Wong &amp; Burton, 2000).</td>
</tr>
<tr>
<td>Jarvenpaa, Sirkka L. (1998), (Kristof et al., 1995):</td>
<td>we define a global virtual team to be a temporary, culturally diverse, geographically dispersed, electronically communicating working group</td>
</tr>
<tr>
<td>Kirkman, Bradley L., Benson Rosen, Cristina B. Gibson, Paul E. Tesluk, Simon O. McPherson (2002),</td>
<td>Virtual teams are groups of people who work interdependently with shared purpose across space, time, and organisation boundaries using technology to communicate and collaborate. Virtual team members may be located across a country or across the world, rarely meet face-to-face, and include members from different cultures. Many virtual teams are cross-functional and emphasize solving customer problems or generating new work processes. Virtual work allows organisations to combine the best expertise regardless of geographic location</td>
</tr>
<tr>
<td>Manheim, Marvin l. and Mary Beth Fritz (1998)</td>
<td>We define virtual work as 'interdependent work activities performed by a group of individuals who spend some time working in different physical locations'</td>
</tr>
<tr>
<td>Townsend, Anthony M., Samuel M. DeMarie, Anthony R. Hendrickson (1998)</td>
<td>Virtual teams are groups of geographically and/or organisationally dispersed coworkers that are assembled using a combination of telecommunications and information technologies to accomplish an organisational task. Virtual teams rarely, if ever, meet in a face-to-face setting. They may be set up as temporary structures, existing only to accomplish a specific task, or may be more permanent structures, used to address ongoing issues, such as strategic planning. Further, membership is often fluid, evolving according to changing task requirements</td>
</tr>
<tr>
<td>Zaccaro, Stephen J. and Paige Bader (2003)</td>
<td>The differences between virtual teams and face-to-face teams reside in two key features. 1. members of a virtual team work either in geographically separated work places, or they may work in the same space but a different timezone 2. the interactions among team members occur through electronic communication channels</td>
</tr>
<tr>
<td>Zigurs, Ilse (2003)</td>
<td>We define a virtual team as a collection of individuals who are geographically and/or organisationally or otherwise dispersed and who collaborate via communication and information technologies in order to accomplish a specific goal.</td>
</tr>
<tr>
<td>Cohen, Susan G. and Cristina B. Gibson (2003), ‘In the beginning’, in: Cristina B. Gibson and Susan G. Cohen (2003)</td>
<td>To be considered virtual to some degree, a team must have the following three attributes: 1. It is a functioning team - a collection of individuals who are interdependent in their tasks, share responsibility for outcomes, see themselves and are viewed by others as an intact social unit embedded in one or more social systems, and collectively manage their relationships across organisational boundaries (Hackman, 1987; Alderfer, 1977) 2. The members of the team are geographically dispersed 3. The team relies on technology-mediated communication rather than face-to-face interaction to accomplish their tasks</td>
</tr>
</tbody>
</table>

Table 2.2. Overview of definitions of virtual teams

Concerning the definitions of virtual teams, the characteristics that are mentioned above are as follows:
- Geographical dispersion.
Chapter 2 Teams, their effectiveness and strategic momentum

- Use of Information Technology (IT) for communication.
- Members have little history.
- Members have organisational and cultural heterogeneity.
- Members have lateral and weak relationships.
- Groups of people who work interdependently with shared purpose.
- Virtual teams rarely, if ever, meet in a face-to-face setting.
- They may be set up as temporary structures, existing only to accomplish a specific task, or may be more permanent structures, used to address ongoing issues, such as strategic planning.
- Membership is often fluid, evolving according to changing task requirements.

The use of IT, or ICT, for communication in and between organisations and teams has become well spread during the last decade. Therefore, it is not a distinguishing characteristic anymore concerning virtual teams. Virtual teams can also be formed with members of the same organisation. For example the Open University in the Netherlands uses virtual teams to accomplish specific tasks, where members of the team are spread over the Netherlands and Belgium. So, organisational heterogeneity is not a distinguishing characteristic. National cultural heterogeneity is also not a distinguishing characteristic of virtual teams. Virtual teams can also consist of members with the same cultural background.

Concerning this discussion, the definition of a virtual team to be used in this thesis is:

A virtual team is a team characterised by geographical dispersion of the members, who rely only to a limited extent on face-to-face communication.

Additional characteristics that can occur, but do not determinate a virtual team, are as follows:
- Use of IT-enabled communication.
- Organisational and cultural heterogeneity.
- Distributed ownership.
- They may be set up as temporary structures, existing only to accomplish a specific task, or may be more permanent structures, used to address ongoing issues, such as strategic planning.
- Membership is often fluid, evolving according to changing task requirements.

But, as I can argue, a collocated team does not always make use of face-to-face contacts to communicate. They can also make use of other communication media as telephone or e-mail. And, as we can derive from the definition, a virtual team can also make use of face-to-face contacts to communicate. To deal with this problem, Cohen and Gibson (2003) see ‘virtuality’ as a continuum. According to them, there are two distinct criteria that makes a virtual team ‘virtual’: ‘geographical dispersion of the team members’ and ‘the use of technologically mediated communication’. Although I agree with the first criteria, I do not with the second one. Instead of ‘the use of technologically mediated communication’, I would prefer ‘the use of other communication media than face-to-face communication’.

Here, I can say that in this research there is also deliberately chosen for virtual R&D project teams, consisting of members from different organisations and in a lot of cases from different countries, to be sure of the geographical dispersion. So I dealt with virtual R&D project teams that had a high degree of ‘virtualness’.

As we already saw in chapter 1, the domain of this thesis are virtual R&D project teams consisting of team members from different organisations. I have presented the definitions of collocated teams and virtual teams. Now I will look at the definition of virtual R&D project teams. The Organization for Economic Co-operation and Development defines R&D as ‘creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of (hu)man, culture and society, and the use of this stock of knowledge
to devise new applications’ (Organization for Economic Co-operation and Development, 2008, p. 156). A project team is a team that usually has a fixed deadline.

So, the definition of a virtual R&D project team is:

A virtual R&D project team is a virtual team that deals with a R&D project, characterised by a fixed deadline and the creation of new knowledge.

2.3. Effectiveness of teams: a definition

In the literature concerning organisations, an organisation is seen as ‘effective if it can (1) secure scarce and valued skills and resources from outside the organization (external resource approach); (2) creatively coordinate resources with employee skills to innovate products and adapt to changing customer needs (internal systems approach); and (3) efficiently convert skills and resources into finished goods and services (technical approach)’ (Jones, 2007, p. 15). For the evaluation of this effectivity, goals can be set for each of the three approaches mentioned before, which can be measured. So, although effectivity can not be measured directly, it can be measured indirectly by measuring the output (performance).

Much literature concerning teams uses the word effectiveness, without defining it explicitly. Mostly, the word ‘effectiveness’ is a synonym of the word ‘success’ or ‘performance’. In the sparse team literature, where team effectiveness is defined, it consists of two factors: performance and satisfaction (Gladstein, 1984), or three factors: performance, satisfaction and competences (Hackman, 1983; Choi, 2002; Gibson & Cohen, 2003).

Hackman (1983) for example suggests to define group effectiveness as a multidimensional construct consisting of three factors. These are as follows:

a. degree to which the group's products or services meet the standards of quantity, quality and timeliness of those who receive, review and/or use the output (performance).

b. degree to which the group's work processes enhance the capability of members to work together interdependently in the future (competences)

c. degree to which the group’s experience contributes to the growth and personal well being of team members (Hackman & Walton, 1986) (satisfaction).

This definition is based on collocated teams. When dealing with virtual teams, beside these three factors, a fourth one can be added to the definition (Furst, Blackburn and Rosen, 1999). This factor is as follows:

- degree to which the team's process and outcomes can be captured electronically, stored and retrieved as needed to contribute to increased levels of organisational knowledge and learning for future teams.

In this thesis, with the effectivity of a team is meant its ability to realise a desired outcome. So, this comes up to the first factor of Hackman (1983), mentioned above. Effectivity is not measured directly, but indirectly by measuring the output (performance).

2.4. Critical success factors for a virtual team

The concept of critical success factors was originally developed by D. Ronald Daniel from McKinsey and company (Daniel, 1961). The concept was developed further and then popularised at the end of the eighties of the last century by Jack F. Rockart of the Sloan management school (Rockart, 1986). BNET Business Dictionary (http://dictionary.bnet.com/definition/critical+success+factor.html) defines a critical success
factor as ‘an element of organizational activity which is central to its future success’. Translated to a (virtual) team, I define critical success factors as ‘an attribute of the internal or external environment of a team, which has an important influence on the effectiveness of the (virtual) team’. In this way, I see success factors as preconditions to increase the effectiveness of (virtual) teams.

This section is mainly focused on virtual teams. The literature concerning collocated teams is used to fill up the gaps of theory concerning different aspects of teams. Besides filling up these gaps, the literature on collocated teams is also used to stress the differences between virtual teams and collocated teams on different variables. Instead of ‘collocated teams’, some researchers call them 'face-to-face teams'. We do not use this term here, because it is also possible that members of a virtual team have (regular) face-to-face contact. And instead of ‘virtual teams’, some researchers call them ‘distributed teams’. We also do not use this term here, to prevent confusion.

To categorise the diverse items (or variables) concerning teams, the input-processes-outcomes (I-P-O) model (Hackman & Morris, 1975) is used. A lot of research has been conducted to see whether a factor works positive or negative on the effectivity of collocated or virtual teams. Concerning team inputs, team composition (Hackman, 1983; Gladstein, 1984) and team roles (Blackburn, Furst, and Rosen, 2003) can be seen as critical success factors. Concerning team processes, teambuilding (Duarte & Tenant Snyder, 2001), process losses (as a mediator (Hackman, 1983)), trust (Duarte & Tenant Snyder, 2001), communication (Gladstein, 1984), management (Gladstein, 1984; Duarte and Tenant Snyder, 2001), knowledge transfer and team cohesiveness can be seen as critical success factors. Lifecycle was not mentioned in the effectivity model as critical success factors. Although it is not a critical success factor, I will look what influence the lifecycle has on effectivity. Concerning the team outcomes, no critical success factors can be presented, because in section 2.3. we stated that ‘with the effectivity of a team is meant its ability to realise a desired outcome’. Hackman and Morris (1975) present also some ‘moderators of virtual team performance’. As a moderator, team tasks (Gladstein, 1984) can be seen as a critical success factor.

2.4.1. Team inputs
The team inputs represent starting conditions of a team, such as member personalities, knowledge, skills and tasks (Martins et al., 2004). Therefore, in this section team roles and team composition will be discussed.

2.4.1.1 Team roles
From research in collocated teams we know that several, sometimes even contradictory, skills can be used in a team. Each person bears knowledge and his own worldview. In this way, a team can easily adapt to a changing environment (Beuving, 1998). But research also points out that the effectivity of teams is best improved by mutual (positive) dependance of team members (Johnson & Johnson, 1989). One can obtain positive interdependence in different ways, which also can reinforce each other when used at the same time. One of these ways is Positive role-interdependency (Prein, H., 1992). Here, it is the intention that the team members obtain complementary and connected roles, which are all essential for the functioning of the team. A theory that is used in many organisations for the composition of teams, and in which attention is paid to these different roles, is the ‘team role management’ of Belbin (1981). The basic idea of this team role theory is that a team must be able to do different things to be effective. According to Belbin there are eight different team roles needed to be able to function in an optimal way as a team, which are as follows:
- caretaker
- group worker
- former
- chairman
- planner/innovator
- monitor
- co-ordinator
- source researcher/networker

In short, the theory of Belbin has propositions that are as follows:
- Behaviour in organisations is determined by three factors: skills and experience (professional content role), hierarchical position (organisational role) and personality (team role) (Also see: Vermeulen & van Hooft, 1997).
- Of the eight mentioned team roles, every person can execute two or three roles without any problem.
- For an effective team people with different qualities are needed, so the team can adapt well in different circumstances.
- In a good functioning team there is a balance between the team roles.
- Team members must investigate their own strong and weak points and accept them.

There is enough support from personality literature for the stability of personality to support the idea of team roles from Belbin. Although the team role theory of Belbin can be useful in collocated teams, we do not know if this also is true for virtual teams. Future research must find this out.

2.4.1.2 Team composition
Concerning team composition, most researchers make a distinction between heterogeneous and homogeneous teams (Mello and Ruckes, 2006). Heterogeneous teams are characterised by significantly different backgrounds and experiences. Examples of these differences are culture, professional background, organisational background, demographic characteristics (age, sex). Very different sources of information can be drawn on, which enables the heterogeneous team to identify superior alternatives in the decision process (Hoffman and Maier, 1961). Heterogeneous teams also have a higher propensity for preferring different projects (Mello and Ruckes, 2006). They also have an advantage over homogeneous ones in highly uncertain situations and when the stakes in the decisions are high. Staples and Zhao (2006) even stated that virtual heterogeneous teams had a performance that is superior to that of collocated teams. On the other hand, when team members have a different professional or cultural background, discussions can end up in a ‘Babel of tongues’, and make communication and collaboration more difficult (Duarte and Snijder, 2001; Bjorn and Ngwenyana, 2009). Especially then, when team members are not aware of the effects of a different professional or cultural background, and/or when the discussion is not led well. This can lead to difficulties in obtaining consensus.

2.4.2. Team processes
A definition of team processes is 'how teams achieve their outcomes' (Weingart, 1997). In this section, several aspects which can have their influence on the team process are discussed. These are team building, process losses, trust, lifecycle, communication, knowledge transfer, management and team cohesiveness.

2.4.2.1 Team building
Team building is the improvement of the individual consciousness and the development of interpersonal skills (Kampermann, 1992). On the basis of team building, team members learn better to understand and eventually change their interaction and other processes in the
functioning of the team (Gerrichhauzen, 1992). The goal of team building is increasing the efficiency and effectiveness of the team. Beside this individual level, team building also plays an important role at the team level when looking at the different phases a team can go through. Looking at the phases of Tuckman (1965) (forming-storming-norming and performing, which will be discussed in more detail in section 2.4.2.4.: Lifecycle) it is a wrong hypothesis that these phases are linear (van Zanten, 1996b). Often, the development concerning these team phases hampers or there is even regression. To steer this development into the right direction, teambuilding is important.

For establishing team building, some organisational conditions are important. Kampermann (1992) points that the first organisational condition is giving a team goals that give direction and that are operational. The second organisational condition is, looking at the flexibility, that the team must be self-steering. The third organisational condition is that the team must be enabled to self-assessment concerning their own functioning, reflection on their behaviour and learning of their faults. These conditions make clear that team building is not only a matter of training, but also of self-reflection.

Concerning team building in virtual teams, Huang, Wei, Watson & Tan (2002) conducted research concerning the effect of goal-setting, whereas a goal-setting structure is a team interaction process through which team members disclose and define individual and team goals, exchange ideas and align both types of goals, and reach a consensus on team goals that are shared by all team members. As a result, virtual teams with the goal-setting structure reported better team cohesion, better team commitment, better collaborative climate, better perceived decision quality, and generated more decision alternatives compared to collocated teams without the goal setting structure.

Warkentin & Beranek (1999) found that Virtual Team Communication training, as a part of teambuilding, led to increasing perceptions of cohesiveness (i.e. member commitment to team goals, trust, and openness of expression) and satisfaction with process over time. Kirkman, Rosen, Gibson, Tesluk, and McPherson (2002) state that 'an excellent example (of training) is Sabre's 24/7 Learning Café. Developed by the technology Center for Excelence, the Café is an on-line training scheduler that allows Sabre employees worldwide to schedule and access virtual training modules such as 'Coaching and developing Others' and 'New Product Training'.

In a study of Rice et al. (2007, p. 590) ‘it was found that the performance of a virtual team can be significantly enhanced when team processes are adapted to the affordances of the CMC environment, and that this adaptation can occur very rapidly if teams are trained on the technology as well as on work processes that best exploit it’. So, training can have a positive influence on the performance of a virtual team.

Although team building seems to have a lot of benefits for teams, an important danger is that it can lead to a team cohesion that is too high. Especially when high team cohesion is supported by the dominant organisational culture (Gerrichhauzen, 1992). Where team cohesion can be seen as one of the most important capabilities to develop commitment (Ouchi, 1981), it can also lead to organisational blindness. This can lead to process losses, as we will see in the next section.

2.4.2.2 Process losses
Team processes can, in combination with or as a part of the process of team building, trigger problems in a good functioning team. Groupthink, group conformism and social loafing are some examples.

Addition by the author.
Chapter 2 Teams, their effectiveness and strategic momentum

**Groupthink**

Groupthink is the consequence of an excessive developed 'we-feeling' within a team (Vermeulen & van Hooft, 1997). The term groupthink is introduced by Janis (1982, p. 9), who used it for ‘(...) a mode of thinking that people engage in when they are deeply involved in a cohesive group, when the members’ strivings for unanimity override their motivation to realistically appraise alternative courses of action’. The result of groupthink is that (the process of) decision making is false or not completely right. This is on the basis of the fact that not all information that is available in the team is used in an optimal way. An example of groupthink is the ‘Pig Bay-incident' on Cuba in 1962.

When does groupthink occur? According to Janis (1982), there are three factors, which make the appearance of groupthink more likely. In the first place a cohesive group. The team feels invulnerable and the members think they can handle everything. So, there is an overestimation of ones self. In the second place there is stirring leadership, and team members do almost not criticise each other. There is even an excess of self-censorship (Gerrichhauzen, 1992). This can also be seen as pressure to conform. In the third place the group is isolated from the outer world. Negative feedback is not seen, but is pushed aside by rationalities, and available alternatives are not overthought properly in the process of decision making (Gerrichhauzen, 1992). This can be seen as cognitive narrowing.

The theory in this section concerning groupthink is based on research in collocated teams. Till now, we have not found any research that verifies or falsifies this theory for virtual teams.

**Social loafing**

The performance of a team depends partly on the devotion, or commitment, of the individual team members for reaching the goals. Not every team member will do his upper best. Especially when the individual devotion is difficult to distinct in the team, phenomenons as social loafing, free riding and shirking can occur. Social loafing was introduced by Latané, Williams & Harkins (1979). With this concept they aim on the decreasing performance of individuals when they are working accompanied by others. Social loafing can occur when a team member can not identify his own effort to the group result, the relationship between input and output is difficult to measure, and the evaluation possibilities are minimal (Vermeulen & Benders, 1998). The team member can hide himself in the team and perform not optimally, without his minimal effort becomming obvious in the team. In fact, the team member makes use of the efforts of other members in the team, and finally participates completely in the team results. Beside these social determinants, also the nature of the task can be a cause for social loafing (Smith & Machie, 1999). What is called social loafing in the social psychology is called free riding in economical terms. With free riding (or social loafing) a horizontal relationship is meant. One is part of a social whole from which one gains profit (Olson, 1965).

**Shirking**

Here, the vertical relationship between employee and manager is centralised. The employee is partly invisible for the manager. In this invisible playing field the employee can choose to do lesser efforts than is expected. Vermeulen and Benders (1998) thinks that offering incentives is a solution to this problem. The principal (manager) rewards the agent (employee) for correct behaviour, and must develop a good reward system to achieve this goal. Also the presence of a monitor can have much influence on the effort of the employee. Using a monitor can have diverse difficulties. First it costs money to have a monitor. Second having a monitor can have bad side effects. Third it is questionable if the monitor is able to see if the employee is optimal performing. Monitoring by the team members themselves will probably have the most effects when a form of team reward is linked to a team performance.
Shirking can be a serious problem, especially for virtual teams, because the team members are almost 'per definition' invisible to the virtual team manager. Besides introducing a good reward system (or the concept of management-by-objectives, from Peter Drucker) emerging and sustaining a strategic momentum in the virtual team can probably reduce shirking.

The process losses can have a negative influence on the effectiveness in a team. Reducing process losses can have a positive effect on the effectiveness of a team.

2.4.2.3 Trust
Mayer, Davis and Schoormans (1995 p.31; in: Jarvenpaa, Knoll & Leidner, 1998) define trust as: 'The willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party'. Trust can be seen as a shared psychological state in a team (Rousseau, Sitkin, Burt, & Camerer, 1998, in: Gibson & Manuel, 2003). Trust between the members in a collocated team plays an important role. In a meta research, in which Dirks and Ferrin (2001) studied 43 empirical studies of collocated teams, it showed that on the basis of trust the communication became better, there was lesser competitive behaviour during negotiations, there was a higher group performance, lesser conflicts, and a greater job satisfaction. Group solidarity, commitment and interpersonal trust are stimulated by the emotional bondages that occur on the basis of the interaction between the members of a collocated team (Smith & Mackie, 2000). But too much trust in a collocated team can be harmful, especially when it are self-managing work teams (Langfred, 2004). Too much trust can be the reason that team members do not or do not enough, control each other. Combined with a greater individual autonomy this can reduce the team performance.

Importance of trust in virtual teams
Many researchers concerning virtual teams stress trust as an important factor (or enabling condition) for virtual teams to perform well (Cohen & Gibson, 2003; Furst, Reeves, Rosen, & Blackburn, 2004; Handy, 1995; Kirkman, Rosen, Gibson, Tesluk, & McPherson, 2002; Peters & Manz, 2007). When a virtual team consists of members from different cultures, Otten (2002) considers trust and trust-building as the core element of every kind of intercultural teamwork - especially in a virtual environment.

Types of trust in virtual teams
Two types of trust can be distinguished: swift trust and true trust. Traditional forms of trust (true trust) between team members can be created by frequent face-to-face contacts. Lack of frequent face-to-face contact between team members, or even the absence of face-to-face contact, can lead to swift trust. Concerning swift trust, the team members act as if trust is present from the start (Jarvenpaa, Knoll & Leidner, 1998). Such trust appears to be very fragile and temporal (Jarvenpaa, 1998). So, swift trust differs from true trust in that swift trust can exist where there has been no opportunity to develop more traditional forms of trust (Meyerson, Weick, & Kramer, 1996 in: Griffith, Mannix, & Neale, 2003). Both types of trust have showed to have positive effects on team dynamics and performance (Griffith, Mannix, & Neale, 2003).

2.4.2.4. Lifecycle
When forming a team, this does not mean that from the first beginning the performance will be high. To become (highly) productive a team has to go through several phases. These phases have to be lived through, because the tuning between the three force fields - individual, task, cooperation - asks for adaptation of behaviour from the individual, that he has to reorientate; and every behavioural change is difficult (van Zanten, 1996b). In the development of groups there are according to Lacoursiere five phases (Kreveld, van, 1990b). These are as follows:
Chapter 2 Teams, their effectiveness and strategic momentum

- orientation
- dissatisfaction
- solution
- production (performance)
- termination

Tuckman (1965) also described these phases, and he called them forming, storming, norming, performing and termination (or: adjourning). According to van Zanten (1996b) another phase can be distinguished, before the forming of a (collocated) team. This pre team phase is important for management, because in this phase the team task is formulated, forming the basis for the selection of team members.

It turns out that this pre team phase can also be important concerning the formulation of the project description. A project description can give a team insight into the objectives that have to be realised. When the project description is vague, or bad, team task insight concerning the objectives of the virtual team will be low. One of the answers Furst, Reeves, Rosen, and Blackburn (2004) got on their question if one could turn back the clock and start over again was that the respondents would define the project description better. The main reason was that respondents have had a lot of problems further on in the project by not doing so. According to Huang, Wei, Watson and Tan (2002), goal setting in virtual teams is positively associated with cohesion and commitment.

Furst, Reeves, Rosen, and Blackburn (2004), wanted to understand how virtual teams of real employees develop through every phase of a team lifecycle from team formation through product delivery. They used Tuckman's Stage Model of Development for determining the stages of the lifecycle. In the forming stage the team will struggle to form a collective identity that promotes a shared commitment to a common goal. A longitudinal study of virtual project teams by the researchers showed that during the forming stage there was an unbridled optimism among the team members concerning the perceptions of the likelihood of team success. Concerning the results of the study nothing is said about the formation of a collective identity. Disagreement and conflict, based on research in collocated teams, characterise the storming fase. Study of virtual teams showed a reality shock. Specific comments reflected four primary issues with which some groups had struggled: establishing leadership roles, setting direction, coordinating work, and building commitment on the task. In the norming stage of development, virtual teams revisited (and reinforced) existing norms or established new norms regarding information collection, document sharing, task responsibilities, acceptable attendance at conference calls, and team commitment. The performing stage of development requires that teams effectively collect and share information, integrate members' inputs, look for creative solutions to problems, and prepare deliverables for outside sponsors.

Project team effectiveness was found to be a function of team members' perceptions of the availability of resources at the forming stage. Teams that perceived greater amounts of resource availability at the onset of their projects performed better at the end of the project. At the storming stage, teams with greater mission clarity, more time to examine work process effectiveness, and higher perceived levels of sponsor support were more effective at the performing stage. At the norming stage, none of the examined variables predicted team performance at the performing stage.

The researchers found that the 'best' teams (i.e. most effective) at each step of the lifecycle were proactive, focused, resourceful, and unafraid to seek support and guidance as needed.
2.4.2.5 Communication
As we can derive from the definitions from collocated teams and virtual teams in section 2.2., there are two dimensions in which both team types differ fundamentally, which can have their impact on communication media and communication. The first one is the geographical dispersion, or physical distance, between the team members. The geographic dispersion is great in a virtual team and small – even nil – in a ‘pure’ collocated team. The second one is the number of face-to-face contacts team members have. As can be expected from the definition, virtual team members have lesser face-to-face contacts (they even can have no face-to-face contacts) than collocated teams.

The kind of communication media used has its impact on the communication, and other variables.

Face-to-face communication
With face-to-face communication is meant when the sender and the receiver of a message are physical near to each other, so that the sender can also see the ‘social cues’ (i.e. physical reactions) of the receiver. Many authors concerning virtual teams stress the importance of face-to-face contacts for the start up of a virtual team, especially for establishing close relationships and trust (Saphiere, 1996; Bosch-Sijtsema & Rispens, 2003; Hinds & Weisband, 2003). As a participant in a research project commented, ‘One thing I have noticed is that communication between people and the willingness to share knowledge is greater once people know each other. Rather than just being able to contact them on e-mail or talk to them on the phone, actually talking face to face. They maybe have a beer or a wine or a coffee and a laugh. Just seeing them and being able to know who you’re talking to on the other side has been the basis of much improved cooperation’ (Cordery & Soo, 2008, p. 491). However, Hart and McLeod (2003) point out that this sort of assumptions and theories are drawn from a context of face-to-face interaction. According to their research findings, close personal relationships are equally able and likely to occur in virtual teams as in face-to-face teams. A face-to-face meeting at the start of a virtual team has different positive outcomes. So called ‘social cues’, for example voice, face expressions, and behaviour is exchanged during a face-to-face meeting. When communicating via computer mediated communication (CMC), the team members involved 'know who the other is'. Cohesion can also be increased during a face-to-face meeting, as part of a team building process. Also the tasks and objectives can be discussed and made more clearly to the team members.

Computer mediated communication (electronically mediated communication)
According to Otten (2002), CMC has two forms: asynchronic and synchronic communicaton. With the help of computer technology people are allowed to acess, store, share and request information with others over time and space distance without having to meet face-to-face. A form of asynchronous communication is e-mail. Forms of synchronous communication are videoconferences, chatboxes (like MSN), and telephone(conferences). The type of technology used by virtual teams is an important input as media richness has been found to positively impact team (collective) commitment (Workman, Kahnweiler & Bommer, 2003). Hart and McLeod (2003) found that by using CMC close personal relationships are developed one message at a time. The communication content between team members with strong personal work relationships is not personal. Coworkers with the strongest personal relationships exchanged significantly more task-related messages than did coworkers with the weakest personal relationships. In strong personal relationships communication is frequent but short. They also found that relationships in virtual teams are developed and strengthened through a proactive effort to solve problems.

The over-generalized critique that CMC is of a poorer emotional quality compared to FTF interaction is no longer the state of knowledge as several studies could demonstrate that people use a wide range of strategies to indicate emotions and feelings in their online communication (Otten, 2002). One possibility of doing so is the use of emoticons (Derks, 2007).
Beside this ‘communication media are not per se better or worse for teamwork. Instead, their use depends on the fit to the communication objectives’ (Hertel, Geister & Konradt, 2005, p. 83).

On the other hand, for using CMC, one must be skilled enough. What is different about virtual teams compared to collocated teams is the amount of technical training that is required empowering the team member to function in the virtual environment (Townsend, DeMarie, Hendrickson, 1998). If the technology fails or team members are not trained in its use, team performance will probably suffer (Goodman, 1986; Duarte and Snijders, 2001).

*Intercultural communication*

Intercultural communication is according to Otten (2002) defined as communication that takes place between people of different cultures in which cultural differences affect the process of communication and its outcomes and culture becomes a matter of significant relevance for mutual understanding (or misunderstanding) between the interacting persons. Otten (2002) stresses the implications of CMC in intercultural virtual teams. Already the question, whether a team should use CMC and/or FTF as means of interaction for a certain project implies a cultural decision upon the appropriateness of the medium, and the acceptance of the medium.

For example, we can make a distinction in low-context cultures and high-context cultures. In a low-context culture, ‘where very little is taken for granted, greater cultural diversity and heterogeneity are likely to make verbal skills more necessary and, therefore, more highly prized’ (Okabe, 1983, p. 38). On the other hand, in a high-context culture, ‘cultural homogeneity encourages suspicion of verbal skills, confidence in the unspoken, and eagerness to avoid confrontation’ (Okabe, 1983, p. 39). In low-context cultures, which are mostly also individualistic, the message is the only thing needed to activate the receiver of the message. Sending an e-mail can be enough to get the preferred things done. However, a person in a high-context culture receiving such an e-mail first wants to know more about the context of the e-mail. He wants to know who the sender is of the message (status, role), why the message was written, if there are others in his organisation that have to see this message or already know about it, and what approval he needs from others to respond. As CMC depends to a large extent on (written) verbalisation of content and explicit coding of social meaning the acceptance of CMC might be lower in cultures that prefer indirect communication, i.e. high-context cultures.

**2.4.2.6 Knowledge transfer**

Knowledge transfer is defined as the process through which one unit is affected by the experience of another (Argote and Ingram, 2000). According to Rosen, Furst & Blackburn (2007, p. 260) it ‘includes the dissemination of existing knowledge among team members and bringing new knowledge into the team from the external environment (…) Knowledge sharing contributes to virtual team effectiveness by promoting more efficient use of team resources while reducing implementation errors’. The key challenge for a knowledge-sharing or knowledge-transferring network (e.g. a virtual team) is to motivate members to participate and contribute knowledge to the collective good. Bosch-Sijtsema and Rispeens (2003) claim that investigating the communication structure at several points in time and feeding this information back to the organisation members will be beneficial for the development of knowledge transfer. De Leede and van Dalen (2004) come to the conclusion that virtualisation has a positive effect on the efficiency of knowledge transfer.

When knowledge concerning the team tasks and objectives is transferred under the team members, this will increase the team task insight. This transfer can take place via direct CMC, but also via archiving electronic exchanges. Electronic exchanges can be archived providing future teams (and new team members) with information about team problems confronted and team solutions generated in the past (Furst, Blackburn and Rosen, 1999).
The concept of Transactive Memory System (TMS) can be used for understanding this archiving and sharing of electronic exchanges. A TMS can be defined as ‘a collective memory system for encoding, storing, retrieving, and communicating group knowledge’ (Lewis, Lange, & Gillis, 2005, p. 581). According to Cordery and Soo (2008, p. 490) ‘research into TMS development within teams suggests that it is a potent predictor of team effectiveness, including team innovation’. This is emphasized by research from Rosen, Furst, & Blackburn (2007), in which an underdeveloped TMS was identified as one of the six most common barriers to virtual team success.

2.4.2.7 Management

Leadership

Leadership can be seen as an aspect of management, beside organising, planning and controlling. Leadership can be defined as a project in which one or more team members have the permission to influence others in the team and to motivate them to reach the team goals (Forsyth, 1999). Leadership can be divided in two task domains. On the one hand taking decisions and tasks performance, on the other hand improving the cohesion in the team (Stogdil, 1963). According to Vermeulen and van Hooft (1997), leadership is a crucial factor in the success of collocated teams. They see coaching as a new way for steering the team that leaders have to learn. Blackburn, Furst and Rosen (2003) state that virtual team leaders often find themselves in the role of virtual coaches. For some team members, coaching takes the form of instructing team members on how to use new technology. What becomes clear, is that a directive kind of leadership, in which the team leader ‘dictates’ team members what has to happen, is least preferred. As virtual team members stated ‘The biggest obstacle to team success was the team captain, who acted like a dictator and made it clear that member input was not valued’ (Rosen, Furst & Blackburn, 2007, p. 264). Distance as neutralizer makes a directive style of leadership unfeasible.

Drenth et al (1992: 371) point that participative management, defined as decision making of all members or at least sharing the influence between a manager and his or her employees, still form a central research topic for the social-sciences. Many studies have proved a, sometimes weak, positive correlation between participation and things like motivation, satisfaction and task performance.

Kayworth and Leidner (2001) found that the core attribute of leadership effectiveness in their virtual team study does not appear to vary significantly from what would be expected of collocated teams. More specifically, in virtual team settings, the leadership roles of social facilitation and communications processing may take on added importance as compared to more traditional work groups. The results indicate that these two leadership roles may be extremely important in virtual team settings. Their evidence indicates that effective leaders simultaneously demonstrated the ability to be assertive and authoritative while still remaining understanding and empathic toward team members.

Those virtual team leaders perceived to be highly effective expressed care, concern, and understanding toward team members, yet, at the same time, they were able to assert their authority to achieve team goals.

Druskat and Wheeler (2003) did research to effective external leadership of self managing teams. This research pointed out that effective external leaders build up good relationships in the team as well as in the organisation, search for information, influence the team and the surroundings to support one another, and empowering the team to achieve success.

Zigeurs (2003) and Kirkman, Rosen, Gibson and Tesluk (2004), have the opinion that the concept of leadership as a system also means that individuals can share and rotate leadership.
roles, and leadership itself becomes a collective effort distributed within the team (empowerment). The challenge of Zigeurs (2003) is to uncover the commonalities for success in team leadership in an electronic context. A good starting point is examining the different roles that team members, leaders, and technology might fill in virtual teams.

Concerning the lifecycle of virtual teams Furst, Reeves, Rosen, and Blackburn (2004) suggest that when leadership selection is based on the skills critical for virtual team success, including conflict management, virtual teams are more likely to survive the storming stage. It is not clear what other skills critical for virtual team success they are thinking about.

Zaccaro and Bader (2003) divide leadership in three roles: team liaison, team direction, and team operational coordinator. The team liaison role refers to the leader's scanning and interpretation of events occurring in the team and its environment. With respect to the team direction-setter role, all team action should occur for a purpose. The role as operational coordinator includes the activities of identifying or developing the member resources most suitable for addressing particular problems and designing the most appropriate ways of utilizing these resources. This role also includes motivating and empowering team members. According to them the dispersion and impermanence that characterize most virtual teams represent significant challenges to their leaders in attempting to fulfill these three respective roles.

2.4.2.8 Team cohesiveness
Team cohesiveness can be defined as solidarity or strength of the group (Forsyth, 1990). If a team has a high amount of cohesiveness, team members will follow the direction of the team, leading to a higher effectivity. Group cohesion is seen as one of the most important tools to develop participation (Ouchi, 1981). When the team cohesiveness is higher, collective commitment will also increase. According to de Leede, Kwakkelstein, Oeij, Looise and Torka (2006) it is a reason for concern to some managers. In a qualitative study they state that ‘It takes more energy then before from managers to maintain commitment of employees. (...) Therefore managers see it as their task to 'organise' cohesion through social events. Intensive coaching is seen as an important way of enhancing cohesion and commitment’. To increase the perceptions of cohesiveness, Warkentin & Beranek (1999) found that Virtual Team Communication training led to increasing perceptions of cohesiveness (i.e. member commitment to team goals, trust, and openness of expression) and satisfaction with process over time.

2.4.3. Team outcomes
Concerning the team outcomes, no critical success factors can be presented, because in section 2.3. we stated that ‘with the effectivity of a team is meant its ability to realise a desired outcome’.

2.4.4. Moderators of virtual team performance
Research concerning (virtual) teams and (virtual) team performance often gives inconsistent results (Martins et al., 2004). In trying to explain these often inconsistent results, researchers have pointed to moderating factors. Here, we will look at task type as a moderating factor, as the type of a task also can have its moderating influence on the effectivity.

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5 When the relation between two factors depends on a third factor, this third factor is the moderating factor.
2.4.4.1 Team tasks
The way the process in the collocated team develops, and with this the outcome of the team process, is also determined by the nature of the team task (van Kreveld, 1990a). McGrath (1984) developed a typology of tasks. This typology is often presented as a circle with eight sectors and therefore known as 'a circumplex model of group task types', in short the 'task circumplex' (Zanten, W.P.C. van, 1996a). Four sorts of activities form the quadrants of the circle:
- produce
- choose
- negotiate
- execute

Concerning the production he means production of ideas in the first place. The second type, which is distinguished by McGrath, is choosing. Here it is important whether the problems have an objective right answer or not.

The third team task is negotiation. Negotiation is seen in situations where the interests of the team members are at least partly conflicted. An important distinction is made between integrative and distributed negotiation.

The fourth major types of team tasks are executive tasks. Here one can speak about physical activities. In this case there can be competition between team members and between teams.

Also, McGrath takes notion whether the activities are conceptual or executing (thinking versus doing) and if they are leaning towards cooperation or conflict. In this way he distinguishes eight different tasks: planning tasks, creativity tasks, intellective tasks, decision-making tasks, cognitive conflict tasks, mixed-motive tasks, contest/battles/competitive tasks, performances/psycho-motor tasks. By making a choice, McGrath also makes a distinction between easy, or 'intellective', tasks and difficult, or 'decision making' tasks. According to him only the last ones asks for a consensus in the group. It depends on the task(s) of the virtual team whether the tasks insight will be gained easily or not and whether consensus will be reached or not.

Concerning team tasks and virtual teams, according to Rice et al. (2007, p. 567), 'Tasks that lend themselves to a structured approach were most effectively accomplished during virtual meetings, whereas face-to-face interactions were better for relatively unstructured, discussion intensive tasks'.

2.5. Conclusions
The different definitions of teams and virtual teams result in a working definition for the domain of this research: virtual R&D project teams, which is: 'a virtual team that deals with a R&D project, characterised by a fixed deadline and the creation of new knowledge'. A key field problem concerning these virtual R&D project teams is the decreased effectivity. To adress this field problem, we defined effectivity of a team as ‘its ability to realise a desired outcome. Effectivity is not measured directly, but indirectly by measuring the output (performance)’. A thorough literature study learned that there are a lot of variables – or critical success factors - that can have their influence on the effectivity in (virtual) teams. Here, we give a short description of these critical success factors.

In the first place team composition, where we find three other critical success factors: (national) cultural background, organisation background and professional background. In the second place team roles can be seen as critical success factors. Research points out that the effectivity of teams is best improved by mutual (positive) dependance of team members (Johnson & Johnson, 1989). In the third place team building. Training can have a positive influence on the effectivity of a team. In the fourth place process losses, as groupthink or social loafing, are having a negative influence on effectivity. In the fifth place Trust. As we
saw, many researchers concerning virtual teams stress trust as an important factor (or enabling condition) for virtual teams to perform well (Cohen & Gibson, 2003; Furst, Reeves, Rosen, & Blackburn, 2004; Handy, 1995; Kirkman, Rosen, Gibson, Tesluk, & McPherson, 2002; Peters & Manz, 2007). In the sixth place communication. Here, we can make a difference in face-to-face communication and other media used for communication. Face-to-face (ftf) communication at the start of a virtual team (ftf kick-off meeting), can have several positive outcomes, as ‘social cues’ are exchanged, and tasks and objectives are discussed and shared with the team members. Using other media for communication (CMC) is dependent on the skills someone has. In the seventh place knowledge transfer. According to Rosen, Furst & Blackburn (2007, p. 260) it ‘includes the dissemination of existing knowledge among team members and bringing new knowledge into the team from the external environment (…) Knowledge sharing contributes to virtual team effectiveness by promoting more efficient use of team resources while reducing implementation errors’. In the eight place management style. A facilitative/participative management style has a more positive impact on effectivity than a directive management style. In the ninth place team cohesion. This factor has a positive influence on the effectivity of a virtual team. In the tenth place the lifecycle of a virtual team. Although it is not a critical success factor in itself, several critical success factors are bounded to the lifecycle, as the project description, proactiveness, focused, resourceful, and unafraid to seek support and guidance as needed. In the eleventh place team tasks can be seen as a critical success factor.

As we saw in chapter 1, the field problem, i.e. the decrease of effectivity, can probably be overcome by a ‘phenomenon’ that makes a virtual R&D team ‘self-propelled’. This ‘phenomenon’ is described in-depth in chapter 3: the emergence and sustenance of strategic momentum. The solution concepts are management and team member interventions aimed at the creation and sustenance of strategic momentum.

I presume that a subset of the critical success factors presented in chapter 2 also have their influence on (the direction and/or magnitude) of strategic momentum. These factors are as follows:

- Team composition, more specifically (national) cultural background, organisation background and professional background
- Training
- Trust
- Communication (face-to-face kick off meeting, Use of different media types)
- Knowledge transfer
- Management style (participative decision making, facilitative/participative/coaching style)
- Team cohesion
- Project description
- Task characteristics

Team roles are not taken into consideration, because we conduct research on team level, not on an individual level. Process losses are also not taken into consideration, because I see this more as a negative efficiency factor. Proactiveness, focused and resourceful is not taken into consideration, because, as we will see in chapter 3, they are part of strategic momentum construct. ‘Unafraid to seek support and guidance as needed’ can be replaced by the critical success factors trust and communication.

As we will see in chapter 3, the forementioned subset of critical success factors is used for developing the initial template for analysing the case studies. In chapter 3, besides describing strategic momentum in –depth, we will present the research model, research question and research design.
Chapter 2 Teams, their effectiveness and strategic momentum
Chapter 2 Teams, their effectiveness and strategic momentum
Chapter 3 Research model, question and design

3.1. Introduction
In chapter 2 I discussed the term ‘effectivity’ and looked at the critical success factors in virtual teams. Several factors influence the effectivity of a virtual team. A possibility to increase the effectivity of a virtual project team and solve the field problem is to create and sustain strategic momentum. In this chapter I will first take a look at the concept of strategic momentum. I will describe the history of the concept of momentum, having its roots in physics. Then, I will present the outcome of a literature study concerning strategic momentum in the academic management literature. Finally, after the concept of momentum in virtual teams has been defined, I will discuss a way in which strategic momentum can be measured in virtual teams.

After this discussion on strategic momentum I will present my research model. In this model the variables influencing the emergence and sustenance of strategic momentum are presented. The model hypothesises that these are team task insight, empowerment and collective commitment. A subset of the critical success factors of chapter 2 will be presented in a template as starting conditions and management interventions, which on their turn can have their influence on the creation and sustenance of team task insight, empowerment and/or collective commitment. The template is part of the research strategy that will be discussed in-depth. This template has been used to analyse the eight cases, which will be presented.

More specific this chapter is organized as follows. Section 3.2. discusses the concept of strategic momentum, 3.3. presents the research model and in section 3.4., the research questions are presented. Then, the research approach in this dissertation is introduced, which is Design Science Research, in section 3.5.. In section 3.6., the research strategy and in section 3.7. the case studies will be presented. In section 3.8. the methodology of the within-case analyses is discussed and in section 3.9. the methodology of the cross case analyses. Finally, in the last sections I give a discussion and some conclusions.

3.2. Strategic momentum

3.2.1. History of the concept of momentum

‘A rushing torrent
Carries boulders
On its flood;
Such is the energy
Of its momentum.’

In the western world, the Greek philosopher Aristotle (384-322 B.C.), a student of Plato and on his turn a teacher of Alexander the Great, meditated as was common in the ancient Greek time about the ultimate source of motion. He postulated that elements move in the direction of their ‘natural’ place in the universe with a speed directly proportional to their weight. According to him this means that fire and air move upward, and earth and water move

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downward. Once they arrive, they resume their natural state of rest. The word for the general concept of *mōmentum* was used in the Roman Republic primarily to mean "a movement, motion." A fish was able to change velocity (*velocitas*) through the *mōmentum* of its tail (Lewis, Charleton T. and Charles Short, 2008). The word is formed by an accretion of suffices on the stem of Latin *movēre*, "to move." A *movi*-men- is the result of the *movēre* just as *frag-men-* is the result of *frangere*, "to break." Extension by -to- obtains *mōvimentum* and *fragmentum*, the former contracting to *mōmentum*. (Buck, Carl Darling, 1933).

*Mōmentum* was not merely the motion, which was *mōtus*, but was the power residing in a moving object, captured by today's mathematical definitions. A *mōtus*, "movement", was a stage in any sort of change, (Lewis, Charleton T. and Charles Short, 2008) while *velocitas*, "swiftness", captured only speed.

The work of Aristotle was forgotten for centuries in Europe, but fortunately the Arab civilization preserved the texts through the Dark Ages. During this time Ibn Sina (Avicenna), in a period called the Islamic Renaissance, referred at about 1000 to *impetus* as proportional to weight times velocity: "Thus he considered *impetus* as proportional to weight times velocity. Avicenna was later to be given the title of the father of *momentum*. In other words, his conception of *impetus* comes very close to the concept of momentum of Newtonian mechanics." (Sayili, 1987).

Italian Renaissance pointed again at the literature and civilization from the ancient Greeks and Romans as a heritage that was worthwhile studying again. The religious scholars of the Church, such as Thomas of Aquino, embraced Aristotle’s philosophy. They saw God as the ultimate source of motion, He who has made heaven and earth, the ‘unmoved mover’. Not everybody was convinced with Aristotle’s ‘motion theory’. Galileo Galilei (1564-1642), who operated concerning science and religion on the edge of a knife, tried to disprove two of Aristotle’s main contentions:

- according to a famous tale he dropped two objects of unequal weight from the leaning tower of Pisa in Italy, to demonstrate that their acceleration was not proportional to their weight.
- he also disproved that falling bodies achieve top speed instantaneously, suggesting instead a continuous build-up of speed.

Galileo may be best known for proposing the ultimate resistance tendency, the principle of inertia: ‘a body moving on an even surface will continue in the same direction at constant speed unless disturbed’.

Closely following Galileo’s advances, Leibniz (1646-1717) sought to explicate ‘natural inertia’ by examining the difficulties involved in moving stationary objects. He proposed the idea of reciprocal action and reaction, wherein others in turn equally react upon acting forces.

The next major contribution to the scientific revolution unleashed by Galileo was Descartes (1595-1650). This French philosopher focused on the nature and properties of collisions between objects. Descartes propounded the law of conservation of momentum: ‘When two bodies collide, the sum of their momenta will not change’. To him, momentum was ‘quantity of motion’, or the force created by multiplying a moving body’s weight and velocity.

The question has been much debated as to what Sir Isaac Newton’s contribution to the concept was. The answer is apparently nothing, except to state more fully and with better mathematics what was already known. The first and second of Newton’s Laws of Motion, which are as follows:

Law I: Every body continues in its state of rest or of uniform motion unless compelled to change by another force

Law II: The rate of change of momentum is proportional to the force operating upon it.

Law III: To every action there is always an equal and opposing reaction.
had already been stated by John Wallis in his 1670 work, *Mechanica sive De Motu, Tractatus Geometricus*: "the initial state of the body, either of rest or of motion, will persist" and "If the force is greater than the resistance, motion will result" (Scott, J.F., 1981).

Newton's *Philosophiae Naturalis Principia Mathematica*, when it was first published in 1686, showed a similar casting around for words to use for the mathematical momentum. His Definition II defines *quantitas motus*, "quantity of motion", as "arising from the velocity and quantity of matter conjointly", which identifies it as momentum. (Grimsehl, Ernst, 1932). Thus when in Law II he refers to *mutatio motus*, "change of motion", being proportional to the force impressed, he is generally taken to mean momentum and not motion. (Rescigno, Aldo, 2003).

It remained only to assign a standard term to the quantity of motion. The first use of "momentum" in its proper mathematical sense is not clear but by the time of Jenning's *Miscellanea* in 1721, four years before the final edition of Newton's *Principia Mathematica*, momentum M or "quantity of motion" was being defined for students as "a rectangle", the product of Q and V where Q is "quantity of material" and V is "velocity" (Jennings, John, 1721).

### 3.2.2. The origins of the concept momentum

The Concise Oxford Dictionary (on-line edition 1999) defines momentum as "the impetus gained by a moving body" or "the driving force gained by the development of a process: the investigation gathered momentum". As could be seen in the former section, momentum is a concept borrowed from physics. This is not uncommon; for example the concept of ‘stress’ has also its origins in physics, but is nowadays widely accepted in an organisation psychological context. In formula: the momentum of a moving body equals mass times velocity \( p = m \times v \). The first meaning, given above, is based on this use of the concept. But also the broader second meaning, also used in everyday language, is inspired on this idea of the impetus of a moving body.

Momentum in physics is a vector, which means that it has a certain magnitude (mass times velocity), as well as a certain direction (the direction of the velocity). In order to change momentum, i.e. a change in direction or an increase or decrease of velocity, one needs to apply force. In formula: the applied force equals the change in momentum \( F = m \times \frac{dv}{dt} \).

The concept of momentum in its broader meaning of “driving force”, is used in various other domains, although in a diversity of specific interpretations as we will see. Nevin et al. (1983) used it in a definition of perseverance of behaviour. They trained pigeons to press buttons to obtain certain gratifications. After changing the functions of the buttons the poor pigeons kept pressing the same buttons, now however without getting gratifications. They called this perseverance of behaviour *behavioural momentum*. Mace et al. (1990), Cohen (1998) and Plaud (1999) have extended this approach by describing perseverance in human behaviour in terms of behavioural momentum of individuals. They studied behavioural momentum in experimental settings, using certain reinforcement processes to vary the magnitude of the behavioural momentum of their subjects.

Interestingly enough Nevin et al. (1983) only measured perseverance of behaviour and documented the external conditions producing behavioural momentum, but did not research the actual driving factors causing momentum. They use a *stimulus-response model* (SR-model), not a *Stimulus-Organism-Response model* (SOR-model). The use of a SOR-model would be, of course, quite difficult with pigeons, but very interesting in human behaviour: what causes (in a SOR-model) perseverance in human behaviour, for example in a team?” (Aken, van & Opdenakker, 2006).

The term momentum is even discussed in sport psychology. Concerning sport psychology there are different definitions that describe momentum. Some definitions make a distinction between positive and negative momentum. Burke et al. (2003) defined positive momentum as
a psychological state of mind affecting performance in a positive direction where almost everything seems to "go right" for the performer(s). 'For example, within a short time frame in a basketball game a player may steal the ball from the opponent, make a good pass, get the next rebound, and score two points'. Negative momentum was defined as a psychological state of mind affecting performance in a negative direction where most everything seems to "go wrong" for the performer(s) (Burke et al.). 'For example, within a short time frame in a basketball game a player may commit a foul, get a pass stolen, go in the incorrect direction on a play, and get a shot blocked'. Still, sport scientists have difficulty to prove empirically that momentum in sports really exists. Several factors are on the basis of this difficulty. In the first place it is difficult to quantify. In the second place it is seen as a subjective variable.

The term momentum as a “driving force” is also used in everyday language. At this moment for example, I see a growing rate of approximately ten percent each year in Chinese economy. Therefore, in everyday language we say that ‘the Chinese economy has gained momentum’. Implicitly, momentum is defined here as ‘perseverance of economic growth’. One can doubt if this ‘everyday meaning’ is correct, because for economic growth a ‘force’ is needed to increase the growth, actually increasing the momentum. On the other hand, when specifically talking about economic growth in China, the Communistic Party can be seen as the ‘force’ needed to increase the growth.

3.2.3. Strategic momentum in the academic management literature

The article by Miller and Friesen (1980) ‘Momentum and Revolution in Organisational Adaptation’ is the first publication in the academic management literature that discusses the concept of momentum. Miller and Friesen (1980) define momentum as 'the tendency to extrapolate previous directions of evolution in strategy and structure' (Jansen, 2004). E.g. when an organisation is bureaucratic, the choices that will be made in future concerning the organisation will lead to a more bureaucratic organisation. On the other hand, an organisation that is organic will even become more organic in future. Miller and Friesen (1980) sum up a large number of potential causes of momentum, which are as follows:

- Enduring organizational myths and ideologies are crucial factors in the direction of an organization's evolution.
- These orientations often entail rather narrow, self-affirming models of reality that reinforce past behaviour and cause it to be amplified in the future.
- Heuristics.
- Political coalitions in the organization: reversals in the direction of evolution often are resisted because they entail an admission of past failure and therefore tend to erode the power base and self-esteem of certain individuals.
- An elaborate set of programs, goals, and expectancies grows up around an organization's modus operandi.

In a later article they apply their idea of momentum to product innovation: you have ‘entrepreneurial firms’ with a consistent drive, or a ‘momentum’ in the direction of innovation, and you have ‘conservative firms’ lacking that drive, that momentum (Miller and Friesen, 1982).

Amburgey and Miner (1992) define strategic momentum as ‘the tendency to maintain or expand the emphasis and direction of prior strategic actions in current strategic behaviour’. They make a distinction between three types of momentum, which are as follows:

- Repetitive momentum occurs when an organization repeats a specific previous action. It is the most basic kind of strategic momentum. As an organization takes actions over time it develops routines and competencies which then become independent engines for further actions. This definition is similar to the definition of Miller and Friesen (1980).
Chapter 3 Research model, question and design

- **Positional momentum** is defined as occurring when an organization takes strategic actions that sustain or extent its existing strategic position, regardless of how it arrived at that position.

- **Contextual momentum** is defined as occurring when broad organizational features, such as structure or culture, shape strategic actions. In general, theory has predicted that strategy determines structure (Mintzberg, 1990). Contextual momentum would mean the reverse causality should also occur: a decentralized structure should lead to diversifying actions. Organizational routines and competencies clearly could create contextual momentum.

The concept of momentum is also used in Gersick (1994). She compares the momentum phase in an organization with ‘convergence periods in organizations, in which groups did not change their basic premises, even when members were unhappy with the way they were working’. Van Aken and Opdenakker (2006) also state that ‘she uses the concept in the framework of the punctuated equilibrium model: organisations have long periods of converging growth, during which a certain momentum in present actions is sustained or even increased, alternated with periods of upheaval/revolution, during which momentum disappears or is destroyed, after which a new period of gaining and sustaining momentum begins’.

Jansen (2004) more or less combines the approach of momentum as persistence in present actions with momentum as persistence in change of actions. She discusses two types of momentum: ‘stasis-based momentum, describing the energy associated with persisting or extending the current trajectory, and change-based momentum, describing the energy associated with pursuing a new trajectory’ (Jansen, 2004, p. 277).

The interpretation of momentum by Dutton and Duncan (1987) also refers to the content of action. Their contribution is especially interesting because they are interested in the creation of momentum. Their starting point is a strategic issue and they discuss how ‘strategic issue diagnosis’, a combination of an assessment of the urgency of the issue and an assessment of the feasibility to do something about it, creates ‘momentum for change’. For them ‘momentum for change refers to the level of effort and commitment that top-level decision-makers are willing to devote to action to resolve the issue’ (Dutton and Duncan, 1987, p. 286).

**3.2.4 Strategic momentum in virtual teams**

In the former section it became clear that there are a lot of different interpretations of the concept of momentum in the academic management literature, ranging from perseverance in (strategic) actions to the impetus of changing organisational characteristics. However, as van Aken and Opdenakker (2006) state ‘it is important to be careful with the use of analogies and metaphors (Gavetti, Levinthal and Rivkin, 2005). Therefore, we propose to aim at a convergence in interpretations of the concept momentum by staying close to its definition as used in physics’.

In this research the term strategic momentum is used concerning virtual teams. The behaviour in a virtual team consists of actions that are aimed at pursuing certain outcomes. This behaviour can also be seen as a strategy. A strategy of a virtual team is a certain course of action, undertaken by a virtual team, using certain resources, in order to realise certain outcomes. Therefore, in this research the definition of a strategic momentum in virtual teams is ‘the perseverance of virtual team strategy’.

Like momentum in physics, strategic momentum has a certain direction - towards the given strategic objectives - and magnitude - the resources spent on the pursuit-. Following this reasoning, when many resources are spent on the pursuit, the momentum will be high. On the other hand, when fewer resources are spent on the pursuit, the momentum will be low. Of course, ‘high’ and ‘low’ are here related to some anchor point, in this case the amount of resources agreed beforehand. According to Bacharach (2006, p. 98), there is an optimum of
effective use of resources, i.e. an optimal magnitude. If fewer resources are spent on the pursuit, and 'if they are so resource-constrained, they (the employees) will come up with better and more cost-effective solutions than they would have if they had unlimited resources'. If unlimited resources are spent on the pursuit, 'momentum (i.e. the magnitude) can be thwarted when people are over resourced’.

So, I regard momentum, like in physics, as a vector, having both a magnitude and a direction. This permits me to distinguish between an effective and an ineffective component of strategic momentum of a virtual team. That is, effective with respect to certain desired strategic objectives: the actual strategic momentum can be decomposed in an effective component, working towards these desired strategic objectives, and an ineffective one, that is not, see below. This is in line with Miller and Friesen (1980), who point to the fact that the organisational momentum can be functional (i.e. into a wished direction), or dysfunctional: 'It can serve to keep features of strategy, structure and environment in proper alignment over time. But momentum also can be very costly when it protracts an orientation that has proved to be dysfunctional'.

3.2.5. Measuring strategic momentum

A way to measure strategic momentum in a virtual team is to link it with the resources, deployed by the organisation(s) to realise the strategic objectives. When the people, allocated to realise the objectives of a certain venture, are working according to plan (or according to expectations if there is no formal plan), using the agreed amount of resources in the agreed direction, we may say that strategic momentum is equal to these resources. In formula SM=R. However, in reality this is often not the case and actual strategic momentum may be described by $SM = \alpha \times \beta \times R$, with $\alpha$ and $\beta$ as dimensionless correction factors. The first one reflects the possibly less or more deployment of resources for the venture in question, because middle managers withdraw some resources from it, for instance to address an urgent issue elsewhere, or because more resources are allocated to the venture (withdrawn from other tasks), for instance because the objectives prove to be more difficult to realise than foreseen. This correction factor is non-negative and can be both greater and smaller than 1. The correction factor $\alpha$ may also reflect the productivity of the resources in question, larger or smaller than planned.

The second correction factor reflects the degree in which one operates into the right direction. This one is equal to $\cos \theta$, with $\theta$ the angle between the actual and the desired direction of working, the angle between the vectors $a$ and $b$ in figure 3.1. With $\theta$ between 0 and 180 degree, $\beta$ lies between +1 and -1. Negative values for momentum mean that one is actually working against agreed objectives. These two correction factors are related with the two factors determining the vector strategic momentum, i.e. respectively its size and direction.
Vector a. effective component (in the direction of presently desired strategic objectives; \( a = \alpha x R \); (in above figure \( \alpha < 1 \))
Vector b. actual strategic momentum (\( = \alpha \times \beta \times R \))
Vector c. ineffective component (not contributing to the presently desired objectives)

\( R \) is the value in case \( \alpha = 1 \)
\( \beta = \cos q \)

Figure 3.1. The decomposition of strategic momentum in effective and ineffective components

It can be somewhat cumbersome to get a specific measurement of strategic momentum of a virtual team in absolute terms. In actual practice one may, therefore, prefer to talk about normalized strategic momentum (\( SM_n \)): \( SM_n = SM_{actual} / SM_{planned} \). In this case one may ask: are we all working with the expected effort in the agreed direction, in which case \( SM_n = 1 \). If not, \( SM_n \) is smaller or larger than 1.

3.2.6. A special case of momentum: team flow

Mostly, \( SM_n \) is equal or smaller to 1, but there are cases in which \( SM_n \) is much larger than 1. For example when we deal with the extraordinary drive of a highly motivated team in a winning mood, this extraordinary drive is described by Csikszentmihalyi as the phenomenon of “flow” and thus of strong momentum. Csikszentmihalyi (1990, p. 65) describes an example of flow in a team: ‘Surgeons say that during a difficult operation they have the sensation that the entire operating team is a single organism, moved by the same purpose; they describe it as a “ballet” in which the individual is subordinated to the group performance, and all involved share in a feeling of harmony and power’. Flow in teams is also demonstrated by Bakker et al (2006, p. 482) ‘Those who worked in highly engaged teams reported higher levels of vigour, dedication, and absorption that were independent of the work conditions’.

Some authors even see momentum as flow, for example Scott (1981). According to him momentum is a concept that operates in different fields, in which the person can be taken out of him selves in a state of ecstasy.

But what is flow exactly? Csikszentmihalyi (1977, p. 36) defines flow as ‘the holistic sensation that people feel when they act with total involvement’.

According to Csikszentmihalyi (1991) and Csikszentmihaly and Csikszentmihalyi (1988), to really understand what flow is and how it emerges, a number of other concepts have to be understood.
addressed. During the millennia of human evolution a system has been created that gives humans their autonomy. This system is called the self. The function of this self is to compromise between the genetic instructions that we as humans have been given (food, drink, sleep, procreate, survive, etc.) and cultural instructions that we as a community have formed as norms and values. Between these two instructions stress can occur. Therefore, man has developed consciousness. In turn, this consciousness consists of three subsystems:

- **Attention**, observing the available information. This subsystem plays the main role. It is the medium through which events can be played in the mind. We can also speak about 'psychic energy'. By investing in this psychic energy the presentations in the consciousness can be managed.
- **Awareness** that interprets the information.
- **Memory** that stores the information. In this way the content of consciousness is filled with experience.

The three subsystems ensure that consciousness can act as a buffer between genetic and cultural instruction on the one hand and behaviour on the other hand. In other words, by having consciousness a human can think first before he does. At a certain point in development almost every man is conscious of his power to focus attention, feel, think and remember. At that point, a new system is developed in consciousness. This is the self. The self is nothing else than the consciousness that becomes aware of itself. As each system the main function of self is self preservation, and where possible to grow and expand. The self represents its own interests as goal. Each self develops its own hierarchy of goals, which ultimately form the structure of this self. There may be many circumstances in which these goals are not (or can not be) pursued. This is called psychic entropy. Psychic entropy is a condition in which 'noise' in the information processing system exists. It is experienced as anxiety, boredom, apathy, fear, confusion, jealousy and a hundred other nuances, depending on the nature of the information and the nature of the goals to which the information is in conflict.

Little is known about the state of consciousness that constitutes the other pole of this just described negative pole. This is the condition that is called psychic negentropy, optimal experience or flow. It occurs when all contents of consciousness are in harmony, and with the goals the self of the person defines. In other words: what one thinks and what one does is in line with what the self wants. These are the subjective conditions that we all call joy, happiness, satisfaction or pleasure. Given the tendency of the self to reproduce itself, and because the self is the most congruent with target-oriented structure during these periods of optimal experience, the continuous experiencing of flow becomes one of the central goals of the self. This is the teleonomy of the self.

Needless to say, that flow can be achieved in the work (and work teams!) situation. Flow in work can be reached (or is reached) when all the following elements are present. Then the consciousness is in harmony, and self - invisible during the flow episode because someone is completely immersed in the activity and not thinking about himself or his actions - increases in strength.

The main prerequisite to achieve optimal experience or flow, is when there is a balance between the challenge in a given situation and the skills a person has to face this challenge with some chance of success to continue. This can be seen in figure 3.2.
Figure 3.2. Only certain level of challenge and skills leads to flow. Flow acts only from a certain level of challenge and skills that are in balance. The origin of this two dimensional space represents, the 'average challenge of the person' and 'skills of the average person'. When the challenge is too great, but the skills of the person are not developed far enough to cope with the challenge, then in extreme cases anxiety and panic occur. When the challenge is too small in relation to the skills a person has, then boredom occurs.

A further aspect of the flow experience is that employees have a strong feeling that they control the situation. And are able to maintain such control. This requires a degree of autonomy, of empowerment.

A third aspect is that the goals of the task must be clear. To get an employee really involved in an activity, it is necessary that he knows exactly every moment what goals he should strive after. Not only the ultimate goal is important, but also the in between steps someone should take to the ultimate goal.

A fourth aspect is feedback on the performance. It is difficult for an employee to immerse fully to his job if he does not get sufficient or regular feedback about his performance.

A fifth aspect of flow is focused concentration. If the goals of an activity are clear and sufficient feedback is given on the activities of the employee, the time may come, during which the employee is completely absorbed in the activity.

A sixth factor is the loss of self-consciousness. Many of those who experience flow indicate that they not only forget their problems and environment, but also their self.

A seventh aspect is a "distorted" sense of time. A typical feature of the flow experience is that the perception of time changes.

The eighth aspect is the autotelic experience. An important feature of flow is that it stems from so-called autotelic activities. These are activities that are an end in themselves, and not because of a reward afterwards. That does not mean that the activity is not justified by a reward afterwards. Someone performed the activity, however, because he finds it useful or challenging.

The ninth and final aspect is that flow is contagious. In other words, when someone experiences flow, this can lead to flow from colleagues in the area.

So far concerning flow. To come up with the dynamics of a virtual project team, normalised strategic momentum is related to agreements with the project management concerning the

<table>
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<tr>
<th>Challenge</th>
<th>Anxiety</th>
<th>Flow</th>
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<td>Skills</td>
<td>Apathy</td>
<td>Boredom</td>
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| Figure 3.2. Only certain level of challenge and skills leads to flow. | |
|---|---|---|
| Anxiety | Flow | Apathy |
| Challenge | Skills | Boredom |
resources planned. When fewer resources are used than planned, but this is based on agreements with the project management, there is lesser absolute momentum, but equal normalised momentum. Absolute momentum is (strictly) based on the agreed resources at the start of the project.

I do not suggest that you always have to measure strategic momentum in quantitative terms or always have to use the formulas, given before. I give these formulas primarily to illustrate the concrete power of the concept and the idea of the impact on strategic momentum of deploying more or less resources than agreed (the $\alpha$) or of deploying them not (fully) into the direction of the agreed objectives (the $\beta$; figure 3.1.).

3.3. Research model
A research model is a description of the unit of analysis in its context in conceptual terms. As became clear in chapter 1, a field problem concerning virtual teams is that it is difficult for a manager to manage the team from a distance, because the manager has to deal with ‘invisible employees’ whom he only sees face-to-face to a limited extent, because of the geographical distance. Moreover it is more difficult to mutually adjust the work-at-hand from a distance, when two or more people who are geographically dispersed are working together. An important consequence is decreased effectivity. It also increases vulnerability of such a team. This field problem is the core management problem of virtual teams.

We also saw that virtual teams are especially difficult to manage when interferences occur. These interferences can frustrate the continuity of a project, on which a virtual team is working. In the most negative case these interferences can lead to a termination of the virtual team, before the project has ended successfully. This problem is probably greater for a virtual team than for a collocated team, because of a lack of face-to-face interactions between virtual team members and the team manager or, because of an ‘influence vacuum’ (Podsakoff et al., 1993).

Formulating the field problem in another way, I ask myself how to create an effective virtual R&D project team, given the starting conditions of the virtual R&D project team. The starting conditions include issues like:
- team composition
- team task
- context
- history

As we already saw, a possibility to increase the effectivity of a virtual R&D project team is a team that is ‘self-propelled’ and resilient. This brought us to the concept of strategic momentum, which is adopted from literature. In this thesis, strategic momentum of virtual teams is defined as 'the perseverance in virtual team strategy'. In other words: the virtual team, which has a certain amount of strategic momentum, is perseverant in the pursuit of the given goals and chosen strategies. Such a virtual team is self-propelled and resilient. An important indicator are momentum effects, which is the phenomenon that the self-propelling-force of the momentum becomes manifest, for example when there is a disturbance or when self-initiatives of the team members occur.

So, the over-all solution concept of this research is that team management and team members should use interventions aimed at creating and sustaining the right strategic momentum of the virtual R&D project team. Ceteris paribus such a team also has a good performance. So, the first initial proposition is as follows.

Initial proposition 1 Creating and sustaining strategic momentum of a virtual team is an effective way to address its core management problem.
Chapter 3 Research model, question and design

Of course, strategic momentum of a team does not completely determine the effectivity of a team; there are also other factors influencing this, as shown in figure 3.3.

![Diagram of causal model of project results]

**Figure 3.3. The causal model of project results**

The main question in this thesis is how to develop and sustain such a strategic momentum. Developing and sustaining strategic momentum of a team, department or organization can be regarded as a mode of planned organizational change. There is much literature on planned organizational change, discussing among other things various kinds of change, forces for and against change and strategies and methods for planned change. In this research we are interested in small scale, evolutionary planned change. There are several books on strategies for change, but most of these give specific steps on how to create conditions for change and on how to implement it (like Kotter & Schlesinger, 1986 or Kotter, 1996), or discuss specific approaches (like Organization Development in Cummings & Worley, 2005). For the issue of developing strategic momentum we are rather interested in the basic principles of such interventions, to be used in developing specific ones for the issue at hand. Publications on such basics are rare, but an important one is the influential book *Managing Strategic Change, Technical, Political and Cultural Dynamics* by Noel Tichy (1983). Tichy maintains that (strategic) organizational change has to be simultaneously managed in three interconnected systems (or domains): the technical (or technical-economic) system, the political system and the cultural (or socio-cultural) system. I hypothesise that the key factor in these three domains are respectively team task insight, empowerment and collective commitment. These hypotheses are also partly based on the work of Akkermans and Van Aken (2005, p. 8), who state ‘in our research model, the desired outcome (...) is a group of people who have learned a great deal about the issue at stake and feel committed to translate these insights into actions whenever the time is right for doing so. This is what we have labelled “strategic momentum”. This construct is a combination of two separate, yet indirectly related indicators: the level of insight gained, (…), and the level of collective commitment (…)’.

With team task insight is meant the degree to which virtual team members felt they acquired insights regarding the objectives and tasks of their virtual team. With empowerment is meant the degree to which tasks, responsibilities, and capabilities are delegated from the management to the virtual team. With collective commitment is meant the degree in which team members feel determined to translate the insights into formal action.

This results in a certain strategic momentum: the strategy and its intended outcomes will be pursued by the virtual R&D project team in question, also in the face of not anticipated difficulties and changing circumstances. The central hypothesis becomes now: when the virtual team members know what has to be achieved and done, when they have the resources and responsibilities and are committed to do so, then the virtual team has strategic momentum and is (among others) self-propelled and resilient.
Thus leading to three initial propositions:

Initial proposition 2. Strategic momentum can emerge and be sustained through team task insight *(van Aken & Opdenakker, 2006).*

Initial proposition 3. Strategic momentum can emerge and be sustained through collective commitment *(van Aken & Opdenakker, 2006).*

Initial proposition 4. Strategic momentum can emerge and be sustained through empowerment *(van Aken & Opdenakker, 2006).*

In their turn creating and sustaining team task insight, empowerment and collective commitment are dependent on several independent variables. These are starting conditions and management interventions, which are part of the model, and for which I will also look in this research. There are starting conditions or management interventions that are specific in one of the domains of Tichy (1983). Other management interventions or starting conditions can have their impact in two or three domains, i.e. factors, at the same time. I have concentrated this knowledge concerning strategic momentum in a model, based on the literature in section 3.2. (Figure 3.4.).

![Diagram](image)

Int: Management interventions

Con: Starting conditions

Figure 3.4. The causal model of strategic momentum

So, I am looking in this research for starting conditions and management interventions which lead to creating and sustaining team task insight, empowerment and/or collective commitment. As already said, on the basis of Tichy’s TPC-model it is hypothesized that team task insight, empowerment and collective commitment will lead to strategic momentum. These hypotheses will be verified or falsified by the research presented in this work. When

*Part of team task insight is transactive memory, or ‘the shared division of cognitive labour with respect to the encoding, storage, retrieval, and communication of information from different knowledge domains, which often develops in close relationships’*
strategic momentum has been created, this will ceteris paribus lead to an effective team, leading to good project results.

There is also another side of the medal concerning strategic momentum. As a substitute for management it can also have its drawbacks. As became clear from the description of momentum in physics, it is difficult to change momentum, i.e. to change the direction of the momentum when for example the original project goals of the team have been changed by the management. Then one could argue that a more negative definition of strategic momentum is 'stubborn pursuing of virtual team strategy'. By 'perseverance in virtual team strategy', the project is difficult manoeuvrable. An important addition is that there is always the possibility to replace the project goal by the management during the project. But then they need to use 'force', i.e. management interventions, to change strategic momentum. This does not have to mean that strategic momentum changes in intensity (or magnitude), but it will certainly change in direction. Also, 'perseverance in virtual team strategy' does not mean that pursuing the project goals is a rigid business in the process between project start and project end itself. There is enough bandwidth for creativity and improvisation, as it helps to push the team further in accomplishing the original project goals.

Also team task insight and collective commitment of a virtual team can have their drawbacks. As van Aken & Op denakker (2006, p. 12) stated, ‘one can have a too powerful collective insight, the infamous (closed) group think (e.g. Cuba’s ‘Pig Bay’ incident in 1962). Too much collective commitment can degenerate into doggedness, obstinacy’.

Although these remarks can be made concerning the concept of strategic momentum, according to me they have no consequences for the model presented earlier. The positive aspects of strategic momentum outweigh the negative aspects. Besides, many theories primarily meant to ‘make this world a better place’ can be used (of course from a specific (and as always: subjective) ethical point of view) in a negative way. Take for example the psychological theory of transactional analysis from Eric Berne. It was developed to shed more light on interaction processes and communication conflicts. When presented, salesman also used it to ‘overrule’ their customers to buy their goods.

3.4. Research questions
In chapter 1 I formulated the field problem that has been driving this study. Before, I reformulated the field problem in another way, which will be presented here too:

*How to create an effective virtual R&D project team, given the starting conditions of the virtual R&D project team.* The starting conditions include issues like:
- team composition
- team task
- context
- history

In order to be able to answer the main question, I formulated five central (or sub) research questions.

Central question 1: How to define strategic momentum and how to measure it?

This question has already been answered in section 3.2.4. and 3.2.5.

Central question 2: Can strategic momentum be more or less a stable property of a virtual team?
Chapter 3 Research model, question and design

Strategic momentum is a sort of ‘hypothetical construct’. We can not see it directly, but only indirectly when momentum effects occur, which have already been defined at section 3.3. In chapter 4, for answering the second question, we will look if such momentum effects exist.

Central question 3: Does team task insight, empowerment and collective commitment lead to the emergence and sustenance of a strategic momentum?

This question will be answered in chapter 5.

Central question 4: What starting conditions and what management interventions can lead to the creation and sustenance of team task insight, empowerment and/or collective commitment?

This question will be answered in chapter 6.

Central question 5: Can the management of a virtual team use the development and sustenance of a strategic momentum to realize the objectives of the team?

This question will be answered in chapter 5.

3.5. Design science research

3.5.1. Definition
The research approach I used in this study is called design science research. There are several terms used by authors, all with the same aim: doing research aimed at developing knowledge to support the design solutions for field problems. Van Aken (2004a, 2005, 2007) calls it ‘design science research’, whereas ‘the term ‘design science’ is chosen to underline the orientation on knowledge-for-design (of solutions for real world problems), and not on action itself and the skills necessary for adequate action, which is the domain of practitioners’ (van Aken, 2005, p. 22). Romme (2003) calls it ‘Design’, probably to make a clear distinction between mode 1, which is ‘science’, and mode 2, which is ‘design’. Finally, Andriessen calls it research at given designs, to avoid any confusion with designers studies. In this research, I will use the term design science research. The definition of design science research is ‘the research within a discipline, aimed at developing general substantive and procedural design knowledge to support the design of solutions for field problems in that discipline’ (van Aken, 2007, p. 69).

3.5.2. Historical background
Design-science research in the field of management and organisation science is not new. Romme (2003) even distinguishes three generations of design thinking, beginning with Frederic Winslow Taylor and his ‘scientific management’ movement as the first generation and sociotechnical systems, functionalist systems theory and human relations as the second generation. Now, a third generation of design thinking is emerging. According to Romme (2003, p. 565) the first generation of designers emphasized ‘technical, instrumental concept(s) used by managers trying to bring their organizations under rational control’. This has led to a misinterpretation of design that is not relevant any longer. The second and especially the third generation of design thinkers view managers not as ‘all-powerful architects of organizations’ (Romme, 2003, p. 565). This is an important notion, because I think this is also the case concerning ‘management problems’. With a workforce that is increasingly highly-educated, that needs more autonomy and empowerment to be creative and innovative, managers are not the only ones in an organisation who are able to define problems (beside the ‘problem’ I have with ‘problems’, as will be explained under ethics).
3.5.3. Paradigmatic starting points

As van de Ven (2007, p. 36) states ‘underlying any form of research is a philosophy of science that informs us about the nature of the phenomenon examined (ontology) and the methods for understanding it (epistemology)’. Here, I will explain my paradigmatic starting point of this research (world-view paradigm).

In this research, I follow the definition of paradigm by Guba and Lincoln (1994, p. 108) that a paradigm is a ‘basic belief system based on ontological, epistemological, ethical, and methodological assumptions’. It represents a world-view that defines, for its holder, the nature of the ‘world’. Now, I will explain my world-view paradigm. I share the epistemology with other advocates of design-science research, which is an epistemology rooted in pragmatism. That is, design (-science) research develops knowledge in the service of action (Romme, 2003). Concerning the ontology, I embrace social constructivism. In the so-called utilitarian problem, the question is whether consciousness became aware of itself, before it looked at the world, or that consciousness became aware of itself, after it looked at the world. I assume the latter. As a consequence, according to me there is a ‘material world’ external of me, but it is not an objective world, but only a subjective world, represented by human thought. This human thought is based again on social constructs, embedded in a specific society. Human thinking is only possible by using language, and this is learned by socialisation in the culture in which one lives. As Berger and Luckmann (1966) suggest ‘it is through the social process that reality takes on meaning and that our lives are formed and reformed through the dialectical process of socialization’. Each new conception of the world is mediated by prior-constructed realities that we take for granted. So, according to me no ‘objective’ knowledge can be derived from the world, because knowledge and the ‘tools’ we use for gaining it, are also based on language (and therefore on subjective social constructs). Let me give some examples. Physicists in the western world would say that a stone sinks into the water because according to Archimedes ‘Any solid lighter than a fluid will, if placed in the fluid, be so far immersed that the weight of the solid will be equal to the weight of the fluid displaced’ (On floating bodies I, prep 5). Of course this means that when the weight of the solid is higher than the weight of the fluid displaced, the solid (the stone) will sink. Animists in Indonesia would say ‘the stone sinks into the water because it is white’. Both ‘see’ the same phenomenon, but they give another explanation of it, on the basis of their social context (and their ‘belief’ systems). But even using a ‘tool’ in one and the same culture can give different outcomes (i.e. interpretations), emphasizing the absence of ‘objectivity’ even in western science. As Gudmund Iversen (Gergen & Gergen, 2003) demonstrated ‘when subjected to differing statistical procedures, the same data can be used to draw quite divers – even antithetical – conclusions’.

Wicks and Freeman (1998, p. 124) define ethics as ‘concern for advancing human purposes’. According to them, researchers who embrace the epistemology rooted in pragmatism do research to help people lead better lives. But they are vague about the process leading to the definition of ‘problems’ for which ‘solution-concepts’ can be developed. I have the impression, on the basis of statements like ‘Ethics in the context of business is about what the corporation strives to be (its goals and ends), how the corporation relates to its stakeholders, how managerial responsibilities are defined, and what ground rules will be used to limit and guide people’s behaviour. Managers, as well as academic researchers, implicitly or explicitly make choices on all these issues (Wicks and Freeman, 1998, p. 131)’ that they give management an important role in the definition process of these ‘problems’. But a ‘problem’ is not an objective fact. As the Greek philosopher Epictetus (c. 55 – c. 135 AD) once wrote in his book Enchiridion ‘Men are disturbed, not by things, but by the principles and notions which they form concerning this’. Therefore, ‘problems’ are always subjective and related to the ones who have the ‘problem’. Designing ‘solution concepts’ for ‘problems’ which are only defined by the management is contradicting the ethical rule of helping all people lead better lives. An important reason for this is that the ‘problem’ is only shared by a specific group: the management. Therefore, ‘problems’ must be defined by all people or a
representative group of people at the level that is probably (as already said, a problem is subjective; it does not have to be a problem for all at the particular level) affected by that ‘problem’. This ‘level’ can be a team, a department, or even the whole organisation. When there is an agreement concerning a ‘problem’ for which a solution concept has to be designed, an advantage is that the ultimate solution-concept will be accepted. This will make it easier to implement the solution-concept, and increase its effectiveness.

Although in this study I started with a field problem that is defined as a management problem, which I now criticize, designing solution-concepts for the problem has advantages for all employees. The field problem is that the ‘influence vacuum’ between manager and employees makes these teams probably less effective. Therefore, I designed a solution concept that not only can help to increase the effectiveness of the virtual team, but also can increase its resilience by increasing the empowerment of the team members. So, thanks to virtuality, employees can gain a lot of autonomy, and employee self-management. Besides, the solution concept, which are management and team members interventions aimed at creating and sustaining strategic momentum, can also lead to flow, which leads to more beautiful work processes (Weggeman, 2006).

3.5.4. Design propositions
Design science is driven by an interest to solve field problems. Knowledge must be developed that can be used by the professionals of the discipline in question to develop solutions for their field problems (van Aken, 2004b). As I already stated, with professionals of the discipline in question I definitely not only mean managers. So, the outcomes of design science research are solution-concepts. One could almost play with a saying of Karl Marx, that ‘(…) the philosophers only have explained the world in different ways, but the task, which is more important, is to change it’ (Russel, 1984, p. 703). Or ‘description-driven research programs are problem focused and only try to describe, explain the problem, but the task, which is more important, is to come up with solution-concepts to solve the problem’.

The nature of the research product of the prescription-driven research programs is heuristic (van Aken, 2004a). An algorithmic-prescription is ‘if you want to achieve Y in situation Z, then perform action X’. A heuristic prescription is ‘if you want to achieve Y in situation Z, then something like action X will help’. ‘Something like action X’ means that the prescription is to be used as a design exemplar. This heuristic prescription is also called a design proposition logic. A design proposition is ‘a chunk of general knowledge, linking an intervention or artefact with a desired outcome or performance in a certain field of application’ (van Aken, 2004a; van Aken, 2005, p. 23). A design proposition is typically not totally general, but applicable to a certain application-domain, a class of problems. Research on design propositions typically goes through a stage of alpha-testing (testing and further development by the originator of the rule), to be followed by beta-testing (the testing of the rule by third parties) (van Aken, 2004a), and eventually gamma-testing (testing of the rule by the users). By testing the proposition in its intended context, justification of the design proposition is obtained (van Aken, 2004b).

Grounding can be done with insights from the social sciences. Here, the concept of generative mechanisms can be used, taken from Pawson and Tilley (1997). Pawson and Tilley’s point of departure is what they call the basic realist formula mechanism + context = outcome. The generative mechanism is the answer on the question ‘why does this intervention (in this context) produce this outcome?’ (van Aken, 2004b). On the basis of Pawson and Tilley’s formula, Denjer, Tranfield and van Aken (2008) developed the CIMO-logic: ‘This logic is constructed as follows: in this class of problematic Contexts, use this Intervention type to invoke these generative Mechanism(s), to deliver these Outcome(s).’ (Denjer, Tranfield and van Aken, 2008, pp. 395-396). The intervention type (I) in the CIMO-logic is the solution
concept. In this research, the over-all CIMO-logic of the principal design propositions runs like:

Design proposition 1: In order to overcome the management problems, caused by the limited face-to-face contacts in virtual teams (C), team management and team members should use certain interventions (I) in order to increase its effectiveness (O) by the perseverance in goal seeking behaviour (M).

3.6. Research strategy

3.6.1. Scoping
As was mentioned before, the research I conducted was on virtual R&D project teams, consisting of members from different organisations. I studied eight virtual R&D project teams; three of them consisted of members from organisations in the Netherlands, and five of them with members from organisations spread all over Europe. Data capture took place between October 2005 and Mai 2008.

Concerning the research I only concentrate on the interaction characteristics, not on the pre-interaction characteristics, for example differences in cultural or professional background. Actually our research starts with the kick-off meeting of a virtual R&D project team. So, only when the pre-interaction characteristics lead to communication (i.e. interaction) disturbances at the start of the virtual R&D project team or later in the process of the team, they will have their value for the research. Further, so called ‘enablers’, like internet connection, can be seen as a part of empowerment. In this research I also concentrated specifically on the team level. So, individual skills of virtual team members were not taken into account.

The three determinants team task insight, empowerment and collective commitment, as strategic momentum, can be analysed on every aggregation level, and for every partner (i.e. organisation).

For the analysis of the data, particularly for the cross-case analysis, I could choose for an unformulated (informal) approach, not using specific methods. But the outcome of using an unformulated approach was not satisfying, leaving too much space for different interpretations. Then I searched for methodologies like Miles and Huberman to analyse the data. In the end I chose for crisp set Qualitative Comparative Analysis (csQCA; formal approach), because it is suited very well for this analysis. csQCA was developed at the end of the eighties of the last century by Prof. Dr. Charles Ragin. It can already be used when dealing with small numbers, which makes it suitable for this research (with a N(umber) of eight cases). The method is based on Boolean algebra, in which a distinction can be made between two conditions or states: true and false. But what makes this method very interesting for this study is that it is not so much interested in isolated factors, but more in configurations of these factors which do or do not positively contribute to an outcome. And this is what I am looking for! In section 3.6.3., we will learn more about this method.

Choice for developing serial single case studies
The research I conducted is partly theory testing research, and partly theory developing research concerning strategic momentum. The testing concerns the right parts of the causal model of strategic momentum (Figure 3.4.), i.e. team task insight, empowerment and collective commitment, their influence on strategic momentum, and its influence on the project results of a team. This testing comes up to the central question 3 in this research: Does team task insight, empowerment and collective commitment lead to the emergence and sustenance of a strategic momentum?, and central question 5: Can the management of a
virtual team use the development and sustenance of a strategic momentum to realize the objectives of the team?

The *developing* (in the domain of virtual teams) concerns the left part of the causal model of strategic momentum (Figure 3.4.), i.e. the starting conditions and management interventions in the technical (T), political (P) and cultural (C) domains. This developing comes up to the central question 4 in this research: What starting conditions and what management interventions can lead to the creation and sustenance of team task insight, empowerment and/or collective commitment?

To give an answer on most of the research questions presented in section 3.4., as a main research strategy a serial single case study was conducted, in which virtual R&D project teams were studied. All cases studied are teams consisting of members from different organisations, so called multiple-party teams. I have chosen for cases to study, because:
- I want to have a closer look into ‘the black box’ of a virtual team developing strategic momentum and into the context dependency of such processes.
- Case studies are particularly effective when a large number of variables that cannot be manipulated have to be dealt with, and when little information about a number of these variables is available (Rasters, 2004, p. 32).
- As van Aken stated (2004, p. 232) ‘The typical research design to study and test design propositions, is the multiple case; (…)’

I do not use the word ‘multiple case-study’, but serial single case study, because with Dul and Hak (2008, p. 45) I agree that the term multiple case-study must be more nuanced. Dul and Hak (2008, p. 45) distinguish as follows:
- A comparative study is a study in which (a) a small number of cases in their real life context are selected and (b) scores obtained from these cases are analysed in a qualitative manner.
- A parallel single case study is case study research with a replication strategy in which a number of single cases are selected at the same time and the same proposition is tested in each of them without taking into account the outcome of any of the separate tests.
- A serial single case study is case study research with a replication strategy in which each test takes into account the outcome of previous tests (Dul and Hak, 2008, p. 45).

I have conducted a serial single case study because I wanted to use advancing insight. I first conducted three case studies. These case studies were:
- Dewey case study: a European project, which was financed by the EU and lasted for 30 months.
- Goa case study: this was the European contribution to a Japanese project. It was also financed by the EU and lasted for two years.
- Print case study: this project was also financed by the EU and lasted for 30 months.

Beforehand, I formulated starting conditions and management interventions on the basis of an explorative study and literature study. The outcome of the three mentioned case studies, concerning (new) starting conditions and management interventions, formed the input for the next series of case studies. These (five) other case studies were as follows:
- Berlin case study: the project was funded by the national governments of the partners and lasted for two years.
- Lisbon case study: the project was also funded by the national governments of the partners and lasted for two years.
- Paris case study: the project was also funded by the national governments of the partners and lasted for three years.
- Jiaozuo case study: this was a Dutch project, financed by a consortium. It lasted for 18 months.
Chapter 3 Research model, question and design

- Groningen case study: this was also a Dutch project, financed by a consortium. It lasted for almost seven years.

In the end, the outcome of these last five case studies formed the input for re-analysing the first three case studies. In this way, ‘(…) the theory is better grounded, more accurate, and more generalizable (all else being equal) (…)’ (Eisenhardt & Graebner, 2007, p. 27).

Although actually a part of the causal model of strategic momentum, i.e. the theory concerning strategic momentum, was tested in this research, I did not accomplish data capture by a questionnaire. Instead, in-depth interviews were held with the respondents. There are several arguments for this choice. First, and probably the most important argument is that I choose for serial single case studies. Second, the theory concerning strategic momentum is still premature. It has not been empirically tested before. Therefore it is more likely not to conduct a pure testing research, but research that also has a more explorative character. In this way the theory can be adjusted if necessary. Third, I want to gain an in-depth understanding of the theory and the model. Qualitative research, by conducting in-depth interviews, is suited for this purpose. Fourth, and in line with the third argument, according to Swanborn (2001, p. 267) ‘one can ask much lesser questions in a questionnaire than in an interview’. Fifth, I want to know in-depth what starting conditions and management interventions, and in what way, have their influence on team task insight, empowerment and collective commitment.

So, for conducting the serial single case studies, I used a semi-structured interview method, which gave me the freedom to keep on asking when new questions occurred (see Appendix 1 and Appendix 2). For my research, I want to investigate dynamical systems: virtual R&D project teams. I want to know what the reactions of these dynamical systems are on disturbances; in the most negative scenario these disturbances can lead to a termination of the virtual project team, although the project is not finished. To make these disturbances manifest, and investigate how the virtual team coped with these disturbances, I used the ‘critical incident technique’ of Flanagan (1954). With an incident, Flanagan meant ‘any observable human activity that is sufficiently complete in itself to permit interferences and predictions to be made about the person performing the act’. To be critical, Flanagan meant that ‘an incident must occur in a situation where the purpose or intent of the act seems fairly clear to the observer and where its consequences are sufficiently definite to leave little doubt concerning its effects’.

A critique that is often given concerning interviews is ‘that the data are biased in which impression management and retrospective sensemaking are deemed the primed culprit’ (Eisenhardt & Graebner, 2007, p. 28). To mitigate this bias, in the first place a total of eight cases were studied, from which seven ex post studies and one longitudinal study. According to Leonard-Barton (1990) a ‘key approach to mitigating bias is to combine retrospective and real-time cases’.

In the second place, from every case three or four informants were interviewed ‘who view the focal phenomena from diverse perspectives’ (Eisenhardt & Graebner, 2007, p. 28). Besides, four interview techniques were used for data capture, i.e. face-to-face interviews (which last for about one hour), telephone interviews (which last for about an hour), MSN interviews (which last for one and a half-hour), and e-mail interviews (spread over several days). These four interview techniques are essentially equivalent for conducting interviews in research. An important distinctive criterion is however the nature of the information one wishes to obtain, especially the importance of social cues. If the interviewer is seen as a subject, and as an irreplaceable person, from whom the interviewer wants to have his personal opinion on a certain topic, for example on the labour union, then social cues are very important. Interviewing by ftf, or by telephone is then preferable. When the interviewer interviews an expert about topics that do not pertain to his status as an expert, then social cues become less important. In that case, all four interview techniques can be used (Also see Opdenakker, 2006).
Chapter 3 Research model, question and design

Beside interviews, also documents concerning the projects and internet sources were used as sources for the research. In this way, the research conducted can come up to the criterion of triangulation. According to Swanborn (1994), triangulation ‘increases the internal validity’.

3.6.2. Strategy for within-case analyses
For analysing data in qualitative research, I can choose between different analysis styles. Crabtree and Miller (1992, p. 18) distinguish four different analysis styles (Figure 3.5.).

**Figure 3.5. Diagrammatic Representation of Different Analysis Styles**
Chapter 3 Research model, question and design

- **Quasi statistical analysis style**
  This style includes several approaches, one of which is basic or manifest content analysis. The content analyst reads the text searching either for 'words' or for semantic units or themes based on a codebook. The words and/or themes are then sorted into categories and manipulated statistically.

- **Template analysis style**
  These techniques all share the use of a template or analysis guide, which is applied to the text being analysed. The basic pattern or template underlying all the template analytic styles is distinguished from the codebook of quasi-statistics in that the template is more open-ended and undergoes revision after encountering the text. In addition the generation of themes, patterns, and interrelationships is an interpretative rather than a statistical process. The template derives from theory, research tradition, pre-existing knowledge, and/or a summary reading of the text. Templates can be codebooks developed prior to data collection, as in the approach of Miles and Huberman (1994), or created after data collection has begun, as in ethnographic content analysis (Altheide, 1987). Whatever the template, it is applied to the text with the intent of identifying the meaningful units or parts. The units are behaviour or language units such as words, phrases, utterances, and folk terms. If the text reveals inadequacies in the template, modifications and revisions are made and the text is re-examined. The interaction of text and template may involve several iterations and include the collection of more data until no new revisions are identified. The analyses then proceeds to an interpretive phase in which the units are connected into an explanatory framework consistent with the text. It are these final connections that form the reported outcomes.

- **Editing analysis Style**
  This style is termed editing because the interpreter enters the text much like an editor searching for meaningful segments, cutting, pasting, and rearranging until the reduced summary reveals the interpretative truth in the text. The interpreter searches for meaningful units or segments of text that both stand on their own and relate to the purpose of the study. Once identified, these units are sorted and organized into categories or codes. The interpreter then explores the categories and determines the patterns and themes that connect them. After this step, the editing style is similar to template analysis. The grounded theory approach of Glaser and Strauss is an example of the editing analysis style.

- **Immersion/Crystallization analysis style**
  This style consists of the analyst's prolonged immersion into and experience of the text and then emerging, after concerned reflection, with an intuitive crystallization of the text. This cycle of immersion and crystallization is repeated until the reported interpretation is reached. (Source: Crabtree and Miller, 1992, pp. 19-20)

  The question is, which analysis style is appropriate. To answer this question, Crabtree and Miller (1992, p. 304) developed 'the analytic space', consisting of two dimensions: 'Perceptual filter', and 'Analyst's relationship to text' (figure 3.6.).
According to Crabtree and Miller (1992), there are three major arguments for choosing the analysis style which are as follows:

In the first place if the goal of the research is theory testing, an approach involving more structure and distance from the text is desirable. Because in this research a model has already been developed, which must be partly tested in (however a subjective) reality, an approach with more structure and distance from the text will be used.

In the second place the amount of knowledge already in hand about the subject or question of interest. If there is much existing literature, especially qualitative literature, then more structure and distance is beneficial. If theory is very explicit and well established in the area of inquiry, then using an approach with a more defined filter is helpful. Although one could argue that the developed model in this research is very explicit, it is not well established in the area of inquiry. Therefore, the perceptual filter must be open enough for not excluding new data.

In the third place the design must be in coherence with the data collection technique. For example, observational data, already filtered by a note taker, might be analysed better using methods with a more defined perceptual filter, whereas analysis methods with a less defined filter are preferable with in-depth interview data. Because in-depth interviews are used in this research for data collection, it also argues for a less defined filter.

A fourth argument is that already from literature study and explorative research (as mentioned in section 3.6.1.), many starting conditions and management interventions were distinguished, aimed at creating and sustaining strategic momentum in virtual teams.

Considering these arguments, I can choose between two analysis styles: Template analysis style, and quasi statistical analysis style. Eventually I have chosen for a combination of the two styles. I use the template analysis style with a more open perceptual filter for data analysing, leading to the within-case analysis. The analysis phase is an iterative process. The starting conditions and interventions of the template will be taken as items on which the cases can be compared. Then the critical incidents and critical interventions of the cases are compared, to look at differences and similarities, and to find new starting conditions and management interventions. These new conditions and interventions are inserted into the template. With the adapted template, the cases will be analysed all over again, till the template is saturated (i.e. no further codes can be added to the template).
After analysing the different cases with the help of the template, a case history was written, as a within-case analysis.

### 3.6.3. Strategy for cross-case analysis

To conduct a cross case analysis, I can do this without a formal method. In this way, different starting conditions and management interventions could be found, leading to team task insight, empowerment and/or collective commitment. But there are some constraints when using this approach. In the first place I think it has a high amount of subjectivity. In the second place, while I am searching for patterns, such an approach would not give me insight into configurations. Searching for a method that would not only increase the quality and reliability of these cross-case analysis, but would also enable me to find configurations leading to certain outcomes, I looked into “Qualitative Data Analysis” of Miles and Huberman (1994).

The only method I could find that could be useful for conducting the cross-case analysis was a ‘Scatterplot’ (Miles and Huberman, 1994, p. 197 -200). These are ‘figures that display data from all cases on two or more dimensions of interest that you think are related to each other’ (Miles and Huberman, 1994, p. 198). But the problem with this method is that these figures call for a careful ‘scale score’, rather than an impressionistic rating. Therefore, I would have to do ‘finer-grained’ work than I actually did in my research. The second problem with this method is that it assumes additivity, which means that each single cause has its own separate, independent impact on the outcome. Instead I wanted to look at configurations, specific combinations of factors leading to certain outcomes.

A method that is very powerful, especially in achieving my research goals concerning the cross-case analysis (i.e. finding configurations), is a method originally developed by Prof. Dr. Charles Ragin in 1987 (Ragin, 1987), called crisp set Qualitative Comparative Analysis (csQCA)\(^9\).

csQCA is a method that does not come up with some basic assumptions that are important for most statistical approaches, but with other assumptions\(^10\). csQCA (mainly based on Rihoux et al., 2009, p. 8-9):

- Does in the first place not assume permanent causality, because it views causality as context specific and also conjuncture specific.
- While a given condition can, in combination with different other conditions, sometimes act in favor of the outcome and sometimes against it (on the basis of combination with different other conditions), uniformity of the causal effects is not assumed in the second place.
- In the third place, this method allows for ‘conjunctural causation’ which means that different configurations, or constellations of variables, can lead to the same outcome. Or in other words: different paths can lead to the same results. This is the notion of equifinality.
- In the fourth place this method gives insight into the questions ‘if’ and ‘which’ configurations are important. Concerning these configurations or conditions, which are the outcome of the csQCA analyses, a distinction can be made between necessary and sufficient configurations or conditions. According to Rihoux et al. (2009, p. xix) ‘a condition (or configuration) is necessary for an outcome if it is always present when the outcome occurs. In other words, the outcome cannot occur in the absence of the condition (or configuration)’ and ‘a condition is sufficient for an outcome if the outcome always

---

\(^9\) Beside csQCA I could also choose for Multi-Value (mv)QCA or Fuzzy set (FS)QCA. The latter two analyses did not produce any extra information compared with csQCA. Therefore in this research only csQCA is used.

occurs when the condition is present. However, the outcome could also result from other conditions (or configurations).”

- In the fifth place ‘additivity’, as is the case in for example a method like ‘Scatterplot’, is not assumed in csQCA but replaced by the assumption that several causes can be simultaneously present (or be combined, somehow), constituting a ‘causal combination’.

- In the sixth place the presence and the absence of the outcome, respectively, may require different explanations. So, causality is not assumed to be symmetrical.

Beside the forementioned assumptions, csQCA:

- can in the first place also be seen as a ‘case-oriented’ method, while QCA techniques can, with the help of formal tools and a specific conception of cases, conduct a systematic comparison of cases.

- is in the second place also used when dealing with small-N(umber)’s, as is the case in this research (eight cases). According to Rihoux et al. (2009, p.4), ‘(...) the “small-N” zone is now usually associated with a really low number of cases – say, between 2 cases (this is a “very small N”, but it does enable some form of binary comparison) and around 10 to 15 cases’. So we presume that eight cases are still suitable.

- deals in the third place with a small number of complex cases in a configurational way, and that is very important concerning my research. With configurational is meant that a case is seen as a ‘whole’, with its complex combination of properties which should not be lost during the analysis.

A disadvantage of csQCA is that it is reductionistic: much information will be lost, on the basis of the ‘binary’ presentation of the variables (see below). But it must be said that the material I worked with was almost binary; it was not measured in a ‘finer-grained’ way, as I already mentioned above. So, the loss of information was not so big.

csQCA is based on Boolean algebra, a form of algebra developed mid-nineteenth century by George Boole. In Boolean algebra, a distinction can be made between two conditions or states: true (or large, present, high) and false (or small, absent, low), or 1 (indicates large, present, high) and 0 (indicates small, absent, low). As a consequence, ‘in a Boolean analyses of social data all variables, independent and dependent, must be nominal-scale measures.’ (Ragin, 1987).

In section 3.9. I will give an example concerning the use of csQCA.

3.6.4. Validation

For the cross-case analyses I used another method, as already introduced, crisp set Qualitative Comparative Analysis. In this way I used a quasi statistical analysis style. So, instead of conducting an alpha or beta, or even gamma test, I conducted a cross-case analysis. The nature of alpha and beta testing of design propositions by means of action experiments is highly similar to the replication logic recommended for comparative case studies (Eisenhardt 1989, Numagami 1998, Yin 1984). In this way, I can conclude that a serial single case study, and in the end a cross-case analysis can replace alpha and beta testing (and a gamma testing).

3.7. The case studies

I already mentioned in chapter 1 and 2 that I have deliberately chosen for virtual R&D project teams. For this domain is chosen because of the following reasoning. A stand still in our economic system is seen as going backwards. Therefore, continued innovation is an important force behind economic progression. Nowadays, innovation is more and more accomplished in settings of multidisciplinary cooperation. A virtual research and development project team is a form of cooperation that plays an important part in these innovation processes. Six out of eight case studies are European virtual R&D project teams. Three European case studies (Dewey, Goa and Print projects) are financed by the EU. Three other European case studies
(Berlin, Lisbon and Paris projects) are financed by the national governments of their participating organisations. All the former mentioned case studies were ex-post case studies, as was the Jiaozuo case study, which was a Dutch project. The eight case study was also a Dutch project, but as opposed to the other case studies this was a longitudinal study.

Here I introduce the eight virtual R&D project teams:

**Dewey project**
This was a European project, financed by the EU. It started January 1st 2001, and lasted for 30 months.
The objective of the project was to define an infrastructure for modelling all phases in a life cycle of new production facilities. Therefore, information such as sub-models and the complete production facility model with clearly defined views of data would flow easily between the suppliers and manufacturers in different phases: planning phase, building phase, and running phase.

**Goa project**
This project was part of a Japanese program. This Japanese program on its turn was part of a global program. The project was the European contribution to the Japanese program within the global program. For the project a proposal was written for the EU (under the 5th Framework Program), and for the global program. The project started in 2000, and lasted for two years. The objective of the project known as GOA was to develop a system that supported assembly process improvement. The system supported in an integrated and ongoing manner using advanced simulation software. This new simulation system included the latest ICT systems with the most recent knowledge of sociotechnic and ergonomics.

**Print project**
This was a European project, partly financed by a program of the European Commission. The project fell under the 5th Framework Program 2000. The project started in January 2001 and lasted for 30 months. The key objectives of the PRINT project were as follows:
- Carry out research into the world’s best practices and critical success factors for X.
- Develop an advanced software system for profit and non-profit organisations.
- Test and validate PRINT with various European Small and Medium-sized Enterprises (SMEs)
- Develop learning and support materials

**Berlin project**
This was a European project, approved by a European institute, and funded by the national governments of the partners in the project. The project started in August 2003, and lasted till August 2005.
The key objectives of this project were:
- To consolidate and extent on the results of the previous project by the investigation of a number of fields of research that are considered extremely important for the application domain but have not been covered by the first project like fault prevention, power management and terminal management including secure downloading aspects.
- The project will also complete the implementation and validation from the prototype level of the previous project results in to a full compliant component based framework.
- The project will continue the standardisation process and support the preparation of the deployment of the compliant component based framework.

**Lisbon project**
This was a European project, approved by a European institute, and funded by the national governments of the partners in the project. The Lisbon project started in July 2001, and lasted till June 2003. The key objectives of this project were:
Chapter 3 Research model, question and design

- Product family adoption: when and how a system-family approach should be introduced and how best to integrate new with existing processes.
- A roadmap for product line adoption (including processes, techniques, and tools).
- Support for integrating existing systems into system families to share knowledge and reduce future cost.
- Support for development on interoperable heterogeneous platforms.
- Support for dealing with varying quality requirements in a product family.
- Integrated traceability, version management and variation support.
- Support for testing and validation to reduce development time for family members.

Paris project
This was a European project, approved by a European institute, and funded by the national governments of the partners in the project. The project started in July 2001, and lasted till June 2004. The main objective of the Paris project was to streamline debugging and testing throughout the product life cycle, and to provide cost-effective methods appropriate to high-volume production.

Jiaozuo project
This was a Dutch project, approved and subsidised by a consortium. The project started in September 2001, and lasted formally till September 2002, but actually till February 1st 2003. The Jiaozuo project was part of a bigger project, which consisted beside the Jiaozuo project of four other projects.

The main aims of the Jiaozuo project were as follows:
- To design and develop a layered electronic practical work in which students broaden their expertise concerning the implementation of e-business. The students were last-year students of schools for vocational studies and first-year students of universities. This practical work was focused on the use of e-business and specially developed for IT students and students of management science.
- To conduct a pilot study in some virtual teams.

Groningen project
This was a Dutch project. The project started formally in January 2001 (according to two informants they started in 2002), and lasted formally till December 2007. The main objective of the project was developing and demonstrating (building) a tool. The project was fundamental research.

Concerning the data capture in the eight cases, next I will explain data capture for every case. The members were invited for the interview by telephone or by e-mail. Confirmation of the appointment for the interview followed by e-mail, and some information concerning the aim of the interview was send to the informant too (see Appendix 3). The first informant of a case was also asked for additional information (documents etceteras) concerning the project, and names etceteras from other members of the project.

The face-to-face interviews (which lasted for about one hour) and telephone interviews (which lasted for about one hour) were tape recorded with beforehand obtained permission from the informants. Afterwards I transcribed the tape. The MSN messenger (which lasted for about two hours) and e-mail interviews (spread over several days) had the advantage that the whole text was available immediately after the interview (see figure 3.7).

At the Berlin, Paris and Lisbon cases, after discussing the first analysis with the PhD supervisor, one member of the team was interviewed (face-to-face) again, trying to gather additional information.

In the end, all interviewed team members (of all eight cases) received a member-check (see Appendix 4 and Appendix 5). When a member did not respond to the member-check, which was send by e-mail, two weeks after sending the member-check I send a reminder. In most cases, one and sometimes two members of a team responded to the member-check.
### Name project | Time interval data capture | Ex post or longitudinal research | Number of interviewed | FTF interview | Telephone interview | MSN messenger interview | E-mail interview
--- | --- | --- | --- | --- | --- | --- | ---
Dewey | November 2005 till February 2006 | Ex post | Four members | 3 | -- | 1 (together with e-mail interview) | 1 (together with MSN messenger interview)
Goa | October 2005 till December 2005 | Ex post | Three members | 3 | -- | -- | --
Print | October 2005 till December 2005 | Ex post | Three members | 1 | 1 | 1 | --
Berlin | October 2006 till February 2007 | Ex post | Three members | 2 | 1 | -- | --
Paris | October 2006 till February 2007 | Ex post | Four members | 1 | 3 | -- | --
Lisbon | October 2006 till February 2007 | Ex post | Three members | 1 | 2 | -- | --
Jiaozuo | December 2005 till April 2006 | Ex post | Two members | 2 | -- | 1 (together with FTF interview) | --
Groningen | February 2006 till March 2006 | Longitudinal | Three members | 3 | -- | -- | --
Groningen | March 2007 till April 2007 | Longitudinal | Three members | 3 | -- | -- | --
Groningen | Mai 2008 | Longitudinal | One member | 1 | -- | -- | --

Figure 3.7. Time interval of data capture and techniques used for data capture in the eight cases

#### 3.8. The within-case analysis

As already stated 'The template derives from theory, research tradition, pre-existing knowledge, and/or a summary reading of the text' (Crabtree and Miller, 1992, pp. 19-20). Primarily derived from literature study and explorative research, but to some extent also from the model, starting conditions and management interventions were distinguished, aimed at the creation and sustenance of strategic momentum in virtual R&D project teams. These conditions and interventions were used to develop an a priori template (figure 3.8.). This is also recommended by Miles and Huberman (1994, p. 58) when they state that 'one method of
Creating codes - the one we prefer - is that of creating a provisional 'start list' of codes prior to fieldwork.

<table>
<thead>
<tr>
<th>Interventions/starting conditions</th>
<th>Coding in Atlas Ti</th>
<th>Interventions or starting conditions or both</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology: team task insight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TTI: Face-to-face kick-off meeting (with task issues)</td>
<td>TM-OBJ</td>
<td>TTI-FtF</td>
</tr>
<tr>
<td>TTI: The virtual team project is a continuation of a former project</td>
<td>TTI-continuation project</td>
<td>C</td>
</tr>
<tr>
<td>TTI: Coaching management style</td>
<td>TTI-coaching</td>
<td>I</td>
</tr>
<tr>
<td>TTI: Knowledge transfer</td>
<td>TTI-knowledge transfer</td>
<td>C</td>
</tr>
<tr>
<td>TTI: Professional background of team members</td>
<td>TTI-professional background</td>
<td>C/I</td>
</tr>
<tr>
<td>TTI: Cultural background of team members</td>
<td>TTI-cultural background</td>
<td>C/I</td>
</tr>
<tr>
<td>TTI: Project description</td>
<td>TTI-project description</td>
<td>C/I</td>
</tr>
<tr>
<td>TTI: Task characteristics</td>
<td>TTI-task characteristics</td>
<td>C/I</td>
</tr>
<tr>
<td>TTI: (Planning or) training</td>
<td>TTI-training</td>
<td>I</td>
</tr>
<tr>
<td>TTI: Participative decision making</td>
<td>TTI-participation</td>
<td>I</td>
</tr>
<tr>
<td><strong>Politics: empowerment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E: Participative decision making</td>
<td>E-participation</td>
<td>I</td>
</tr>
<tr>
<td>E: Coaching management style</td>
<td>E-coaching</td>
<td>I</td>
</tr>
<tr>
<td><strong>Culture: collective commitment</strong></td>
<td>CC-OBJ</td>
<td>Condition/intervention</td>
</tr>
<tr>
<td>CC: Face-to-face kick-off meeting (with socialising issues)</td>
<td>CC-FtF</td>
<td>I</td>
</tr>
<tr>
<td>CC: The virtual team project is a continuation of a former project</td>
<td>CC-continuation project</td>
<td>C</td>
</tr>
<tr>
<td>CC: Participative decision making</td>
<td>CC-participation</td>
<td>I</td>
</tr>
<tr>
<td>CC: Coaching management style</td>
<td>CC-coaching</td>
<td>I</td>
</tr>
<tr>
<td>CC: Professional background of team members</td>
<td>CC-professional background</td>
<td>C/I</td>
</tr>
<tr>
<td>CC: Team cohesiveness</td>
<td>CC-team cohesion</td>
<td>F</td>
</tr>
<tr>
<td>CC: Use of different media types (communication)</td>
<td>CC-media types</td>
<td>I</td>
</tr>
<tr>
<td>CC: Cultural background of team members</td>
<td>CC-cultural background</td>
<td>C/I</td>
</tr>
<tr>
<td>CC: Organisational background of team members</td>
<td>CC-organisational background</td>
<td>C/I</td>
</tr>
<tr>
<td>CC: Project description</td>
<td>CC-project description</td>
<td>C/I</td>
</tr>
<tr>
<td>CC: Task characteristics</td>
<td>CC-task characteristics</td>
<td>C/I</td>
</tr>
<tr>
<td>CC: (Planning or) training</td>
<td>CC-training</td>
<td>I</td>
</tr>
</tbody>
</table>

I = Management intervention
C = Starting condition

Figure 3.8. Template of categories and subcategories for initial research design (derived from the literature and explorative interviews).

The template was revised through exposure to the textual data. The literature study had increased the theoretical sensibility. During the analysis process of the EU framework teams, more factors and interventions (and indicators) could be abstracted from the data, what has led to refinement of the template (Figure 3.9.)
<table>
<thead>
<tr>
<th>Interventions/starting conditions</th>
<th>Coding in Atlas Ti</th>
<th>Interventions or starting conditions or both</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology: team task insight</strong></td>
<td>TTI-OBJ</td>
<td>Condition/intervention</td>
</tr>
<tr>
<td>TTI: Face-to-face kick-of meeting (with task issues)</td>
<td>TTI-FtF</td>
<td>I</td>
</tr>
<tr>
<td>TTI: Coaching management style</td>
<td>TTI-coaching</td>
<td>I</td>
</tr>
<tr>
<td>TTI: Knowledge transfer</td>
<td>TTI-knowledge transfer</td>
<td>C</td>
</tr>
<tr>
<td>TTI: Professional background of team members</td>
<td>TTI-professional background</td>
<td>C/I</td>
</tr>
<tr>
<td>TTI: Cultural background of team members</td>
<td>TTI-cultural background</td>
<td>C/I</td>
</tr>
<tr>
<td>TTI: Project description</td>
<td>TTI-project description</td>
<td>C/I</td>
</tr>
<tr>
<td>TTI: Task characteristics</td>
<td>TTI-task characteristics</td>
<td>C/I</td>
</tr>
<tr>
<td>TTI: (Planning or) training</td>
<td>TTI-training</td>
<td>I</td>
</tr>
<tr>
<td>TTI: Participative decision making</td>
<td>TTI-participation</td>
<td>I</td>
</tr>
<tr>
<td>TTI: Feed back (positive or negative feed back can lead to more team task insight)</td>
<td>TTI-feed back</td>
<td>I</td>
</tr>
<tr>
<td>TTI: Partner selection</td>
<td>TTI-partner selection</td>
<td>C</td>
</tr>
<tr>
<td><strong>Politics: empowerment</strong></td>
<td>E-OBJ</td>
<td>Condition/intervention</td>
</tr>
<tr>
<td>E: Participative decision making</td>
<td>E-participation</td>
<td>I</td>
</tr>
<tr>
<td>E: Coaching management style</td>
<td>E-coaching</td>
<td>I</td>
</tr>
<tr>
<td>E: Task reallocation</td>
<td>E-task reallocation</td>
<td>I</td>
</tr>
<tr>
<td><strong>Culture: collective commitment</strong></td>
<td>CC-OBJ</td>
<td>Condition/intervention</td>
</tr>
<tr>
<td>CC: Face-to-face kick-of meeting (with socialising issues)</td>
<td>CC-FtF</td>
<td>I</td>
</tr>
<tr>
<td>CC: Participative decision making</td>
<td>CC-participation</td>
<td>I</td>
</tr>
<tr>
<td>CC: Coaching management style</td>
<td>CC-coaching</td>
<td>I</td>
</tr>
<tr>
<td>CC: Professional background of team members</td>
<td>CC-professional background</td>
<td>C/I</td>
</tr>
<tr>
<td>CC: Team cohesiveness</td>
<td>CC-team cohesion</td>
<td>C</td>
</tr>
<tr>
<td>CC: Use of different media types (communication)</td>
<td>CC-media types</td>
<td>I</td>
</tr>
<tr>
<td>CC: Cultural background of team members</td>
<td>CC-cultural background</td>
<td>C/I</td>
</tr>
<tr>
<td>CC: Organisational background of team members</td>
<td>CC-organisational background</td>
<td>C/I</td>
</tr>
<tr>
<td>CC: Project description</td>
<td>CC-project description</td>
<td>C/I</td>
</tr>
<tr>
<td>CC: Task characteristics</td>
<td>CC-task characteristics</td>
<td>C/I</td>
</tr>
<tr>
<td>CC: (Planning or) training</td>
<td>CC-training</td>
<td>I</td>
</tr>
<tr>
<td>CC: Task reallocation</td>
<td>CC-task reallocation</td>
<td>C</td>
</tr>
<tr>
<td>CC: Expectations of the outcome</td>
<td>CC-outcome expectations</td>
<td>C</td>
</tr>
<tr>
<td>CC: Partner selection</td>
<td>CC-partner selection</td>
<td>C/I</td>
</tr>
</tbody>
</table>

I = Management intervention  
C = Starting condition  

Figure 3.9. Template of categories and subcategories for initial research design (derived from the interviews EU framework teams)
And at March 5th 2007, after coding the next five teams (The previous were the three EU framework teams) further refinement could be made to the template, leading to figure 3.10.

<table>
<thead>
<tr>
<th>Interventions/starting conditions</th>
<th>Coding in Atlas Ti</th>
<th>Interventions or starting conditions or both</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technical: team task insight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TTI: Face-to-face kick-off meeting (with task issues)</td>
<td>TTI-FtF</td>
<td>I</td>
</tr>
<tr>
<td>TTI: (FtF) meeting</td>
<td>TTI-meeting</td>
<td>I</td>
</tr>
<tr>
<td>TTI: technical knowledge sharing</td>
<td>TTI-knowledge sharing</td>
<td>C</td>
</tr>
<tr>
<td>TTI: Technical adjustment</td>
<td>TTI-technical adjustment</td>
<td>C</td>
</tr>
<tr>
<td>TTI: Professional background of team members</td>
<td>TTI-professional background</td>
<td>C/I</td>
</tr>
<tr>
<td>TTI: (National) cultural background of team members</td>
<td>TTI-cultural background</td>
<td>C/I</td>
</tr>
<tr>
<td>TTI: Project description</td>
<td>TTI-project description</td>
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<tr>
<td>TTI: Task characteristics</td>
<td>TTI-task characteristics</td>
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<td>TTI: (Planning or) training</td>
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<td>I</td>
</tr>
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<td>TTI-participation</td>
<td>I</td>
</tr>
<tr>
<td>TTI: Feedback (positive or negative feedback can lead to more team task insight)</td>
<td>TTI-feedback</td>
<td>I</td>
</tr>
<tr>
<td>TTI: media types</td>
<td>TTI-media types</td>
<td>I</td>
</tr>
<tr>
<td>TTI: management style</td>
<td>TTI-management style</td>
<td>I</td>
</tr>
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<td>TTI-partner selection</td>
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</tr>
<tr>
<td><strong>Politics: empowerment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E: Decision making</td>
<td>E-participation</td>
<td>I</td>
</tr>
<tr>
<td>E: technical adjustment</td>
<td>E-technical adjustment</td>
<td>C</td>
</tr>
<tr>
<td>E: management style</td>
<td>E-management style</td>
<td>I</td>
</tr>
<tr>
<td>E: (National) cultural background</td>
<td>E-cultural background</td>
<td>C/I</td>
</tr>
<tr>
<td>E: Task reallocation</td>
<td>E-task reallocation</td>
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<tr>
<td><strong>Culture: collective commitment</strong></td>
<td></td>
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</tr>
<tr>
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<tr>
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</tr>
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<tr>
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</tr>
<tr>
<td>CC: Use of different media types (communication)</td>
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<td>I</td>
</tr>
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<td>CC: feedback</td>
<td>CC-feedback</td>
<td>C</td>
</tr>
<tr>
<td>CC: Task reallocation</td>
<td>CC-task reallocation</td>
<td>C</td>
</tr>
<tr>
<td>CC: Trust</td>
<td>CC-trust</td>
<td>C</td>
</tr>
<tr>
<td>CC: Expectations of the outcome</td>
<td>CC-outcome expectations</td>
<td>C</td>
</tr>
<tr>
<td>CC: Partner selection</td>
<td>CC-partner selection</td>
<td>C/I</td>
</tr>
</tbody>
</table>
Chapter 3 Research model, question and design

I = Management intervention
C = Starting condition

Figure 3.10. Template of categories and subcategories for initial research design

To increase the reliability of the coding process (i.e. when a second researcher wants to code the texts, the outcomes may not differ too much from the outcomes of the first researcher), the codes were defined in the following way (figure 3.11.):

<table>
<thead>
<tr>
<th>Item</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Face-to-Face kick off meeting</td>
<td>Meeting at the start up of a virtual team where people meet physical (in person; not virtual)</td>
</tr>
<tr>
<td>2. Meeting</td>
<td>Meeting, other than the start up of a virtual team, where people meet physical (in person; not virtual)</td>
</tr>
<tr>
<td>3. Management style</td>
<td>The style of the manager to manage the team (i.e. facilitative, directive etc.)</td>
</tr>
<tr>
<td>4. Technical knowledge sharing</td>
<td>Technical knowledge sharing</td>
</tr>
<tr>
<td>5. Technical adjustment</td>
<td>Technical adjustment</td>
</tr>
<tr>
<td>6. Professional background of team members</td>
<td>Professional background of team members</td>
</tr>
<tr>
<td>7. Cultural background (national) of team members</td>
<td>Cultural background (national) of team members</td>
</tr>
<tr>
<td>8. Project description</td>
<td>Description of the project that can give a team insight into the objectives that have to be realised</td>
</tr>
<tr>
<td>9. Task characteristics</td>
<td>Characteristics of the task</td>
</tr>
<tr>
<td>10. Training</td>
<td>Activity in which skills and knowledge are transferred to team members</td>
</tr>
<tr>
<td>11. Participative decision making</td>
<td>Decision making of all members or at least sharing the influence between a manager and his or her employees</td>
</tr>
<tr>
<td>12. Feedback</td>
<td>Giving information to the team members (by other team members, the management or third parties) concerning tasks etc. they achieved so far. The difference with ‘knowledge transfer’ is that knowledge transfer is in my terminology neutral. Feedback in my terminology bears a value judgement in it.</td>
</tr>
<tr>
<td>13. Task reallocation</td>
<td>Reallocating the task from one team member or partner to another team member or partner participating in the team</td>
</tr>
<tr>
<td>15. Use of different media types</td>
<td>Using media as e-mail, MSN messenger, video-conferencing, telephone, telephone conferencing etc.</td>
</tr>
<tr>
<td>16. Expectations of the outcome</td>
<td>The expectations one or more team members have concerning the outcome of the project</td>
</tr>
<tr>
<td>17. Trust</td>
<td>Trust between team members and/or partners</td>
</tr>
<tr>
<td>18. Partner selection</td>
<td>Selection of the partners, which will participate in the project</td>
</tr>
</tbody>
</table>

Figure 3.11. Definition of codes

As we saw in section 3.6.2., a template approach with a more open perceptual filter was used for data analysing, eventually leading to the within-case analysis. But how was this process of data analysis actually conducted in practice? The outcome of the MSN messenger interviews or e-mail interviews could be set in a Word document directly. The interviews conducted ftf or by telephone were transcribed in a Word document by me. Then, all the Word documents
Chapter 3 Research model, question and design

were loaded into Atlas ti. This is a software tool for qualitative analysis. Each set of three or four interviews (belonging to one case study) was analysed with the help of the template, mentioned in this section. When I saw, that a part of the text - which can be a part of a sentence, a whole sentence, or even more sentences at the same time – had to do with e.g. team cohesion (in the cultural domain), that part of the text was highlighted and coded in the right margin with ‘CC-team cohesion’ (Figure 3.12).

Figure 3.12. Example of the coding process in Atlas ti

In this way all texts of a case were analysed. Atlas ti then gives the opportunity to put all text parts with the same code under each other. After doing this, these coded text parts were used to write the within-case analysis.

To determine the connections interpretively between the categories, I used axial coding during the analysis process in Atlas ti. So with axial coding, relations between categories could be analysed. I focused upon the causalities (one or more categories) of a phenomenon (another category; these mostly were the critical incidents). I also focused on the intervention strategy that was used to reduce the negative impact of the phenomenon, as on the consequences of this intervention. I also looked if there were context categories, in which the phenomenon was embedded. This led to the model (Strauss and Corbin, 1996, p. 78): (A) Causalities > (B) Phenomenon > (C) Context > (D) Intervention strategy > (E) Consequences.

Example of axial coding

After the project worked out for twelve months, a capacity reduction (A) took place at one of the partners. The cause of this was that an employee left for the duration of a year. Although the partner on the basis of a capacity lack (decrease of strategic momentum (B)) did not continue the activities, towards the management the suggestion was kept upright, since the communication went by means of e-mail (C), that all went successfully. Approximately five months later (then the project was in its 17th month) the management (which consisted of three Dutch partners) discovered the capacity reduction. Management intervened by redistribution of the tasks (D). Other partners (two), who could take over the tasks on the basis of expertise, were asked if they wanted to take over the tasks. These partners had a high
strategic momentum, as they worked harder to realise the added tasks within the time frame (E). On the basis of the capacity reduction there had been a time loss.

Although logically seen axial coding follows template coding, in the practice of coding these processes were done in parallel.

In section 3.6.1., I said I conducted a serial single case study. After analysing the first three cases (EU framework teams: Dewey, Goa and Print) with the help of the coding template, a case history was written, as a within-case analysis. As we could see in this section, the analysis of these three cases led to an adaptation of the template (Figure 3.9). This template was used for the analysis in Atlas ti of the next five cases. After coding the next five teams, further refinement could be made to the template, leading to figure 3.10. Then, the EU framework teams were coded again with the template of figure 3.10. Fortunately for me, they HAD to be analysed again. Not only because I had to use the new template (figure 3.10.), but also because the computer on which the former analyses were conducted, crashed in August 2006. So, the analysis phase is an iterative process. With the adapted template (figure 3.10.), the first three cases were analysed all over again, and the template was saturated (i.e. no further codes could be added to the template). In the end, eight within-case analyses were written, which are presented in chapter 4.

3.9. The cross-case analysis

3.9.1. Introduction
Concerning the cross-case analysis, in chapter 5, I conduct crisp set Qualitative Comparative Analyses (csQCA) in the first place to see whether or not team task insight, empowerment or collective commitment have a positive contribution to the development and sustenance of strategic momentum. In the second place to see which configurations of these three factors do or do not positively contribute to the creation and sustenance of strategic momentum. In chapter 6, I conduct crisp set Qualitative Comparative Analyses (csQCA) to see which configurations of starting conditions and management interventions do or do not positively contribute to the creation and sustenance of team task insight, empowerment or collective commitment. According to Ragin and Sonnet (2004, p.1) ‘Case-oriented explanations of outcomes are often combinatorial in nature, stressing specific configurations of causal conditions’.

Based on Rihoux et al. (2009), I used five key practical steps for csQCA. To give a profound description of each step, I use the outcome of a csQCA, which is also presented in chapter 5: ‘TTI, E and C and their impact on strategic momentum at the start of the project’. Here, the hypotheses are tested concerning the creation of the effective component of strategic momentum at the start of the project.

3.9.2. The five step csQCA procedure
Here, I will first describe csQCA in short.

In section 3.6.3. is said that csQCA uses Boolean algebra. The main conventions of Boolean algebra are as follows:
- an uppercase letter represents the [1] value for a given binary variable. Thus [A] is read as: ‘variable A is large, present, high…’
- a lowercase letter represents the [0] value for a given binary variable. Thus [a] is read as: ‘variable A is small, absent, low…’
Chapter 3 Research model, question and design

- A dash symbol [-] represents the ‘don’t care’ value for a given binary variable, meaning it can either be present (1) or absent (0). This also could be a value we don’t know about (e.g., because it is irrelevant or the data is missing).

Boolean algebra uses a few basic operators, the two chief ones being the following:
- Logical ‘AND,’ represented by the [*] (multiplication) symbol. NB: It can also be represented with the absence of a space: [A*B] can also be written as: [AB]
- Logical ‘OR,’ represented by the [+ ] (addition) symbol.

The connection between the condition and the outcome: the arrow symbol [→] is used to express the (usually causal) link between a set of conditions (or configuration) on the one hand and the outcome we are trying to ‘explain’ on the other.

Look for example to the following (hypothetical) formula as an outcome of csQCA analysis:

TTI*E + TTI*CC → SM

We can also rewrite this formula as TTI*(E+CC) → SM

TTI is a necessary condition in this example. Both TTI*E and TTI*CC are sufficient configurations; there is no necessary configuration, because there are two paths leading to the outcome SM.

The five step csQCA procedure is as follows:
Step 1. Building a dichotomous input table: the data from the within-case analysis are dichotomized and put into an input table of a specific format.
Step 2. Constructing a truth table: with the help of the software all configurations, found in the research, are listed with the outcome of each.
Step 3. Resolving contradictory configurations: in social research it is quite possible to find ‘contradictory configurations’ that is configurations that lead to different outcomes. These contradictory configurations are to be resolved (see below). In this research I did not find contradictory configurations.
Step 4. Boolean minimization: csQCA is used to establish a causal model. In this step 4 three versions of the causal model are determined:
   i. The complex solution: all configurations found in the research and used to establish the complex solution.
   ii. The minimal solution or parsimonious solution: the logical remainders (in theory possible configurations not present in the studied sample of N cases) are tested on outcomes 0, respectively 1. On this basis the non-discriminating conditions in the configurations are eliminated (see below).
   iii. The intermediate solution: solutions between parsimonious and complex based on ex-ante theory.
Step 5. Interpretation by the researcher.

**Step 1: Building a dichotomous input table**

For the notation of data, only a sort of binary system can be used. So, all data have to be operationalised in [0], [1] or [-] when unknown (e.g., because the data is missing) (Table 1).
Chapter 3 Research model, question and design

<table>
<thead>
<tr>
<th>Name project</th>
<th>Team task insight [TTI]</th>
<th>Empowerment [E]</th>
<th>Collective commitment [CC]</th>
<th>Strategic momentum as the outcome of the ftf kick-off meeting (project start)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin case [BER]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Paris case [PAR]</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1] (according to the informant who said that the ftf kick-off meeting lasted for 2 days) + [1] (according to the informant who said that the ftf kick-off meeting lasted for only one day) Two out of four informants participated at the ftf kick-off meeting. They disagree concerning the height of strategic momentum as the outcome of the ftf kick-off meeting. Because both outcomes are [1], this does not make a difference for csQCA.</td>
</tr>
<tr>
<td>Lisbon case [LIS]</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Dewey case [DEW]</td>
<td>_ _ [0]</td>
<td>_ [0]</td>
<td>+ [1]</td>
<td>_ [0]</td>
</tr>
<tr>
<td>Print case [PRI]</td>
<td>_ [0]</td>
<td>_ [0]</td>
<td>+ [1]</td>
<td>_ _ [0]</td>
</tr>
<tr>
<td>Goa case [GOA]</td>
<td>_ [0]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>_ [0]</td>
</tr>
<tr>
<td>Groningen case [GRO]</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Jiaozuo case [JIA]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1] (after ftf kick-off and three immediately follow-up meetings during the initial phase of the project)</td>
</tr>
</tbody>
</table>

Legend
++: High team task insight/empowerment/collective commitment/strategic momentum; This means that strategic momentum or determinant is 1 or greater than 1.
+
:+ Medium team task insight/empowerment/collective commitment/strategic momentum; This means that strategic momentum or determinant is some smaller or about 1.
_: Low team task insight/empowerment/collective commitment/strategic momentum; This means that strategic momentum or determinant is smaller than 1.
_ _: Very low / absent team task insight/empowerment/collective commitment/strategic momentum This means that strategic momentum or determinant is much smaller than 1 or even 0.
/: unknown This means that it is unknown what strategic momentum or determinant was at that point in time.

For the analyses conducted with csQCA, I must use a dichotomy, rating strategic momentum and determinants with [0], [1] or [-].

The category [0] is used for:
_: low team task insight/empowerment/collective commitment/strategic momentum;
Chapter 3 Research model, question and design

_ _: very low or absent team task insight/empowerment/collective commitment/strategic momentum

The category [1] is used for:
++: high team task insight/empowerment/collective commitment/strategic momentum;
+: medium team task insight/empowerment/collective commitment/strategic momentum;

The category [-] is used for:
-: unknown (e.g., because the data is missing)

Table 1 Operationalisation of the data concerning TTI, E and C and their impact on strategic momentum at the start of the project

In the construction of the truth table (Step 2) the binary date were used (that is +,0,-). Table 1 gives also ++ and _ _ values to be used for the interpretation in step 5. In step 2 ++ becomes + and _ _ becomes _.

**Step 2: Constructing a truth table**

A ‘truth table’ is a table of configurations. A configuration is ‘a specific combination of factors (or conditions, stimuli, causal variables, ingredients, determinants etc. (…)) that produces a given outcome of interest (Rihoux et al., 2009, p. xix). According to Ragin and Sonnett (2004, p.4) ‘Most conventional techniques assume that causal conditions are ‘independent’ variables whose effects on the outcome are both linear and additive. The key to QCA is that it sees cases as configurations of conditions and uses truth tables to represent and analyze causal configurations. Truth tables list the logically possible combinations of causal conditions and the outcome associated with each combination’. An example of a truth table is as follows (Table 2):

<table>
<thead>
<tr>
<th>TTI</th>
<th>E</th>
<th>CC</th>
<th>number</th>
<th>sm</th>
<th>Consist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0.000000</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
</tr>
</tbody>
</table>

**Legenda**

*number*: the number of cases displaying the combination of conditions
*consist*: the proportion of cases in each truth table row that display the outcome.

Table 2. Example of a Truth table

The term ‘Consist’ is the abbreviation of ‘Consistency’. According to Ragin (2008, p. 27) it means that ‘with crisp sets, this calculation is simply the proportion of cases in a given row that display the outcome in question. A score of 1.0 (or close to 1.0) indicates high consistency - that the cases in the row agree in displaying the outcome. A score of 0.0 (or close to 0.0) indicates that the cases in the row agree in not displaying the outcome. With crisp sets, consistency scores in the middle (0.30 to 0.70) indicate that the cases in a given row are strongly divided with respect to presence/absence of the outcome’. Looking at the example of the truth table, the consistency of each row is:

The 5 cases in the first row all had sm = 1; consistency = 5/5 = 1.0
So, these 5 cases all agree in displaying the outcome.

The 2 cases in the second row had sm = 0; consistency = 0/1 = 0
So, these 2 cases agree in not displaying the outcome.

The 1 case in the third row had sm = 0; consistency = 0/1 = 0
Chapter 3 Research model, question and design

So, this case agrees in not displaying the outcome.

According to Ragin (e-mail from Charles Ragin, 21 October 2009) ‘If the cases in a row are contradictory, some with outcome equal to 0 and some with the outcome equal to 1 (in the data spreadsheet), then the consistency score will be between 0 and 1’. So, what we can conclude is that in this example there are no contradictory configurations. All cases agree whether in displaying or not displaying the outcome.

For constructing the ‘truth table’, I used a software tool called ‘FSQCA’. It is freeware, downloaded from www.compasss.org on June, 23th 2009. For obtaining the ‘truth table’ I chose the ‘truth table algorithm’

**Step 3: Resolving contradictory configurations**

These are configurations, which lead to a [0] outcome for some cases that are observed, but to a [1] outcome for other observed cases (so, with the same configuration!). For example, two cases can have a configuration (with four variables) such as [0], [1], [1], [1]. If the outcome of the first case is [1], and the outcome of the second case is [0], we deal with contradictory configurations. Before continuing with csQCA, these logical contradictions have to be resolved. The problem can be solved, for example, by adding a fifth variable to the two cases, in order to discriminate between the conflicting four-variables-configuration.

In this study (and in this example), I did not find any contradictory configuration.

**Step 4: Boolean minimization (Determining the causal model)**

In this step, I am going to determine the causal model, by determining one or more configurations (or patterns), leading to the outcome (in this case: strategic momentum).

I will take a look at the configurations in three different forms, or solutions. These forms, or solutions, are:

a. the complex solution
b. the parsimonious solution
c. the intermediate solution

**a. The complex solution**

A complex solution is a solution with the most possible distinguished configurations, *purely based on the given cases in the research*. For obtaining the complex solution, I conducted the ‘single analysis’, because only in this way it is possible, as recommended by Rihoux et al. (2009), to explain the [1] configurations and the [0] configurations separately. According to Rihoux et al. (2009, p. 57) ‘It is important to minimize both types of configurations, because we do not expect to find some form of perfect “causal symmetry” in social phenomena. In other words, we should not deduce the minimal formula for the [0] outcome from that of the [1] outcome, or vice versa (...)’

The [1] Configurations (i.e. the configurations with outcome [1])

For obtaining the most complex solution, I used the Quine-McCluskey algorithm, with the setting Positive cases ‘true’ (these are the cases with a [1] outcome, or said otherwise: all cases with a configuration leading to the *presence* of strategic momentum (or better: medium to high)) and all others ‘False’. I obtained the following formula (formula 1):

$$TTI*E*CC \rightarrow SM$$
Chapter 3 Research model, question and design

(BER, PAR, LIS, GRO, JIA)

The ‘1’ outcome (emergence of strategic momentum) is observed in virtual teams that combine medium to high Team Task Insight AND medium to high Empowerment AND medium to high Collective Commitment. As we can see in table 2, the truth table, all five cases I found in the research which have as an outcome the presence of strategic momentum, have the same configuration: medium to high Team Task Insight AND medium to high Empowerment AND medium to high Collective Commitment.

**The [0] Configurations (i.e. the configurations with outcome [0])**

For obtaining the most complex solution, I used the Quine-McCluskey algorithm, with setting the Negative cases to ‘True’ (these are the cases with a [0] outcome, or said otherwise: all cases with a configuration leading to the *absence* of strategic momentum (or better: low to very low)) and all others to ‘False’. I obtained the following formula (formula 2)

\[
\text{tti} \times \text{CC} \rightarrow \text{sm}
\]

(GOA, PRI, DEW)

The ‘0’ outcome (non-emergence of strategic momentum) is observed in virtual teams that combine low to very low Team Task Insight AND medium to high Collective Commitment.

This can be derived from table 2:

\[
\text{tti} \times \text{e} \times \text{CC} \rightarrow \text{sm} \quad (1)
\]

\[
\text{tti} \times \text{E} \times \text{CC} \rightarrow \text{sm} \quad (2)
\]

Combining (1) and (2) gives \(\text{tti} \times \text{CC} \times (\text{e} + \text{E}) \rightarrow \text{sm}\)

So, empowerment is redundant, leading to \(\text{tti} \times \text{CC} \rightarrow \text{sm}\)

**b. The parsimonious (or minimal) solution**

Boolean minimization is the ‘reduction’ of a long, complex expression into a shorter, more parsimonious expression. It can be summarized verbally as follows: ‘if two Boolean expressions differ in only one causal condition yet produce the same outcome, then the causal condition that distinguishes the two expressions can be considered irrelevant and can be removed to create a simpler, combined expression’ (Ragin, 1987, p.93). For example, consider the following Boolean expression, with four condition variables (A, B, C and D) and one outcome variable (E) (formula 1):

\[
A \times B \times C \times D + A \times B \times e \times D \rightarrow E
\]

What we see is that no matter which value the [C] condition takes (0 or 1), the [C] outcome value is the same. This means, in verbal reasoning, that the [C] condition is superfluous. So it can be removed from the initial expression, leaving a much shorter, reduced expression (formula 2): \(A \times B \times D \rightarrow E\).

According to Ragin (2008, p. 173) ‘the parsimonious solution follows from the designation of all remainder combinations as potential counterfactual cases. The resulting solution incorporates any counterfactual combination that yields a simpler solution’. With ‘counterfactual cases’ Ragin (2008, p. 9) means ‘a substantively relevant combination of causal conditions that nevertheless does not exist empirically. Counterfactual analysis involves evaluating the outcome that such a case would exhibit if, in fact, it existed’.
To ‘create’ such a parsimonious solution, I make use of the logical remainders, which in potential all are counterfactual cases. ‘Logical remainders’ are logically possible configurations ‘that have not been observed among the empirical cases’ (Rihoux et al., 2009, p. 44). Let us make this more clear with the help of the variables team task insight, empowerment, and collective commitment in our example. There are three conditions, which means that there are $2^3 = 8$ potential configurations. All three determinants can have a value of [1] or [0] (the outcome [-] must be used as less as possible). So, the potential configurations are as follows:

- [1],[1],[1] or (TTI*E*CC)
- [1],[1],[0] or (TTI*E*cc)
- [1],[0],[0] or (TTI*e*cc)
- [0],[0],[0] or (tti*e*cc)
- [0],[0],[1] or (tti*e*CC)
- [0],[1],[1] or (tti*E*cc)
- [0],[1],[0] or (tti*E*cc)
- [1],[0],[1] or (TTI*e*CC)

In ‘normal’ words [1],[1],[1] or (TTI*E*CC) means, that team task insight and empowerment and collective commitment are present (or better: medium to high). [1],[0],[0] or (TTI*e*cc) means, that team task insight is present (or better: medium to high) and empowerment is absent (or better: low to very low) and collective commitment is absent (or better: low to very low). [0],[0],[0] or (tti*e*cc) means that team task insight and empowerment and collective commitment are absent (or better: low to very low).

But as we see in the example, the eight observed cases in the research I conducted ‘only’ deliver three configurations at the start of the project, which are as follows:

- [1],[1],[1] or (TTI*E*CC)
- [0],[0],[1] or (tti*e*CC)
- [0],[1],[1] or (tti*E*CC)

So, there are still five logically possible configurations, or logical remainders, or potential counterfactual cases, left. These are as follows:

- [1],[1],[0] or (TTI*E*cc)
- [1],[0],[0] or (TTI*e*cc)
- [0],[0],[0] or (tti*e*cc)
- [1],[0],[1] or (TTI*e*CC)
- [0],[1],[0] or (tti*E*cc)

By including (some of) these logical remainders (or non-observed cases, or even hypothetical cases), more parsimony is achieved. I can explain this as follows, to a great extent based on Rihoux et al. (2009, p. 59 - 60). As we can see above and see in the Venn diagram (Figure 3.13), there is a ‘reservoir’ of logical remainders.
Figure 3.13. Venn Diagram with the use of logical remainders (The Venn diagram is produced by the ‘visualiser’ tool, TOSMANA 1.3.0.0 software). In this research only three (the three shaded parts in this figure) out of eight configurations were found, so there are five logical remainders (the five white parts in this figure).

Only a part of the logical property space is occupied by the empirical cases: out of 8 potential configurations only 3 correspond to observed cases. Thus, the 5 logical remainders constitute a pool of potential cases that can be used by the software to produce a more parsimonious minimal formula. This can be explained by the Venn diagram in figure 3.13 and the concrete cases. I start with the 3 concrete cases: all those cases with a [0] outcome, which also happens to be situated on the left-hand site of the Venn diagram (Dewey and Print; Goa).

First, note that the simpler (the “shorter”) a Boolean expression, the larger the number of configurations it covers:

- a combination of three conditions covers only one configuration (e.g. the [0], [1], [1] zone, which contains the GOA case)
- a combination of two conditions covers two configurations. If we want to cover not only the GOA case, but also the zone right above it that contains the DEWEY and PRINT cases (the [0], [0], [1] zone), we only need to have information about two conditions. I don’t need to know about the Empowerment condition: it has a [1] value for the GOA case and a [0] value for the DEWEY and PRINT cases.
- And a statement that contains only one condition covers 4 configurations. This is half of the Boolean property space. For instance, the zone corresponding to a [0] value on the Team Task Insight condition is the whole left half of the Venn diagram, corresponding to 4 configurations (only 2 of which contain some observed cases. Those 3 cases that all happen to have a [0] outcome)
Following this logic, the usefulness of logical remainders is quite straightforward: to express those 3 cases in a simpler way, it suffices to express them as part of a broader zone, also comprising some logical remainders.

What I can do is to make a “simplified assumption” regarding the 2 logical remainders on the left-hand side of the Venn diagram: I assume that, if they existed, they would also have a [0] outcome (i.e. strategic momentum is low to very low), just like the 3 observed cases. If the assumption is correct, then we have produced a much larger zone (the whole left-hand side of the Venn diagram, comprising 4 configurations) sharing the [0] outcome, and thus the 3 observed cases can be expressed in a much more parsimonious way: simply [0] value for the team task insight condition. This is exactly what the software does: It selects some logical remainders (only those that are useful to obtain a shorter minimal formula), adds them to the set of observed cases, and makes “simplifying assumptions” regarding these logical remainders. This then produces a simpler term in the minimal formula.

To obtain the parsimonious solution, I conducted the ‘single analysis’, because only in this way it is possible, as recommended by Rihoux et al. (2009), to explain the [1] configurations and the [0] configurations separately. According to Rihoux et al. (2009, p. 57) ‘It is important to minimize both types of configurations, because we do not expect to find some form of perfect “causal symmetry” in social phenomena. In other words, we should not deduce the minimal formula for the [0] outcome from that of the [1] outcome, or vice versa (...’

The [1] Configurations
For obtaining the most parsimonious solution, I set the Positive cases ‘True’ and all others to ‘False’ (these are the cases with a [0] outcome, or said otherwise: all cases with a configuration leading to the absence of strategic momentum (or better: low to very low)), except the Reminders which I set to ‘Don’t Cares’ in the Specify panel. According to Ragin (2008, p. 156) ‘When treated as ‘don’t care’, a remainder is available as a potential ‘simplifying assumption’. That is, it will be treated as an instance of the outcome if doing so results in a logically simpler solution. Likewise, it also can be treated as an instance of the absence of the outcome, again, if doing so results in a logically simpler solution for the absence of the outcome’.

I obtained the following formula with the Quine-McCluskey algorithm (formula 3):

TTI → SM
(BER, PAR, LIS, GRO, JIA)

The ‘1’ outcome (emergence of strategic momentum) is observed in virtual teams that have medium to high Team Task Insight.

Which ‘logical remainders’ will probably have been used here? It must have been one or more of the three, which are as follows:

[1],[1],[0] (TTI*E*cc)
[1],[0],[0] (TTI*e*cc)
[1],[0],[1] (TTI*e*CC)

To obtain the parsimonious solution of formula 3, it is easy to see that beside the configuration TTI*E*CC, the logical remainder TTI*e*cc is used as a counterfactual case, so TTI*E*CC + TTI*e*cc → SM.
What we see is that no matter which value the [E] and [CC] condition takes (0 or 1), the outcome value is the same. This means, in verbal reasoning, that the [E] and [CC] conditions are superfluous. So it can be removed from the initial expression, leaving a much shorter, reduced expression: TTI $\rightarrow$ SM.

**The [0] Configurations**

For obtaining the most parsimonious solution, I set the Negative cases to ‘True’ and all others to ‘False’, except the Remainders which I set to ‘Don’t Cares’ in the Specify panel.

I obtained the following formula with the Quine-McCluskey algorithm (formula 4):

\[ tti \rightarrow sm \]

The ‘0’ outcome (non-emergence of strategic momentum) is observed in virtual teams that have a low to very low Team Task Insight.

Which ‘logical remainders’ will probably have been used here? It must have been one or two:

- \([0],[0],[0]\) (tti*e*cc)
- \([0],[1],[0]\) (tti*E*cc)

To obtain the parsimonious solution of formula 4, it is obvious that beside the configuration tti*E + tti*CC, the logical remainder tti*e*cc is used as a counterfactual case, so tti*E + tti*CC + tti*e*cc $\rightarrow$ SM.

What we see is that no matter which value the [E] and [CC] condition takes (0 or 1), the outcome value is the same. This means, in verbal reasoning, that the [E] and [CC] conditions are superfluous. So it can be removed from the initial expression, leaving a much shorter, reduced expression: tti $\rightarrow$ sm.

c. **The intermediate solution**

According to Ragin and Sonnet (2004, p. 14) ‘most social scientists prefer explanations that strike a balance between complexity and parsimony’. This balance can be obtained by the intermediate solution. The question is, how this intermediate solution is obtained. Below, I will give a stepwise explanation, to a great extent based on Ragin (2008).

Consider the truth table presented in table 2, which uses TTI, E and CC as causal conditions and SM as the outcome.

<table>
<thead>
<tr>
<th>TTI</th>
<th>E</th>
<th>CC</th>
<th>SM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>?</td>
</tr>
</tbody>
</table>

I can assume, from the theoretical model in section 3.3., that the presence of the conditions team task insight, empowerment and collective commitment are linked to the outcome strategic momentum. So, TTI*E*CC explains SM from a theoretical point of view. From the analyses, leading to the complex solution, we see that the presence of TTI combined with the presence of E and the presence of CC accounts for the presence of SM. The analysis of this
same evidence, permitting any counterfactual that will lead to a more parsimonious result, shows that TTI by itself accounts for the presence of SM. The complex solution and the parsimonious solution can be placed on a continuum as follows:

<table>
<thead>
<tr>
<th>TTI<em>E</em>CC</th>
<th>TTI*E</th>
<th>TTI*CC</th>
<th>TTI</th>
</tr>
</thead>
</table>

The solution privileging complexity (TTI*E*CC) is a subset of the solution privileging parsimony (TTI). This follows logically from the fact that both solutions must cover the rows of the truth table with SM present; the parsimonious solution also incorporates some of the remainder rows as counterfactual cases and thus embraces additional rows. Now, along this continuum we can find other possible solutions to this same truth table. An example is the configuration TTI*E. Intermediate solutions as this one are produced by putting different subsets of remainders which are used for the production of the parsimonious solution are incorporated in the results. These intermediate solutions constitute subsets of the most parsimonious solution (TTI in this example) and superset of the solution allowing maximum complexity (TTI*E*CC). The implication is that any causal combination that uses at least some of the causal conditions specified in the complex solution (TTI*E*CC) is a valid solution of the truth table as long as it contains the causal conditions specified in the parsimonious solution (TTI).

It follows that there are two valid intermediate solutions to the truth table in table 2:

<table>
<thead>
<tr>
<th>TTI<em>E</em>CC</th>
<th>TTI*E</th>
<th>TTI*CC</th>
<th>TTI</th>
</tr>
</thead>
</table>

Both intermediate solutions are subsets of the solution privileging parsimony and superset of the solution privileging complexity. The first (TTI*E) permits the counterfactual TTI*E*cc as a combination linked to the outcome SM. The second (TTI*CC) links counterfactual TTI*e*CC to outcome SM. The relative viability of these two intermediate solutions depends on the plausibility of the counterfactual that has been incorporated into them. The counterfactual incorporated into the first intermediate solution is difficult because it is used to eliminate CC from the combination TTI*E*CC, and in this example, existing knowledge supports the idea that it is the presence of CC, not its absence c, that is linked to outcome SM. The counterfactual incorporated into the second intermediate solution is difficult too because it is used to eliminate E from TTI*E*CC, and according to existing knowledge, the presence of E should be linked to the presence of outcome SM.

11 (E-mail Opdenakker, May 8th 2011) I am a bit confused concerning using the intermediate solution in my dissertation. As I understood from publications concerning the intermediate solution, a counterfactual can be considered as ‘easy’ as long as researchers have well-developed theoretical and substantive knowledge at their disposal. But in my case, it is partly theory testing research, and partly theory developing research. So, I am wondering if when using the intermediate solution the analysis will become something like a self-fulfilling prophecy.

(E-mail Prof. Ragin on May 9th 2011) In essence, the goal of the intermediate solution is to drop from the complex solution any causal condition that does not make sense from the viewpoint of theoretical and substantive knowledge, as long as doing so does not lead to an intermediate solution that contradicts the parsimonious solution. In effect, the goal is the drop what might be considered "nuisance" conditions from the complex solution. The nuisance conditions exist only because of limited diversity--the fact that there are many combinations of causally relevant conditions that lack empirical cases. For example, if AbCd is a causal recipe from the complex solution and (1) condition "d" seems to be a nuisance condition and
Chapter 3 Research model, question and design

Now the principle is that only easy counterfactuals (or plausible counterfactuals) should be incorporated. Because we deal here with difficult counterfactuals this supports the idea of neglecting the former two valid intermediate solutions and support the selection of \( TTI^*E^*CC \) as the optimal intermediate solution. This is confirmed by the FSQCA software.

For deriving the ‘intermediate solution’ with the FSQCA software, I clicked the “Standard Analyses” button. Then I filled in that \( E(mpowerment), C(collective) C(ommitment) \) and \( T(eam) T(ask) I(nsight) \) should contribute to \( S(trategic) M(omentum) \) when cause is present.

I obtained the following formula with the Quine-McCluskey algorithm (formula 5 in chapter 6)

\[ TTI^*E^*CC \rightarrow SM \]

(\( BER, PAR, LIS, GRO, JIA \))

The ‘1’ outcome (emergence of strategic momentum) is observed in virtual teams that combine medium to high Collective Commitment AND medium to high Empowerment AND medium to high Team Task Insight.

**Step 5: Interpretation**

CsQCA is ‘only’ a tool to help the researcher with enhancing the comparative knowledge in small and intermediate \( N(umber) \) research. In the end, it is the researcher who has to interpret the (minimal) formulas on the basis of his profound knowledge of the cases and/or theory to come to final conclusions, as will become clear in the chapters 5 and 6.

3.10. Issues related to quality issues in this research

**Generalisation (external validity)**

The eight virtual teams I studied each consisted of members from several organisations, and all were virtual Research & Development (R&D) project teams. Concerning the generalisation (or external validity), which is one of the important criteria for the rigour of the research, the ‘solution concepts’ can only be used in this class of virtual teams: multi organisational virtual R&D project teams.

**Triangulation**

From each team I interviewed three or four informants (except the Jiaozuo team, where I interviewed two informants), studied additional project information and (when available) the project website. In this way, triangulation was realized.

---

(2) there are no cases of \( AbCD \) (due to limited diversity), then it is reasonable to use \( AbCD \) as an easy counterfactual case.

This is no different from what a qualitative case oriented researcher would do, viewing case \( AbCd \) by itself. The case-oriented researcher is unlikely to include condition \( d \) in his/her account of why this case exhibited the outcome in question.

So my bottom line is that it is usually OK to derive an intermediate solution when developing theory. Barring some sort of "aha!" experience when confronted with \( AbCd \) (where "d" makes sense), it is reasonable to use the easy counterfactual case to derive \( AbC \).
Chapter 3 Research model, question and design

Saturation
Each interview was analysed on starting conditions and management interventions, as on team task insight, empowerment and collective commitment. By analysing the explorative study and specific literature, these starting conditions and management interventions were gathered. These starting conditions and management interventions were placed in a template, which was then used for the analysis of the eight different cases with support of the software program Atlas TI. By analysing the eight cases several times, new starting conditions and management interventions could be added to the template, and others removed. This process of analysis was repeated until no new starting conditions and/or management interventions were found in the cases, i.e. when saturation occurred.

Reliability
One of the criteria for the rigour of research is reliability. To come up with this criterion I asked two people to replicate (as a peer check) one of the analysis (one case; three interview texts) with the aim to look to what point their analysis was the same as mine. Unfortunately, on the basis of a shortage of time of both people, these analyses could not be conducted by them. So, to come up with the criterion reliability in another way, the whole project process and procedures (chain of evidence) are written in detail in this chapter 3. According to Huijs and van Buuren (1992, p. 58), in this way ‘although replication of a case study may be an almost impossible ideal, an explicitation and systematic justification of the procedures used in the research is desired. Other researchers must have the possibility in this way to control the different steps concerning the gathering of the ‘evidence’ and their use in the ultimate ‘argumentation’”.

Internal validity
Within-case analyses were written for each case, which will be presented in chapter 4. The written within-case analyses were send to each team member I interviewed. The feedback was used to enrich the within-case analysis. With this member-check, the internal validity was checked too.

Construct validity
Strategic momentum is, as was explained in section 3.2.5., measured by linking it with the resources, deployed by the organisation(s) to realise the strategic objectives. When the team is working according to the initial plan or expectations and use the agreed amount of resources in the agreed direction, the strategic momentum is equal to these resources. When using lesser resources than agreed, and/or operating in a direction that is not agreed, strategic momentum will be lower. Using more resources than agreed, strategic momentum will be higher.

3.11. Conclusions
In this chapter, we presented the research model, research questions and research strategy. The research model showed that the emergence and sustenance of strategic momentum is presumably dependent on three variables: team task insight, empowerment and collective commitment. Management interventions and starting conditions have their influence on the creation and sustenance of team task insight, empowerment and collective commitment. The research approach used in this dissertation is design science research, which is not only based on scientific rigour, but also delivers relevant solution concepts for real life problems.

For the analysis of the eight serial single case studies, a template approach is suitable. The outcome of the analysis of each case will be presented in a within-case analysis in chapter 4. Crisp set Qualitative Comparative Analysis (csQCA) is a method specifically used when dealing with small-N(umber)’s that will be used for the cross-case analyses, presented in the chapters 5 and 6. This method is used to increase the quality and reliability of these cross-case analyses, but also to find patterns (or configurations) which lead to a certain outcome.
Chapter 3 Research model, question and design
Chapter 4 Case studies

4.1. Introduction

In the former chapter we introduced the research strategy and the choice and introduction of the case studies. In this chapter, we will give an answer to the second central research question: Can strategic momentum be more or less a stable property of a virtual team? For answering this question, we will look if momentum effects, which is the phenomenon that the self-propelling-force of strategic momentum becomes manifest, exist.

Therefore, we will first present the project structure of each case. Then we will present the within-case analysis of eight case studies. We look at what people have done to achieve an effective team and the amount in which strategic momentum has been created, if momentum effects can be found in the cases, to what amount team task insight, empowerment and collective commitment lead to the perseverance in virtual team strategy, to what amount interventions and starting conditions lead to developing and sustaining strategic momentum etceteras. The presentation of each case study ends with a visualisation of developing and sustaining strategic momentum in time and a short summary.

We start in section 4.2. with the Dewey case. Section 4.3 is reserved for the Goa case. In the sections 4.4 and 4.5. respectively the Print and Berlin case will be presented. In the section 4.6 we will continue with the Paris case. The Lisbon case will be presented in section 4.7, and the Jiaozuo case in section 4.8. Finally, the Groningen case will be presented in section 4.9. The chapter ends with section 4.10., the conclusions.

4.2. Dewey case

4.2.2. Project structure

The consortium consisted of eleven partners from five member states of the EU and one associate state. Three from Germany (one university, and two companies), two from Spain (one research institute and one company), two from Portugal (one university, and one company), two from the Netherlands (one university, and one company), one from Israel (company), and one from Italy (management consulting firm).

The results, which could be transferred to any type of industry, would be evaluated by three end-users: two turnkey suppliers and one manufacturer.

The Dewey project was organised in ten work packages. According to the project plan the first work package, the management, had to be carried out during the whole project phase (30 months) to co-ordinate the work between the partners (WP1). In the first four months of the project the requirements of modelling had to be defined by all project partners (WP2). From here the architecture of the communication platform had to be developed and implemented within the first ten months (WP3). During this work package four additional work packages (WP4, WP5, WP6, WP7) had to follow, where the main modules had to be developed. At the end of each work package the module had to be integrated within the communication platform. This integration work package (WP8) had to start from the 12th month of the project. During the integration phase each module had to be tested and evaluated on different sites in three test cases (WP9). From the midterm of the project the exploitation had to start, beginning with informing industrial partners about the Dewey project and ending with turning the Dewey project into a commercial product (WP10).
Chapter 4 Case studies

- Project management (see figure 4.1.)

![Diagram of Project Management Structure]

- Steering Committee
  A steering committee was installed as the highest decision making body. It handled:
  Problems and conflicts which could not be solved by the project management committee,
  overall strategic and managerial decisions, appointing leaders of work packages.
  Each partner nominated a manager with senior management status inside the partner’s
  organisation as a representative. Those representatives formed the steering committee. The
  Chairman of the Steering Committee was the representative of the co-ordinating partner.

- Project Management Board
  The project management board consisted of the project co-ordinator that was supported by
  local managers. The project leader guided it. The project co-ordinator was responsible for the
  global administrative management of the project.

- Technical Management Board
  The technical management board was responsible for the technical matters of the project. It
  was guided by the technical co-ordinator. All work package leaders formed the management
  of the work packages.
  The technical management had to support all global decisions concerning technical issues.
  The technical management board had to supervise the achievements of the tasks and
  milestones of the project in respect to developed technologies and the previously defined
  requirements.
  The work package leaders were responsible for the execution of their respective work
  packages according to the work plan, for the production of progress reports, and for the
  exchange of all work package related information and project documents with their local
  managers. Though it was recommended that a specific person had both roles, work package
  leader as local manager.
  Since all partners jointly input their ideas and requirements in the Work package 2
  Requirements Definition, the technical management board had to decide which ideas and
  requirement definitions were finally accepted and authoritative for the execution of the work
package. For work packages which contributed significantly to the achievement of a milestone, 100% consensus was needed, for the rest a simple majority was enough. The work package leaders were supported by the work task leaders which were responsible for the same points like the work package leaders, only on task level, since some tasks could not be broken down so that only one partner was working on them.

*Exploitation Management Board*

All industrial partners carried out the exploitation management. This included that the exploitation managers were responsible for the observation of project activities and making of suggestions that could help increasing the marketability. They were also responsible for collecting information and establishing contact to other possible users of the technology developed in the project (apart from the ones that were directly involved in the project). There was extra time allocated in the work plan in Work package 10 for exploitation.

4.2.2. Within-case analysis: The emergence and sustenance of strategic momentum

*Emergence of strategic momentum*

*Preface*

The initiative for the project was taken by a German company and a German university. They had an idea and took the initiative, formulated a concept proposal and sought for partners. Although the ones that took the initiative wrote most parts of the project plan, work package leaders had to fill in their part of the project, and in this way the project management tried to establish an outcome in the cultural and technical domains. So, the final project plan was the result of participating decision making. But not all partners delivered a work package leader, so some partners did not participate in the process of deciding and writing the project plan. According to one informant ‘I think not all partners had been involved in the project preparation and therefore they had the wrong expectations perhaps’.

Although participative decision making could lead to the development of the alpha into the direction of 1 for most of the partners, one can doubt about it, because - as will become clear at the start of the project – the informants disagreed concerning the collective commitment. Although most partners participated in the process of deciding and writing the project plan, the project plan itself was vague, and the aims remained vague for a long time for the partners. So, team task insight could develop (very) slowly, leading to a beta between 0 and +1. In this way participative decision making did not have a positive influence on team task insight, because the project plan itself was vague. A possible reason for this conclusion can be that there were no real discussions concerning the project aims, and every work package leader filled in their part of the project plan according to their own interpretation (which was not shared with the others in the team).

The partners in the project were selected along three ways for the consortium. In the first place the familiarity with the initiators of the project. In the second place because these partners were familiar with other partners, whom could take part in the project. The familiarity with these partners led to faith (trust). In the third place one partner who was added by the EU to the consortium. So, most partners were selected on the basis of familiarity, but here this did not lead to a greater collective commitment, given the vague aims.

*Before the start of the project, a project plan was written by the initiators of the project and the work package leaders. It turned out that the project plan was vague, leading to a low team task insight. The informants disagreed concerning the degree of collective commitment in the team. The partners in the project were mostly chosen on the basis of familiarity.*
Chapter 4 Case studies

Start project
There was a kick-off meeting in Germany in January 2001. Here, every partner presented his organisation or his company and the participants could socialise with each other. At the start of every work package the group which was responsible for the work package also had a kick-off meeting. Here, milestones were defined and the results were added, probably having a positive influence on team task insight. Before the content meetings, project management intervened, trying to establish an outcome in the cultural domain, by organising a conducted tour at one of the participating partners. Also, the team went out at night to eat together. So, a kick-off meeting can have a positive influence on the collective commitment, and the alpha could develop into the direction of +1.

Concerning the collective commitment in the beginning of the project, the informants disagree. According to one informant there was a very small collective commitment in the beginning of the project, because the aims were vague and the partners wanted to invest less in this project. According to another informant, one could talk of a great collective commitment, what became obvious from the clear will to come with an end product. This commitment was collective because everyone had his role in this and the commitment was aligned clearly above the individual interests of the partners.

The collective commitment was not equally distributed over all partners. Some partners had a small collective commitment in the beginning. E.g. there was a German partner (not an initiator of the project), which resisted from the beginning against the project and had a very small collective commitment. Others had a greater collective commitment.

Teambuilding, for example by determining the social competences to form the team, was not an explicit aim for the initiators. The empowerment in the team was low in the beginning. In the beginning of the project the team task insight was very small. This was caused by a vague project plan, and one did not know what one had to do, so the beta did not develop much into the direction of +1. The vague project plan probably had to do with the innovative character of the project. The aims were not defined clearly enough for most of the partners. It was only to a great extent clear for the initiators of the project. The team task insight grew (after a while) by good consultation between the work package leaders, developing the beta into the direction of (but not near to) +1.

These factors caused a low strategic momentum in the beginning of the project. The project developed itself, by the vague project aim description (and the small team task insight), at the beginning in all directions; it did not have a clear direction. This lead to a high ineffective component of strategic momentum, which can be made clear with vectors (see chapter 2, figure 3.1.).

At the start of the project, team task insight was low on the basis of a vague project description. After some time, team task insight grew because the work package leaders consulted each other. Empowerment was low at the start. Collective commitment was unequally distributed over the partners. Some partners were to some extent or even not at all committed to the project, others were highly committed.

Sustenance of strategic momentum

Team task insight
Team task insight was very low in the beginning of the project, and became not much higher until an ftf meeting after twelve months, were some knots were cut. As one informant said ‘the first year most partners did not know what to do’. A core team (of five partners) was formed, which already had a higher team task insight, which steered the other partners into the right direction. So, their team task insight was high. Team task insight was also high in the developers team in the project.

For the technical knowledge sharing, but also for discussions on technical adjustments in the virtual project team, several media types were used. Face-to-face meetings were evaluated as ‘very important’, and one informant even saw it as a ‘drive for the process’. After getting to
know the other team members by ftf meeting, using e-mail and sometimes a telephone call can be very efficient. According to this informant, first team task insight must develop with the help of ftf meetings, before other communication forms become efficient. Especially in the design face of an innovation project. Beside these media types, the virtual team also used MSN messenger, telephone conferences, a project website and a collaboration tool. Latter did not function very well. So, different media types can have a different influence on team task insight and technical adjustment. Ftf-meetings have the greatest (positive) influence on team task insight and technical adjustment, followed by the other communication media; telephone communication was the least preferred by one informant, because ‘you know nothing about the emotional aspect of the other, or if he is writing things up or just ‘day dreaming’’. Although the cultural backgrounds of the team members were different, it didn't have any consequences for the project, i.e. team task insight. As one participant stated 'this only worked fruitful'.

Concerning feedback, it was agreed that one industrial partner gave feedback concerning the products of the programming teams. This way of ‘knowledge (or insight) sharing’ had a positive effect on team task insight.

The professional background in the virtual team was different. This led to a ‘Bable of tongues’, because team members had different views on the subject; different meanings for the same words. This had a negative influence on the team task insight. So, a difference in professional background can have a negative influence on team task insight.

There was task-reallocation between some partners in the project, but they did this ‘to have the project running and not cancelled by the EU’. So, it is unclear which influence this had on the team task insight, but it certainly was the outcome of a difference in collective commitment.

As we already saw, team task insight was low at the start of the project and became higher after some time on the basis of the consultation between the work package leaders, and high after twelve months during a special project meeting. Task-reallocation and differences in cultural background did not have any influence on team task insight; differences in professional background, feedback and knowledge sharing did.

**Empowerment**

The management style was more facilitative, at least during the first year of the project. The partners became more empowered after the start of the project. After a year, when a knot was cut during an ftf meeting, the core team dictated more what the other partners had to do. In this way, empowerment was decreased, because partners had to do what the core team dictated. So, a directive (dictating) way of decision making can probably have a negative influence on empowerment.

*After the start of the project, empowerment became higher. Empowerment decreased after a year, when the core team dictated what the other partners had to do.*

**Collective commitment**

As became clear above, the informants disagreed concerning the magnitude of the collective commitment in the virtual project team, at least in the beginning of the project. Collective commitment in the team increased when a developers team was formed and started to work. The collective commitment of this developers team, consisting of five or six team members, was very high. According to the informant ‘It was very hard time for all of developers working more than 38 hours without sleeping and only small breaks for breakfast, lunch and dinner. I was very proud to say that nobody escaped from the group - the moral was very high - and everybody seemed to expect good results from our work’. So, collective commitment has a positive influence on strategic momentum, which was high in this developers team. We can even say that there was ‘flow’ in this developers team.
Chapter 4 Case studies

Collective commitment of most team members increased, when the developers group presented a ‘nice looking prototype’. During the last half year of the project, the collective commitment was high, because the team wanted to achieve the goal.

The commitment in the virtual team during the whole project was unequally distributed over the different partners. The German company and the German university had a high commitment as initiators. The two Dutch partners also had a high commitment. This was also the case with the university from Portugal. The Spanish partners had a low commitment. The commitment of one German partner fluctuated during the project.

The cultural background of the team members was different. According to one informant, this was fruitful for the project ‘by combining the rational straight forward mentality of the Germans with the spontaneous enthusiasm of the southern European team members’. So, cultural differences do not always have to lead to communication disturbances, and can probably also have positive influences on the collective commitment.

Concerning decision making, this was not always based on a participation basis. E.g. after twelve months project management decided what was going to happen. Although partners accepted this, other partners disagreed, endangering their collective commitment. So, directive decision making can have a negative influence on the collective commitment, endangering the sustenance of the alpha. According to one informant ‘The aim of the core team (consisting of five partners) that steered the projects was to tell the partners what their tasks were’. According to this informant this functioned very well. On other ftf-meetings there was more room for participating decision making.

The collective commitment of the virtual project team was positively influenced with the start of a developers team, although the commitment in the virtual team during the whole project was unequally distributed over the different partners. This team was highly committed, and we can even say that this team was in a state of ‘flow’. During the last half year of the project, the collective commitment was even high because the team wanted to achieve their goal.

Above, we looked at several interventions (and some starting conditions) and their influence on team task insight, empowerment and/or collective commitment. Now we will pay special attention to the ftf meetings, because it can be seen as an intervention that forms the platform for several other interventions with the aim to sustain strategic momentum.

**Ftf-Meetings and sustenance of momentum**

There were ftf meetings for the whole team twice or three times a year. Ftf meetings were used for discussions concerning the content of the project at workshops, leading to more conversion and therefore team task insight in the virtual team. These meetings were also important for learning to know each other better, also by social activities, leading to a higher collective commitment. As one informant said ‘Friendship emerges when one has personal contact. You don’t need friendship, but you need some personal commitment with somebody’. It could even lead to a greater strategic momentum, as one informant said ‘the drive for the process, the will to come to results and also understanding what the other wants to do, is only possible with ftf meetings’. So, ftf meetings can have a positive influence on team task insight and collective commitment.

Beside ftf meetings for the whole team, there were also separate ftf meetings for the work packages. The members of these work packages also learned to know each other better during these meetings, leading to a higher collective commitment.

There were also separate ftf meetings for the developers group, in which they worked very often throughout the whole night to develop the software tool, leading to a higher team task insight.

When a Portuguese partner after ten months stopped for political reasons with their activities in the project, there were several parallel meetings, beside the ‘official’ meetings, to
reallocate the budget over the other partners, which took over some tasks. In this process, there were conflicts concerning the reallocation, probably endangering the collective commitment. The reallocation of resources was based on agreements with the project management, and so had no influence on the normative strategic momentum.

Interferences\textsuperscript{12} and sustenance of momentum
There were also some critical incidents in the project, threatening the alpha or beta. The German partners considered the project as their own project. In the first place, the Germans used a dictating style of management (as a result of which the empowerment of the partners became lower). In the second place the remaining partners were only commissioned for 'doing odd jobs'. The moment that a link arose between a university from Portugal and the Germans, this last attitude changed.

The objective of the project remained unclear for a long time, so that one had to wait for clarity of other work package leaders before one could continue further, and team task insight could increase. This clarity was the result of discussion on ftf meetings. So, participative decision making can have a positive influence on team task insight. However, in several ftf meetings this clarity was not realised much. About 12 months after the start of the project the team already had developed some team task insight (in the sense of WHAT had to happen there), but the operationalisation (in the sense of HOW, or to which it had to satisfy) stayed unclear; which requirements one had to formulate for the components) remained a chaos. Project management (Germany) intervened after twelve months, trying to establish an outcome in the technical domain, by cutting some knots on an ftf meeting to stop this divergence. Although this was accepted by most partners, some protested, forming an endangerment for the collective commitment.

However, the requirements remained unclear, whereupon the project did not run well, and team task insight kept on changing. Much of the problems concerning the unclear requirements 'were however smoothened' in the development group (momentum effect), which had an important place in the project, in this way increasing team task insight and developing the beta into the direction of +1. This development group was formed after about 14 to 18 months in the project and consisted of participants of several partners: a German partner, a Portuguese and a Dutch partner. Concerning the developers there was a high collective commitment. In the first place because there was much good fellowship and team cohesion in this group was great. So, team cohesion can have a positive influence on collective commitment.

In the second place there was a common drive. As one informant said 'Inside of the development team we had a very good team moral. When anything did not run, we worked together on problem solutions and also worked longer on a day to help the others to come forward with developing e.g. by helping with testing a software or making real time tests over the Internet taking some hours time'. Also, the empowerment and the team task insight in this group were very high, so one could speak about a high strategic momentum. This is also illustrated by the fact that this group worked very hard, and the task was finished earlier than expected. This caused also an increase of strategic momentum in the project team.

After a year one of the partners (Portugal) stepped for company-political reasons out of the project, what brought their strategic momentum to nil. Project management intervened, trying to establish an outcome in the technical domain, by not replacing the company in the first place. In the second place a reallocation of tasks and budget took place. This was regulated in special (smaller) ftf meetings, because the partners had several conceptions concerning partitioning. In the fourth place to outsiders the idea was given as if the company participated until the end of the project. The intervention caused that strategic momentum in the rest of the group could be sustained on the same level.

\textsuperscript{12} With 'Interferences' is meant an interference (or intervention) of the management or the team when critical incidents occur.
At one German partner the commitment changed several times seriously during the project. From the beginning of the project there was low commitment at the German company. The cause for this was in the first place misunderstanding at the partner concerning participation in the project. In the second place the company first had business links with a company from Israel, which also was a partner in the project. The German company chose however at a given moment for a competitor. Then she had no more interest in the project, because she did not want to share her (scientific) insights etceteras with the company from Israel. The consequence was that the representative of the German company established himself negative in the team. Eventual, the German company wanted to step out of the project. Project management intervened, trying to establish an outcome in the political and technical domains, by persuading them in ftf meetings (at the German company itself) several times of participation in the project. At the German company concerning the project twice an internal task shift (eventual three departments of the organisation have been involved) took place. This had as a consequence that the project at every transfer had to start up again at this partner, to build up team task insight and commitment, which caused a strategic momentum. After the last internal task shift the company from Israel was deployed again and the German company could identify itself with the product (of the company from Israel). Then, as one informant said 'the people worked straight forward in that project'. In the course of the project it became clear that the eventual objective deviated from the original aim determined in the project proposal. Thereby, the virtual team had to handle in a creative manner with a finished part of a work package to reach the eventual aim, within the rigid structure of the work packages. The core team (approximately five partners) intervened, trying to establish an outcome in the technical domain, by steering the remaining partners into the direction of the final aim. This 'reorganisation' caused a new strategic momentum, but with another direction, since the project became a success, but the original objective was not reached.

There was a difference in view between the partners in the project. This was especially caused by a difference in professional context. One used the same words in the many discussions for example, but with different contents, what lead to many misunderstandings. Project management intervened, trying to establish an outcome in the technical domain, by keeping on discussing with the team members concerning the content until there was a result.

According to one informant, the project went well during the last six months of the project, when software was developed. This was the result of the expertise and the enthusiasm of the developers team.

The project was concluded with a test implementation. A pursued objective was to show a functioning software in the end. This was successful.

**Momentum effects**

There was a momentum effect in the project. A momentum effect is a manifestation of a momentum. The momentum effect in the Dewey project is:

- On the basis of a vague project aim description there was a divergence concerning the fulfilment of the tasks. So, one had to wait for clarity of other work package leaders before one could continue further. However on several ftf meetings this clarity was not realised much. Project management intervened after twelve months by cutting some knots on an ftf meeting to stop the divergence. The participants accepted this. However, the requirements remained unclear, although project management had cut some knots to stop the divergence. The project did not run well (team task insight kept on changing). Much of these problems 'were however smoothened' in the development group.
Figure 4.2. Visualisation of the creation and development of strategic momentum in time
The figure is mainly focused on the magnitude of strategic momentum

Explanation of the illustration
The illustration is an estimation of strategic momentum by the researcher, on the basis of empowerment, collective commitment, and team task insight. The thick line entirely above in the illustration is an estimation of strategic momentum at group level. This is not on equal scale. It is also not the sum of the unit strategic momentums. But, as said earlier, the estimation of strategic momentum by the researcher.

It gives the actual strategic momentum not taken into account that for a while the objectives were unclear. After the turning point X the actual and desired strategic momentum were the same because the direction was effective.

Unit strategic momentum:
(1) Portuguese partner (firm)
(2) German partner (Firm D-C)
(3) Partners other than 1 and 2

X: turning point where strategic momentum changed direction

Unit strategic momentum: 

Collective strategic momentum: 

4.2.3. Commentary
The project has been a successful project, in the sense that it has reached a final objective. Most of the partners also had a high spirit to reach the objective, especially when the development group came into action. Although it was a successful project, there was undoubtedly one weak point: the vague project proposal. This lead to a low team task insight in the beginning, because the participants didn't understand their work package. Besides writing a project proposal which is clearer, it is also possible to have more ftf meetings in the beginning of the project to discuss about the objectives and how to reach them. In such meetings it is better possible for the ones who have the most team task insight to give feedback to the other partners. This would increase the team task insight, and probably also the collective commitment, leading to the development of a higher strategic momentum in a
Chapter 4 Case studies

much earlier phase of the project. During the project, there were two or three ftf meetings a year for the whole team, and some ftf meetings for each work package. This was probably not enough to increase the team task insight in this virtual project team.

There was only one momentum effect during this project, but a very important one, because it was manifest for a longer period and increased strategic momentum for the whole team. Relatively seen, there were many interventions. In most critical incidents project management intervened, mostly trying to establish an outcome in the technical domain (not only because of the low team task insight, but also because it turned out that strategic momentum had to be steered into another direction).

4.3. Goa case

4.3.2. Project structure

The project group consisted of five European universities (the Netherlands, Germany, Sweden, Greece and Switzerland), two research institutions (The Netherlands and Finland), and two software developers (The Netherlands and Italy). Japanese and American partners were members of the global program.

According to the project plan and concerning the GOA project process, at first the requirements had to be defined by a Swedish, Finnish, American, Italian and Japanese partner in work package 1 (wp1). To make the connection with different users and existing software a language had to be defined (wp2: the ontology). This ontology was of course used in the procedure (a kind of handbook), which had also to be developed in wp1.

In the first year, the first paper and pencil versions of parts of the ergonomic and sociotechnical tools had to be developed and tested (wp3). Between month 12 and 18 both the ergonomic and sociotechnical tool had to be adapted to put them into software. Data from the tests had to be used to prepare the software versions. Also, the software versions had to be developed. At conceptual level the software had to be integrated into one tool: the E/S tool.

Also, the technology that had to be able to connect the users and packages (wp4: navigator) had to be developed and finalised. A part of the procedure was to test the effect of suggested improvements partially in the existing data of the Enterprise Resource Planning (ERP) systems. To enable this simulation the integrator (wp5) had to be made. With the integrator GOA could use existing data in ERP systems. During the last 6 months the different GOA parts had to be tested at the Swedish, Finnish, American, Italian and Japanese partner (wp6).

The results had to be presented in a workshop for industry in March 2002 and in a GOA book.

Concerning the project management of the project, the following functions were agreed:

*Project manager*: His task was managing the project in such a way, that the end was reached with good results.

*Management team*: The management team consisted of three persons from three different Dutch organisations.

*Co-ordination and secretary*: consisted of three persons and were also in Dutch hands.

*Work package (WP) leaders*: Each WP leader was responsible for organising and managing the work within the individual work packages.

The project was a big success, both from an ICT point of view, and from an organisational learning perspective, as well.
4.3.3 Within-case analysis: The emergence and sustenance of strategic momentum

Emergence of strategic momentum

Preface
The project was an initiative of a Dutch organisation, which had contacts in Japan. The project proposal was written by four partners (three Dutch, and one Swedish) of the project. According to informant C1\textsuperscript{13}, the project proposal was the outcome of the decision making process of a small group. For the other partners, it was more something like 'if you don't like it, you may lump it' according to this informant. The aim and the tasks had been fixed by a very small group; there were little choice possibilities for the other partners. Informant C2 says that it was possible to bring in change requests by the partners for their tasks during the ftf kick-off meeting, as the outcome of discussions. Informant C2: ‘in this way, consensus was reached’. So, according to him there was room for participative decision making concerning the tasks and aims for the partners. According to informant C3, other partners (beside the four original partners) were involved in the production (participating decision-making) of the project proposal. All three informants agree that in the first place the project proposal was written by a small group. Two informants out of three agree that the other partners had influence on the project proposal concerning the aim and the tasks. So, we conclude that the first draft of the project proposal was written by a small group, but the eventual project proposal was the result of participative decision making by the partners. The project proposal, as the outcome of participative decision making, probably had a positive influence on the collective commitment, developing the alpha into the direction of 1. It could also have a positive influence on team task insight, but the project proposal turned out to be too vague, giving the partners too much opportunity to fill it in in their own way. In this way, the beta could not develop much into the direction of +1.

In the meantime the partners who wrote the first draft of the project proposal looked for other partners (up to a total of twelve). These partners were selected on two main criteria. In the first place, most of the partners who were involved in the project were acquaintances of one or more of the original four partners. Some partners were added by the EU to the project. The criteria which were put to these partners had its origin from the EU, which financed the GOA project. These criteria were as follows:

a. It must be a good mix from the different member states of the EU.
b. Also Mediterranean Sea countries had to be involved, because these have a separate status in the EU.

In the second place, every partner must have an added value for the project with regard to its expertise. So, an attribute of partner selection is expertise. After the original project manager had to lay down his tasks, a new project manager was chosen by the complete group. To this function the following properties had been linked: a high stability, high trust (of the group), highly output oriented (also task co-ordinator) and very honest (or integrity). After the project proposal had been adopted by the EU a face-to-face (ftf) kick off meeting was organised.

Before the start of the Goa team, a small group wrote a project proposal. But some time later there was room for participative decision making by the other partners concerning the aims and tasks. The partners were chosen on the basis of different criteria; most of them were acquaintances of one or more of the original partners. The EU added others.

Start
There was an ftf kick-off meeting, in which the project management sustained a good balance between content discussions and socialising elements (in this way intervening and trying to

\textsuperscript{13} ‘Informant C1’, ‘informant C2’ etc. were the codes used for the interviewed informants, which are anonimised in this way.
establish an outcome in the technical and cultural domain). In this way, team task insight could develop, developing the beta, and collective commitment could develop, developing the alpha. According to informant C2 the socialising events led to more trust between the participants. So, an ftf kick-off meeting can have a positive influence on team task insight, collective commitment, and trust.

At the time of the ftf kick-off meeting the partners had the possibility to introduce themselves. The management team outlined the planning for the duration of the project. The framework of the project was filled in with the partners. In dialogue with the partners the locations for the about six ftf meetings during the project were planned. These ways of participative decision making can have a positive influence on the collective commitment, developing the alpha. Also, there were possibilities for introduction in small groups. According to one of the informants (C1) a lot of cockerel behaviour appeared in these introduction meetings. In the sense of boasting of how good someone is.

It can be concluded that indeed a strategic momentum was created at the beginning of the project, the magnitude of this strategic momentum was high, but not the desired strategic momentum, because it was caused by sufficient commitment (as turned out only concerning the own activities), empowerment, but a lack of team task insight. This lead to a high ineffective component of strategic momentum, which can be made clear with vectors (see chapter 2, figure 3.1).

Sustenance of strategic momentum

Team task insight

The project proposal was the initial paper for developing the team task insight. The aims of the project were not changed during the project, but the operationalisation was. This led also to more team task insight, developing the beta into the direction of +1. But in the beginning task insight developed into different directions at some partners, developing the beta in the direction of 0 or even –1. A reason for this behaviour is that according to one informant ‘most participants were strongly focused on the aim of their own activities. And the use of their results. They were to a lesser extent focused on the broader, publicly use of the results’. Another reason was that the project proposal was vague, leaving enough room for different interpretations in the work packages. Beside ftf meetings, other media were used for knowledge transfer and technical adjustment as e-mail, requirements management tool (DOORS; a tool to make an inventory of needs and to give arguments for the decisions; this system did not work in practice) telephone, telephone conferences and video conferences. The last medium mostly led to a ‘babel of tongues’, in the sense that people did not listen to each other. There was also a website, to disseminate knowledge to others.

There was at least knowledge sharing in the work packages (meetings) and concerning the end users. The latter had to evaluate the developed products. There were differences in professional background, in some cases, although feedback was given, leading to communication disturbances or ‘a babel of tongues’. As one informant said ‘the ICT people are more model oriented, simulation oriented. The sociotechnical people are more oriented on the work organisation, on action research’. This had at least a negative influence on the collective commitment, but probably also on the technical adjustment.

The project proposal was vague, and some partners were more focused on their own interests, instead of the interests of the whole team. On the basis of this, in the beginning the team task insight did not develop properly, instead developing into different directions. After nine months this became obvious to the project management. After their intervention, team task insight could increase, increasing the beta into the direction of +1 (See Interferences and sustenance of strategic momentum).
Empowerment
Concerning the management style, the project manager had not many possibilities to sanction behaviour. He could slow down the payments, when a partner did not deliver his contribution. But according to one informant ‘this is not enough after some time’. The project manager saw it as his aim to bring the project to a good end. The management style was mostly facilitative, human oriented, able of building bridges, and sometimes directive. The project description was to some extent open. Team members had the autonomy to fill in the content to some extent by themselves. There was much discussion concerning the content. On the basis of the fact that the partners could use the resources to their own insights (as management was mostly facilitative, not directive) there was empowerment, sustaining the alpha close to 1. But this empowerment was not equal during the whole project. It was also not equally spread over all partners. So, an attribute of empowerment is autonomy.

The management style was mostly facilitative, and the partners could use the resources to their own insights, increasing the empowerment.

Collective commitment
There was (collective) commitment concerning the things that were agreed beforehand. Indicators are that people fulfilled their agreements, and a good operationalisation of the tasks. The team members were engaged. According to another informant, there was a (collective) commitment for sure in the end of the project. The informant also admits that there was (collective) commitment during the whole project ‘the most successful was the active participation of all participants. The fact that they all were motivated to reach the end result’. On the other hand, one informant said ‘most participants were strongly focused on the aim of their own activities. And the use of their results. They were to a lesser extent focused on the broader, publicly use of the results’. So, we may conclude that there was commitment in the team, but a less than average collective commitment in the team during the project.

The collective commitment was unequally distributed over the partners. Some partners had a low collective commitment. They only came to listen and learn what was going on in the project. This knowledge they used in another virtual project team in which they participated. The partners in the project had a different cultural background. Management did not always take enough care of the cultural differences. For example, when people from Japan visited the European partners, it was not a custom to buy presents for them, as is usual in Japan. One of the members of the management team took care of this. This had no consequence for the project.

There were also cultural differences concerning power distance between young and old team members. This sometimes led to motivation problems, for example at the Italian participants.
Concerning media types used for technical knowledge sharing and technical adjustment, beside ftf meetings, e-mail, video- and telephone conferences were used. According to one informant, video- and telephone conferences led to communication disturbances, on the basis of too less conversation management. So, when video- and telephone conferences are not managed well, it will lead to communication disturbances, having a negative effect on the collective commitment, and team task insight.

There were differences in professional background, in some cases leading to communication disturbances or ‘a babel of tongues’. As one informant said ‘the ICT people are more model oriented, simulation oriented. The sociotechnical people are more oriented on the work organisation, on action research’. This had at least a negative influence on the collective commitment, but probably also on the technical adjustment. So, a difference in professional background can have a negative influence on the collective commitment, and probably on technical adjustment. There was low team cohesion. ‘It was a bit like loose sand’, according to one informant.
We may conclude that there was commitment in the team, but a less than average collective commitment in the team during the project. The collective commitment was unequally distributed over the partners.

Several interventions (and some starting conditions) and their influence on team task insight, empowerment and/or collective commitment are presented above. Now we will pay special attention for the ftf meetings. An important reason is that it can be seen as an intervention that forms the platform for several other interventions with the aim to sustain strategic momentum.

Ftf-Meetings and sustenance of momentum
There were for about six ftf meetings during the project for the whole project team. According to one informant, during these ftf meetings there was a good balance between content discussions and the socialising activities. Examples of socialising activities were bicycling, walking, and sauna. It always was a sportive activity, lasting for about four hours, and before the content discussions. Trust became stronger through these activities, as the collective commitment, sustaining the alpha into the direction of +1. So, an ftf meeting and trust can have a positive influence on collective commitment. An ftf meeting can have a positive influence on team task insight.
There also were ftf management meetings. There were no social activities after an ftf-meeting in Amsterdam (management meeting). Sometimes there were also ftf-meetings on work package level.

Interferences and sustenance of strategic momentum
In the beginning of the project, the project manager had to lay down his tasks, on the basis of problems in his organisation. A new project manager was chosen, in a democratic way, by the complete group.

At the beginning of the project, but after the project description was approved, it became clear that there were difficulties with technical adjustment in the team. Causes for this were the multidisciplinary background inside the team, and the technology. As a consequence, the technology of partner A could not be used at partner B and vice versa. The team intervened by suggesting an advanced technology, but this did not work (Momentum effect). Although the problem was not really solved, it had not many consequences for the project.

As already mentioned before, it can be concluded that indeed a strategic momentum was created in the beginning of the project, but that this was not very high.
There was one exception. During the first six months, strategic momentum was high at one work package with regard to the disseminative activities. This was the period where the concept was presented on conferences (dissemination). Indicator for this period (and the momentum) was the great pleasure that the participants had in these activities. One could also talk in this period about a united team (high collective commitment). Cause of this high strategic momentum was, among other things, the great expectation with respect to the outcomes of this project. After these six months it became clear that the expectations were aimed too high, as a result of which that expectation decreased. Causes for this were the developed ontology’s (certain developed language) that became too complicated (this can have an effect on collective commitment (a decrease)), and the too high ambitions of the IT employees (this can lead to an 'overkill' of strategic momentum. This is also bad for a project, because you have to slow it down). The expectations became always smaller, because nevertheless in the end a product had to be produced.
The work package leaders were empowered to fill in their part of the project at their own insights. After nine months, when end products were presented, a harmonisation problem between the different products became obvious for the management. Causes for this problem possibly were the small responsibility by the workpackageleaders for the whole, no communication leading to technical adjustment, and no knowledge sharing, and a vague project proposal, what led to a low team task insight (or lack of consensus in team task insight). For example two partners, a Dutch and an Italian, both made a product which did not fit with each other. A cause was that there had not been any technical adjustment till then. So, the task insight concerning their own work package was high (at least under the work package leaders), but the team task insight was on a low level. So, the beta was about 0 or even developing in the direction of -1. It lasted for nine months before the project management became aware of this problem on the basis of e-mail communication.

The project management intervened, intending to establish an outcome in the political and the technical domains, in the first place by visiting different partners to steer their activities more in the wished direction. In the second place they organised a meeting in Aachen, were in a more directive decision making style the coordinator made clear what had to be done by the different partners. For example, concerning the problem of the Italian and Dutch participant, the project manager intervened in a directive way (but not choosing ones side), by suggesting to make a link between both products, so they would fit. So, the project management intervened by autonomy reduction, or by decreasing the empowerment.

As a result, there was more technical adjustment and more team task insight, leading to the development of the beta into the direction of +1. On the other hand, because technical adjustment was the outcome of a directive decision making style, collective commitment at some partners was endangered, because they had to continue with their activities into another direction. This led to irritation and angriness, and possibly to a decrease of the alpha, which became smaller than +1.

On the other hand, on the basis of conflicts during the meeting, which were managed, some partners collaborated better after the meeting than before.

After the project worked out for twelve months, a capacity reduction took place at one of the partners (Sweden). The cause of this was that an employee left for the duration of one year. Although the activities were not continued by the partner on the basis of a capacity lack (decrease of strategic momentum), to management the suggestion was kept upright, since the communication went by means of e-mail, that all went successfully. Approximately five months later (then the project was in its 17th month) the management (which consisted of three Dutch partners) discovered the capacity reduction. The project management intervened with the intention to establish an outcome in the political domain. They reallocated the task from the Swedish to a Dutch partner. The Swedish partner got less financial resources, and the Dutch partner more. As a result, the deliverable was delivered in time, because the Dutch partner put more resources in it (greater strategic momentum).

There were also motivation problems with the AIO's in the second year of the project. The cause of this was culture-specific: large power distance in a country (Italy; culture aspect), as a result of which the contribution of AIOs was not appreciated. The project management intervened here, trying to establish an outcome in the cultural domain, by making clear in individual conversations that cultural differences were the bottle-neck, and that the contribution was, however, appreciated (increase commitment, and trust). This increased strategic momentum of the AIOs.

As a result of cultural differences between the different end users it was possible that the product which was tested in a certain manner at one end user, could not be tested in the same way at another end user (activity in the last six months of the project). For example, an end user in Italy was asked to conduct the observations on the production line by their laborers. But when laborers in Italy get new and different tasks, they have to be payed more. This difference in culture with e.g. Sweden was not known by the project management beforehand.
As a consequence, by e-mail the Italian partner mailed several times that they would send the results, but in fact no observations were conducted.

There was also another reason for this behaviour of the Italian partner: a top manager of the Italian partner was not convinced about the added value of the project. As a consequence, the manager below the top manager was not empowered to deploy resources for the project.

The project management intervention consisted of culture specific interventions, to establish an outcome in the political domain (taking care of differences in labor relations and differences in hierarchical relations). Concerning the first problem of the end user in Italy the project management intervened by visiting the Italian partner and solved the problem by letting the developers of the production line conduct the observations. As a result, the end user made the observations and gave their feedback. Their strategic momentum became greater (flying wheel effect). Concerning the second problem the project management intervened by letting a top manager of a Dutch partner write a letter to the top manager of the Italian partner, to convince him what the outcome of the project could mean for the Italian partner. As a result, the top manager of the Italian partner was convinced, and the manager was more empowered.

There were motivation problems in the team, caused by the insufficient cooperation between partners, the concepts that were inconnectible, and plannings that did not work out well. To sustain strategic momentum in the project team during the whole project duration, the management deliberately used several intervention methods in the cultural and political domain, on the basis that commitment was present: taking care of a good communication. Building good individual relations with participants, and addressing people on their responsibilities (empowerment). They also incorporated socialising events at the time of face-to-face meetings in the program, preceding the technical, substantive conversations. This increased the mutual trust and collective commitment, by which strategic momentum was emerged and maintained in an artificial way (as opposite to a natural way).

The difference in policy aim between universities (long range; external; public) and companies (short range; internal; profit) brought about a continuing field of tension in the project. No specific interventions were used to deal with this incident

There were negative team tensions, leading to disagreements in meetings. This was the result of a difference in professional background of participants (sociotechnologists versus computer scientists).

Project management intervened to establish an outcome in the technical domain by trying several times to create more time for content discussions during the project meetings, but that sometimes lead to more misunderstanding than problem solving. So, a difference in professional background can have a negative influence on team task insight.

In Japan, people are very driven concerning innovation. As a consequence, when the Japanese had analysed their workplaces, and came up with improvements, they started to try them all out. Not only some of them, and without an intervention of the project management. So, their strategic momentum was very great.

The project ended in March 2002 with a meeting in the Netherlands. A book was presented. Although contacts remained after the project no continuation was given to it. There are three reasons for this. In the first place many changes had taken place at the industrial partners in the project. They thought that there was a disbalance between time/effort and output. There were also industrial partners in which the personal situation was changed, or there was no commitment for another project. In the second place multidisciplinary was seen as a difficult path to research results. There were people with another profession context in the team. In the third place the EU saw no reason for a continuation, although two requests for continuations have been submitted.
Chapter 4 Case studies

Figure 4.3. Visualisation of the creation and development of strategic momentum in time
The figure is mainly focused on the magnitude of strategic momentum

Explanation of the illustration
The illustration is an estimation of strategic momentum by the researcher, on the basis of empowerment, collective commitment, and team task insight. The thick line entirely above in the illustration is an estimation of strategic momentum at group level. This is not on equal scale. It is also not the sum of the unit strategic momentums. But, as said earlier, the estimation of strategic momentum by the researcher. It gives the actual strategic momentum.

Unit strategic momentum:
(1) Dutch partner (software developer)
(2) partners
(3) Swedish partner (university)
(4) end users
(5) end user (Italy)
(6) Dutch partners (university and research institute)
(7) Dutch partner (university)

Unit strategic momentum:  

Collective strategic momentum:  

Momentum effect
There was one momentum effect in the project. A momentum effect is a manifestation of a momentum. The momentum effect in the Goa project is:
- After some time, it became clear that there were difficulties with technical adjustment in the team. As a consequence, the technology of partner A could not be used at partner B
and vice versa. The team intervened by suggested an advanced technology, but this did not work (Momentum effect). Although the problem was not really solved, it had not much consequences for the project.

4.3.3. Commentary
The project was succesful, and a book could be presented at the end meeting. On the basis of a vague project proposal and few or no possibilities to discuss the content, it lasted for a very long time before one could speak about a shared task insight. This had its influence on strategic momentum. Beside writing a project proposal which is more clear, it is also possible to have more ftf meetings in the beginning of the project to discuss about the aims and how to reach them. In such meetings it is possible for the ones who have the most team task insight to give feedback to the other partners. This would increase strategic momentum in a much earlier phase of the project.

Another problem that could be foreseen and anticipated on is the difference in cultures. A course in diversity management followed by the management or even by all the partners beforehand could sensitise them for problems that can occur on the basis of cultural differences.

Six ftf meetings were organised during the two year project, which is not too much. There was an average number of (TPC) interventions, and the interventions established an equal outcome in all three domains. Only one momentum effect occurred.

4.4. Print case

4.4.1. Project structure
Ten European organisations joined the project. Three from the United Kingdom (two contractors; one end user), two from Spain (one contractor; one end user), one from the Netherlands (contractor), two from France (one contractor; one end user), one from Belgium (end user), and when the project already lasted for 19 months, one from Poland (contractor). A balance has been sought between type and size of organisation, research capabilities, support activities with companies and market needs, technical and managerial skills, range of networks, scope for diffusion of results and experience with previous collaboration. It were complementary organisations that contributed in one or more required areas of the workplan that had been developed, for achieving the project objectives. This work plan consisted of eleven inter-linked work packages (WPs), which were performed sometimes concurrently. After Poland joined the Print project, a twelfth work package was added to the project. Beside the work packages, a number of milestones were identified in respect of the project life cycle. These milestones were as follows:

| Month 6 | list of success factors |
| Month 10 | completed specifications for the Print software components |
| Month 12 | tested and validated Print functionalities and knowledge base |
| Month 14 | mid-term assessment review (Acceptance by the Commission) |
| Month 18 | Print prototype, learning and support materials, and knowledge base |
| Month 20 | report on performance of Print and validity of results |
| Month 30 | Commercial Implementation Plan |

The project management of Print has deliberately been identified and supported, via work package 1, in order to enable R&D and other partners to concentrate their main efforts on the task of developing and testing the technical innovations and the added-value benefits. Concerning the project management of the project, the following functions were agreed to optimise planning, monitoring, co-ordination:
Chapter 4 Case studies

**Project manager**: the project manager was responsible for the organisational co-ordination within the project and for contact with the European Commission.

**Project board**: the project board consisted of one senior representative from each of the six full contractors in the project. They were joined, on a rolling base, by one of the end users. The project manager chaired the project board. The board made strategic decisions, resolved project wide issues, had to agree on project modifications whenever required and generally had to support the project manager in guiding the project to a successful completion. It is anticipated that project Board meetings had to be held monthly for the first three months, changing to quarterly thereafter.

**Work package (WP) leaders**: each WP leader was responsible for organising and managing the work within the individual work packages. WP leaders were nominated and could be revoked by the project board. WP leaders were designated on the basis of their research, development or other relevant expertise.

**Technical co-ordinator**: over-arching technical leadership and quality control of the research and development activities had to be the responsibility of the lead contractor (The Spanish contractor).

The project has been finished successfully, within the time-frame (30 months).

### 4.4.2. Within-case analysis: The emergence and sustenance of strategic momentum

**Emergence of strategic momentum**

**Preface**

An organisation in Israel had problems with A. Instead of asking a company in the UK (which was the initiator of the Print project) to develop the software, they started a consortium to apply for European funding. The proposal was rejected. Then, the initiator of the Print project, who saw a commercial advantage in this project, wrote a new project proposal. So, the project proposal was not the outcome of a participative decision making process. This did not have a positive influence on the development of the collective commitment, and the alpha could not develop. So, if the project proposal is not the outcome of participative decision making, but as in this case of one-way (or directive) decision making, this has a negative influence on the development of collective commitment and probably team task insight.

Eight other participants for the project were added to the project. The participants came or from the initiators’ network, or were acquaintances of other participants in the project. This led to trust, which led to the development of collective commitment, and therefore to the development of the alpha. As an informant said ‘The key players were all in the UK, and they know each other by heart’. The partners were selected for their expertise, and organisation talent. The initiator of the project had also prepared the task division in the project team. So, every partner knew beforehand what he had to do. Then a meeting was convened piloting the project through the negotiation phase with the EU commission. After approval by the EU commission an ftf kick-off meeting took place. So, trust can have a positive influence on collective commitment.

The project proposal was written by the initiator of the project, probably having a negative influence on the development of collective commitment and team task insight. The participants of the project were acquaintances of the initiator, or acquaintances of these acquaintances.
Chapter 4 Case studies

Start
At the kick-off meeting a plan was accepted for the operationalisation of the project. Afterwards, there was space for further familiarisation between the participants, by going to a restaurant. This intervention, trying to establish an outcome in the cultural domain, had a positive influence on the collective commitment, and the alpha could develop. So, an ftf kick-off meeting can have a positive influence on the collective commitment. In the project proposal was written down what the tasks and output of every partner had to be. Because the tasks were prepared by one partner, and not by the whole team, team task insight could not develop at the start of the project. Also, empowerment was low at the start of the project. Especially in the beginning of the project, there were more ftf meetings. At the time of these ftf meetings the partners could present proposals how they wished to fill in the workpackages. The initiator commented the proposals, in this way trying to establish an outcome in the technical domain. As a result, team task insight could develop, developing the beta into the direction of +1. The workpackage leaders could explain to the team at the time of the ftf meetings how they intended to produce the deliverables on time. So, ftf meetings can have a positive influence on the team task insight.

During the ftf kick-off meeting there were no discussions concerning the content of the project proposal. On the basis of this, team task insight could not develop. Collective commitment could develop, because after the meeting there was room for familiarisation. By planning several ftf meetings shortly after the ftf kick-off meeting, team task insight could develop.

Sustenance of strategic momentum

Team task insight
Team task insight was low in the beginning of the project. The Dutch partner, who was an expert in the field of A., shared his knowledge concerning A. with the rest. Team task insight (and technical adjustment) could also increase by the ftf meetings in the beginning of the project, were the initiator commented the proposals of the workpackage leaders. In this way, after a while team task insight could develop further, developing the beta to get closer to +1. The cultural background of the participants differed, but had no influence on the team task insight.

There was feedback given on a regular base by the end users on the products the core group of the Print team produced. This increased team task insight, and sustained the beta. So, feedback has a positive influence on team task insight.

Concerning knowledge sharing, and technical adjustment, the virtual team used ftf meetings (every six months), telephoneconferences, e-mail, and MSN messenger. One informant saw telephone conferences as efficient. But, according to one informant there was less knowledge sharing: ‘I have told once a story concerning A., but this was on a request of the commission (…) There was also no need for knowledge sharing, because everyone knew his place’.

Concerning task characteristics, it was to a great extent complex knowledge work, and some practical work (e.g. software development). One organisation took care for the theoretical knowledge concerning A. Another organisation could transfer this into a learning tool. And another organisation took care of the software development. Some end users used the developed products, and gave their feedback. So, there was a clear task division with highly complex tasks.

Team task insight could develop on the basis of ftf meetings and as an outcome of the feedback of the end users.

Empowerment
There was a project leader, but he did not lead. Leadership of the virtual team was on a changing basis; when a specific part of the project was made, e.g. the theoretical framework
concerning A., the partner who was responsible for this took the lead. So, an attribute of management was expertise. But the initiator kept on managing, although they formally did not have the lead, in a more or less directive way. As they said ‘Someone always has to take charge’.

The partners were partly empowered. As an informant said ‘They were stuck with what was written in the proposal as this became part of the contract. Therefore they were stuck with timescales, budgets and deliverables and tasks. But within those constraints they could do whatever was necessary to be able to produce the deliverables on time’.

The partners in the virtual project team were partly empowered during the project.

Collective commitment
The collective commitment was unequally distributed in the virtual team. The initiator of the project had a high collective commitment. The French organisation had a high collective commitment. The UK coordinator an average collective commitment: ‘they did what they had to do and nothing else’. On the other hand, the initiator of the project did not expect more from them. The Spanish organisation had a low collective commitment. The Dutch organisation first had a low collective commitment, but got a greater collective commitment after some critical incidents. The organisation from Poland also had a higher collective commitment. Except the Belgian end user, which had a high collective commitment, all the other end users had a very low collective commitment.

The cultural background of the participants differed, but had no influence on the collective commitment.

The decision making process in this project was dominated by the initiators of the project. They wrote the project description, and determined the boundaries within which the other participants could operate. So, there was participative decision making only to a less extent, having a neutral to negative influence on the collective commitment.

Team cohesion was very low in this virtual project team. This had no consequences for the project, because it was structured very well by the initiators of the project. Although the partners experienced the team cohesion as low, standards existed in the team. When someone did not keep himself to this, then he/she was excluded.

Social activities were organised spontaneously and not planned beforehand.

The partners where during the project a high momentum emerged and maintained (French partner, Dutch partner, and Belgium partner) continued doing business with the initiator of the project after the project. They are placed on the Internet site of the initiator as a member of the associate network.

Although the collective commitment was average to high for some participants in the project during the project, and certainly after a breakthrough meeting (which lead for this participants to a state of ‘flow’), for most of the participants the collective commitment was low or became lower. So, certainly in the end, the collective commitment was low in the virtual team. This was caused by the fact that the initiator of the project took the lead. They also took the other partners by the hand, and arranged everything. In this way empowerment was low too. So, in the end the alpha became (much) lower than 1, also increasing the differences in strategic momentum in the team (The initiator in the end had a high momentum; other partners had a low momentum).

An indicator for the low collective commitment is also that, although dissemination was a big issue in the virtual team, only the French partner and the UK initiator went to many conferences.

Although we have already looked above at several interventions, some starting conditions, and their influence on team task insight, empowerment and collective commitment, we will
pay special attention to ftf meetings. An ftf meeting can be seen as the platform for several other interventions with the aim to sustain strategic momentum.

**Ftf-Meetings and sustenance of momentum**

At the start of the project there were more ftf-meetings than later on. As we have seen, the first ftf-meetings were meant to develop and sustain the beta. There were ftf-meetings, but not as much as intended by the team members. This problem was solved by making use of teleconferences and e-mail. The end users participated in most meetings.

According to one informant, the problem in this and other virtual team projects is that beside the virtual project, team members also have their main activities on a daily base locally. The pressure of a virtual team project is a bit more away than the physical pressure they have on the day-to-day activities. As a consequence, partners started to work on the project only a week before the next ftf-meeting.

This effect, where resources are not spread equally over the whole project time, i.e. the momentum differs over the project time, is called the *momentum roller coaster effect*.

![Figure 4.4. The ‘Momentum roller coaster effect’.](image)

In a virtual team, concerning strategic momentum there is a ‘momentum roller coaster effect’. At the ftf-meetings the momentum is the greatest. After the ftf-meeting it will decrease, and nearing the next ftf-meeting, it will increase. So, ftf-meetings are (very) important for sustaining strategic momentum. The effect probably occurs because team members can have other (internal) projects, beside the Print project, which take their time during their stay in their organisation.

**Interferences and sustenance of momentum**

There were also some critical incidents in the project, threatening the alpha or beta. After six months, at a meeting with externals where some partners in the virtual team presented a draft methodology, they got positive feedback and indicators for improvement on the product (the breakthrough meeting). As a consequence, this created much enthusiasm – as an indicator of momentum - at the virtual team partners, and these partners (three; the initiator, a French partner and a Dutch partner) ’found ’ each other on this meeting in the United Kingdom. So, feedback can have a positive influence on collective commitment and team task insight, and on strategic momentum. This meeting increased the momentum for
these partners, increasing the alpha, and was an indicator therefore that they were working into the right direction. From that moment on, these participants formed key participants in the project. As a result of which at the disappearance (in several forms) of other participants the key participants also continued the project and brought it to a good end. An important result was that the methodology was completed and works started on the software development and learning materials. Another ‘result’ was that strategic momentum was not distributed equally over the partners in the virtual team. So, feedback can have a positive influence on (collective) commitment and team task insight.

The Dutch partner attracted two consultants for the project who did do too less work. As a consequence, a deadline was not reached by the Dutch partner, and an employee – who also worked on the project – got a telephone call from the coordinator in the UK which was not nice. An employee of the Dutch organisation took care that the two consultants disappeared. The virtual team (project board) intervened, intended to establish an outcome in the cultural domain, by letting a ‘father figure’ talk with the employee of the Dutch partner in such a way, that he became very committed to work harder. As a result, the employee delivered a report of 200 pages concerning A in two weeks. As the informant said ‘in the end I have done the work for three people in a couple of weeks time’.

In the beginning, the Spanish contractor wanted to see if the project could be used as a tool or a solution that could be proposed for their members. But on the basis of a lack of internal resources, it was too complex for them to implement and to disseminate it with the partners in Spain. As a consequence, the Spanish contractor became less committed to the project. The initiator intervened, intended to establish an outcome in the political domain, by taking over the activities of the Spanish contractor, and made their only deliverable. As a result, strategic momentum in the project remained the same, on the basis of this task reallocation and decrease of empowerment of the Spanish contractor.

A member of the commission (from EU, Brussels) did not like the coordinator; there was no chemistry between the two persons. As a consequence, the coordinator had a hard time when she met the member of the commission in meetings. She could not defend herself, because this could have had consequences for the budget, since the commission had the power to decrease the budget. The team intervened, by inviting the assistant of the coordinator to attend these meetings. As a result, there were no negative disturbances between the commission and the team anymore.

When a new participant (Poland) in the 19th month of the project was added, the EU commission put a new amount of money available for distribution. As a result, at some partners the commitment changed during the project as a result of these financial changes (they got more or less money). There was no specific intervention. The new participant was, according to one informant, ‘a breath of fresh air’, which was very enthusiastic about the project, and probably had a high momentum.

One SME got bankrupt, so their strategic momentum became nil. There was no specific intervention. Because it was an end user, only testing the developed products and giving feedback, this probably had no effect on the total strategic momentum.

The critical incidents in the project could threaten the alpha or beta of strategic momentum of the whole team. These are described above. Beside the dynamic of strategic momentum of the whole virtual team, there was also a ‘dynamic’ concerning strategic momentum of the different partners. During the project strategic momentum was not distributed equally over the participants, and changed for most participants at some points; in most cases as an outcome of the critical incidents. The initiator had a very high momentum, caused by team task insight, empowerment, and to a great extent collective commitment.
Chapter 4 Case studies

A partner (main contractor Spain) had an average commitment in the beginning. They found out that they did not have the internal resources for the project, and no experience with EU projects, as a result of which their motivation (and commitment) decreased. This capacity reduction (as a result of lack of internal resources and experience) caused a momentum change (momentum decrease) at this partner, for which is an indicator that they had troubles with working at their deliverable. The strategic intervention was a redistribution of tasks. This again caused a momentum change (increased momentum at the initiator; since the partner (the initiator of the project) took over those tasks (commitment, team task insight, empowerment) and worked harder to get the tasks finished within the determined time).

The Dutch partner had a high momentum after a year, caused by commitment and team task insight. The high commitment is illustrated by the fact that this partner wrote a paper of 200 pages in three weeks after the project continued for a year. The high team task insight is illustrated by the fact that the Dutch partner developed insight in the computer model. The relationship between the Dutch partner and the initiator was very good.

The French partner had a high momentum, caused by commitment and team task insight. The high commitment is illustrated by the fact that he and the initiator of the project went to many conferences to disseminate the knowledge concerning the project. The high team task insight is illustrated by the fact that this partner read a lot of books concerning A.. An indicator for this great momentum was enthusiasm.

The administrator (United Kingdom) had an average commitment, since she did what she had to do and nothing more. Empowerment was low because the partners were informed by her of important deadlines concerning administration but she was told not to interfere otherwise. Team task insight was also low. This caused a low momentum.

Two SME's had an average momentum, caused by an average commitment because they did what they had to do and nothing more. They were empowered for validation and test of the products and to give feedback. The team task insight for end users changed little in time, because the task had been fixed and they had a proactive task (give feedback). At one other SME the momentum became nil because they got bankrupt.

One SME had a higher momentum than the other SME's, caused by a higher commitment. This high commitment in its term was caused partly by the fact that he could do good business (also in the future) with the initiator. Another factor was his interest in the topic of the output of the project (project description). Although the initiator indicated that none of the SME's was involved (commitment) much. Strategic momentum for end users (SME's) changed little in time, because the task had been fixed and they had a proactive task (give feedback).

The partners where during the project a high momentum emerged and sustained (French, Dutch and Belgium partners) continued doing business with the initiator of the project after the project. They are placed on the internet site of the initiator as a member of the associate network.
Figure 4.5. Visualisation of the creation and development of strategic momentum in time
The figure is mainly focused on the magnitude of strategic momentum

Explanation of the illustration
The illustration is an estimation of strategic momentum by the researcher, on the basis of empowerment, collective commitment, and team task insight. The thick line entirely above in the illustration is an estimation of strategic momentum at group level. This is not on equal scale. It is also not the sum of the unit strategic momentums. But, as said earlier, the estimation of strategic momentum by the researcher. It gives the actual strategic momentum.

Unit strategic momentum:
(1) Initiator (UK)
(2) partner (Dutch)
(3) partner (French)
(4) partner (administrator; UK) and SME (Belgium)
(5) SME
(6) SME
(7) partner (Polish)
(8) partner (main contractor; Spanish)

Unit strategic momentum: 

Collective strategic momentum: 

Momentum effect

There were several momentum effects in the project. A momentum effect is a manifestation of a momentum. The momentum effects in the Print project were:

- An end user experienced a bad cooperation between them and a Dutch partner. The end user in fact had to get tasks/indications from the Dutch partner, but this did not run. Also, the End user passed information concerning a collaborative platform to the coordinating organisation and the Spanish organisation. They did not come back on this information. They used it for their own commercial advantage, and did not come into business with the End user. As a consequence, both critical incidents had a negative effect on the collective commitment of the end user ("So it was not a real partnership in that aspect"). The collective commitment of the end user increased again when she improved her contact with the initiator of the project.

- There was not enough money to pay for the travelling costs. As a consequence, there were less ftf-meetings than expected. The team intervened by using other media (telephone conferences, e-mail) than ftf meetings.

- A member of the commission (from EU, Brussels) did not like the coordinator; there was no chemistry between the two persons. As a consequence, the coordinator had a hard time when she met the member of the commission in meetings. She could not defend herself, because this could have had consequences for the budget, since the commission had the power to decrease the budget. The team intervened, by inviting the assistant of the coordinator to attend these meetings. As a result, there were no negative disturbances between the commission and the team anymore.

4.4.3. Commentary

The project became a success, because for the initiator of the project, the 'champion' in the team, the project result was so important that they 'dragged' everyone with them to fulfil the tasks in time. There was a clear and good prepared project proposal, in which every partner had his place and knew what to do. The initiator also checked this at the different ftf meetings in the beginning of the project. There were more ftf meetings in the beginning of the project, and then every six months. Although the project was a success, strategic momentum was only high at the core partners (on UK Partner, a French and a Dutch partner). On the basis of the dominant role of the initiator, collective commitment decreased at most of the other partners, also decreasing their strategic momentum. Because after a while, the initiator of the project ‘just got on with the project together with the French partner and just ignored everyone else. Yes we informed them what we were doing of course, but after the Dutch partner finished their WP they were no longer involved much. And the French partner and ourselves were the only ones who worked with the Poles. It was easier this way...we knew what we were doing and decided just to get on with it. Everyone was satisfied with the results. We even did the only deliverable for the Spanish partner as they were incapable’.

Because there was not a clear leader in the virtual team, or the leader did not fill in his role properly, at some critical incidents the team intervened (RO/and I question if it were not the ones with the great momentum). Critical incidents, in which the project board intervened were rare, and did not have a clear overweight concerning one of the domains of the TPC.

Strategic momentum would have been distributed more equally over the partners of the virtual team, when more attention had been given to motivating and coaching them, instead of taking their activities out of their hands when things went not well the first time.
4.5. Berlin case

4.5.1. Project structure
Nine European organisations joined the project. Two from Switzerland (two companies), four from Spain (one university, three companies), one from Finland (a company), and two from the Netherlands (one university and one company). About eighty people participated in the project. The project was divided into three workpackages, which were phased over time. One requirements analyses and specification phase, one design and implementation phase, and in the end the validation and demonstration phase. Each workpackage had a workpackage leader. This was a more experienced team member; they also had their experience with the previous project (The Berlin project was a follow-up project). There were also four tasks, with a task leader of each task. These tasks run through the whole project like a continuous threat.

Project management structure
The ‘top manager’ of the Berlin project was the project co-ordinator (or project manager). Together with the three workpackage leaders and the four task leaders, he formed the Project Management Team (PMT). The project co-ordinator managed the three workpackage leaders. The three workpackage leaders managed on their turns the four task leaders. This was (almost) not done in parallel, but sequential (This is the A in figure 4.5); when the first workpackage was (almost) finished, the second workpackage leader took over the management responsibilities. Each task leader managed their task team throughout the whole project. There was also a Project coordination committee. Their tasks were project monitoring and conflict management. They only came together on demand. During the whole project this committee did not come together, because the project management team could monitor the project and there were no conflicts. The whole management structure is illustrated by one of the informants, who said ‘what it does for me is that it is a federation with no real hierarchy, and actually it is only a loose collaboration’.
There were different kinds of communication levels in the Berlin project:

**Communication structure**
There were different kinds of communication levels in the Berlin project:

**Project Management Team level**
The meetings for the Project Management Team were attended by the project co-ordinator (or project manager), the three workpackage leaders and the four task leaders. Every two months there was a formal face-to-face (ftf)-meeting; when there was too less progression, an extra ‘informal’ ftf-meeting was planned. The formal ftf-meeting lasted for two days. A half-day was meant for the Project Management Team; the other one and a half day was meant for the consortium. Concerning the communication structure there was direct two-way communication possible between the project co-ordinator, the workpackage leaders and the task leaders during these ftf-meetings.

There was also informal communication – much by telephone; lesser by e-mail - between the project co-ordinator and the workpackage leaders or task leaders.

**Consortium level**
Every two months there was a formal ftf-meeting; when there was too less progression, an extra ‘informal’ ftf-meeting was planned. The formal ftf-meeting lasted for two days. First one and a half day workshops, and then a half day project management meeting.

All team members could participate in the workshop part. Task leaders communicated with each other. But most team members only communicated with members of their own task.
team. Other team members collaborated in several task teams, so they could communicate with members from different task teams. So, it was also possible that during these ftf-meetings short meetings on task level were held, where two task teams met.

There were two special ftf-meetings in the project, one after six months and one after eighteen months, which lasted for one whole week. During this week the team members lived and worked together. There were also workshops. Mostly about fifty people took part in this week.

All informants think an ftf-meeting is more efficient than other media types concerning content and technical discussions. As one informant said ‘The most important thing on workshops were the content discussions. Often, these discussions were very passionate. This does not work with other media. The discussion can be continued afterwards via e-mail. But just making ones point of view clear to the others and discuss about it goes much easier in an ftf-context’.

Workpackage level
Sometimes, between the consortium meetings special ftf-meetings, or teleconference meetings, on workpackage level (but in practice only for one or two (interdependent) tasks) were organised. At these meetings task team members, task team leader(s), and workpackage leader (the one who was ‘on the lead’ by then) participated.

Task level
Sometimes during the two monthly consortium meetings, on task level, small meetings took place for deliberation. This were ftf-meetings, in which task team members and the task team leader participated.

Task team members could also communicate with each other, or with their task leader, using other communication tools than ftf-meetings. It could also happen that team members from two tasks communicated with each other, because their tasks were interdependent. They communicated via e-mail, telephone (conferences), and a shared repository. In this shared repository, which was most important for the technical work (for one task or between two tasks), one could find all project data (reports of gatherings, all presentations, and software under development with the last version). E-mail was the most important tool for the communication. Telephone conferences were not used much.

Sometimes, there was communication between a team member and a workpackage leader or the project co-ordinator. The communication bottom-up became less dense. This communication was almost only during ftf-meetings.

4.5.2. Within-case analysis: The emergence and sustenance of strategic momentum

Emergence of strategic momentum

Preface
The Berlin project was a follow-up project. The project leader, who was project leader for both projects, presented the idea for the Berlin project several times on ftf-meetings in this previous project. All the partners with the exception of one joined the Berlin project. On the basis of this intervention of the project leader in the cultural domain, collective commitment developed, and the alpha came close to 1.
As the members knew each other beforehand, and knew what they could and could not expect from each other, there was also trust in the team. According to one informant ‘the level of trust was quite good. Of course you going to more trust in some persons than others. Average I think it was quite well’. So, trust can have a positive influence on the collective commitment and therefore on the alpha.

When the partners accepted the idea, the project leader started writing the project outline. For writing this project outline, the project leader asked a contribution from others. Only a few members, who had key positions as workpackage leader in the team and had the expertise, were empowered by the project leader for participation in the writing process. This intervention of the project leader had consequences in the cultural, political, and technical domain. By asking only a few members to participate in the writing process, collective commitment (cultural domain) increased only for this group, which formed a big part of the Project Management Team. Team task insight (technical domain) also increased in this group, as their empowerment (political domain). In this phase of the project, the alpha came close to 1, but only for this selective group. Also, as a result of the increasing team task insight, their beta came close to 1. So, participation can have a positive influence on empowerment and collective commitment. Writing and discussing the project description can have a positive influence on team task insight.

The contribution of this group did not only consist of content information, but also in which workpackage and in which task(s) a partner wanted to contribute. Partners chose for a task(s), that was/were the most profitable for them, increasing also their collective commitment.

Partners had different motivations to participate in the project, although they can be divided in extrinsic and intrinsic motivations. By participating in the project, one partner (Dutch; university) could acquire funding for research (extrinsic motivation). Other partners participated in the project to see and hear what happened. They did not have a clear contribution to the project, and therefore their collective commitment and their momentum was low (extrinsic motivation). Most partners were intrinsically motivated for participating in the project. Firstly, because they were interested in the content of the project. Secondly, as one informant added, because they could work together with industry and in this way could validate their research (Dutch; university). This intrinsic motivation stimulated the development of collective commitment, bringing the alpha close to 1. Extrinsic motivation does not have to lead automatically to a higher collective commitment. This (intrinsic) motivation can also lead to a spontaneous emergence of momentum.

At the pre-start of the Berlin project, especially a big part of the Project Management Team already had a normal momentum, and in the right direction.

Start

The project started with a semi kick-off meeting. The aim of the kick-off meeting was to refresh the memories of the partners concerning the project and to make agreements. Refreshing the memories of the partners concerning the project was necessary because there was a long time interval between discussing and writing the project proposal, and the start of the Berlin project. And because, although it were the same partners, some old members left the team and some new members came. Eventually the team consisted of a total of eighty team members. Making agreements was necessary because otherwise partners continued with their development activities for the previous project; sustaining the momentum from the previous project (momentum effect). By making new agreements for new objectives, a new momentum could emerge. So, the agreements during the kick-off meeting also aimed to change the direction of the momentum from the previous project. Agreements were made
Chapter 4 Case studies

concerning the first three months of the project. Therefore the task teams made a detailed plan, in which topics like who does what?, when is it finished?, and how will the results be delivered?, were enclosed.

Interventions during this kick-off meeting in the cultural domain, by letting the team members participate in the discussions concerning the tasks, increased the collective commitment. Also, by letting team members participate in the discussions concerning the tasks, the empowerment increased.

So, in this phase the alpha came close to 1 for the whole project team. Another outcome of these discussions, i.e. participative decision making, was technical adjustment. Team task insight, which was actually very low at the beginning of the project for most team members increased also during this kick-off meeting (and some follow-up meetings), so the beta came close to 1. Also, because on the basis of the agreements the direction of momentum of the previous project was changed into a new and ‘right’ direction.

So, a kick-off meeting can have a positive influence on team task insight. Participation can have a positive influence on collective commitment and empowerment. Participative decision making can also lead to technical adjustment.

In the beginning of the project the project leader also tried to get clear what team members could contribute, starting with their capabilities. The main reason for this behaviour was that the project leader did not have much power resources to force people doing things. On the basis of this intervention of the project leader in the cultural domain, collective commitment increased, and the alpha came close to 1.

Although the professional background of the team members was almost the same, small differences could lead to big problems. The same terminology was interpreted in a different way by different scientific fields, what could lead to ‘a Babel of tongues’. To prevent this problem, at the beginning of the project a scientific article was distributed under the team members in which the terminology, with only one interpretation, was written down. This terminology, and interpretation, was adopted as the standard in the project. With this intervention in the technical domain, there was a good basis for the technical discussions, eventually leading to conversion concerning team task insight, and a beta that was close to 1 during the project. I.e. the activities were all in the (right) direction of the formulated goals of the project. So, a (slight) difference in professional background can have a negative influence on team task insight, and therefore on the direction of the momentum, i.e. the beta.

The management style of the project leader was empowering (political domain) the work package leaders and task leaders as much as possible, by trusting them and giving them much freedom (autonomy) and responsibilities. This also had a positive influence on the alpha.

In the beginning of the project, much attention was spent on the development of the magnitude and right direction of strategic momentum, especially by the project leader. Collective commitment was developed by a kick-off meeting, participation of team members in the discussions concerning their tasks, and letting team members contribute to tasks on the basis of their capabilities and intrinsic motivation. Empowerment was developed by the participation of team members in the discussions concerning their tasks. In this way, alpha came close to 1 at the beginning of the project.

Team task insight, which was actually very low at the beginning of the project for most team members increased also during this kick-off meeting and some follow-up meetings. Although the professional background of the team members was almost the same, slight difference could lead to a ‘Babel of tongues’, eventually leading to a beta < 1, or even a negative beta. By presenting a scientific article with ‘standard definitions’ of terminology, this problem was decreased. On the basis of all these interventions, team task insight could increase in to the right direction, or a beta close to 1.
Chapter 4 Case studies

Sustenance of strategic momentum

Team task insight
Team task insight was unequally distributed over the partners. For some it lasted a long time before team task insight grew. Other partners could work on a task, which was the same as in the previous project. As one informant said ‘And in the previous project we realised what was the cause of the new things we need to develop to enforce the previous development. So it was quite clear at the beginning what was the main issue to carry out in the project. To enstrenthen the previous development’. So (team) task insight was great here.

One informant said that the partner he represented formulated a research question at the beginning of the project. So it was unknown beforehand what came out of the research, and task insight was low. This increased during the project, with advancing insight and also because the task was co-ordinated with other tasks in the project.

So, some partners had a beta that was close to 1 from the beginning, i.e. the activities were all in the (right) direction of the formulated goals of the project, whereas at other partners it took some time before the beta came close to 1.

For the technical knowledge sharing, but also for discussions on technical adjustments, in the virtual project team, where technical knowledge sharing can have a positive influence on team task insight, several media types were used, like face-to-face (ftf) contacts, e-mail, telephone (conferences), and a shared repository. In this shared repository, which was most important for the technical work, one could find all project data (reports of gatherings, all presentations, and software under development with the last version). E-mail was the most important tool for the communication. Telephone conferences were not used much. All informants think an ftf-meeting is more efficient than other media types concerning content and technical discussions. As one informant said ‘The most important thing on workshops was the content discussions. Often, these discussions were very passionate. This does not work with other media. The discussion can be continued afterwards via e-mail. But just making ones point of view clear to the others and discuss about it goes much easier in an ftf-context’. So, different media types can have a different influence on team task insight and technical adjustment. Ftf-meetings have the greatest (positive) influence on team task insight and technical adjustment, followed by a shared repository, and then e-mail.

The cultural background of the team members was different. Especially the Fins were reserved, which sometimes had a negative impact on technical knowledge sharing, and probably on the team task insight.

Team task insight was high at some partners at the start of the project, and low at other partners. After a while also the team task insight of the partners who first had a low team task insight became higher.

Empowerment
The management style of the project leader was empowering the work package leaders and task leaders as much as possible, by trusting them and giving them much freedom and responsibilities. On the other hand he expected much from them. He only interfered when he saw no progress in the project, or when conflict situations occurred. He was very keen on the project structure. Because he preferred not working in a virtual setting with such a project, although this was unavoidable, he organised many ftf-meetings. On the basis of this empowerment the alpha could become close to 1.

Team members were empowered to use for their communication several media types, like face-to-face (ftf) contacts, e-mail, telephone (conferences), and a shared repository.
The management style was more facilitative, and the virtual project team could choose between several communication media to communicate, which had a positive effect on the empowerment of the virtual project team.

**Collective commitment**

There was collective commitment in the virtual project team. One informant said that each partner committed on the work they had to do in the project. This informant also said there was collective commitment, because the team climate was good. ‘Because inside the consortium there were very good relationships, very good way of dealing with things. That was very beneficial for the project. Because if you are happy with that team, your contribution could be better. You can contribute better in the project. And to be more collaborative with the other partners’.

According to another informant this collective commitment was weak, because most of the collaboration was within the companies, and not between companies and/or universities. But one can argue if, because of the fact that the objectives were reached, there was at least an average or even high collective commitment. Also because partners used more resources to reach the deadlines. And there was co-ordination of activities at the ftf-meetings, although there was less collaboration between the partners. Another factor that had a positive influence on collective commitment was the organised social activities.

The collective commitment was unequally distributed over the partners in the team, differing the α for different partners. According to one informant companies were mostly more committed than universities. Companies take part in such projects because it fits in the internal strategy and objectives. Universities take part in such projects to get funding for PhD candidate-positions. They were more concentrated on internal aims, like publications, than on project deliverables. Other partners participated in the project to see and hear what happened. They did not have a clear contribution to the project, and therefore their collective commitment (and their momentum) was low. Most partners were committed for participating in the project.

According to one informant there was team cohesion, because when team members met each other in another context, they immediately joined together. Although this also depends on culture and background. This was also the perception of another informant. He/she added that in the follow-up project of the Berlin project, the team cohesion, as the collective commitment, was much lower. According to him/her the major reason for this was that after the follow-up project terminated, there would not be another follow-up. So people were less willing to invest in relationships.

Although there was team cohesion, according to one informant the collaboration between the different companies in the Berlin project was low. Partners followed their own agenda. Some partners had to connect their contribution in the Berlin project to internal projects, which steered their goals in the Berlin project (organisational factor; momentum of the project in the organisation had its influence on the momentum in the project). Another informant thinks that the team cohesion was high within the task teams, but lower in the consortium as a whole. So, we can conclude there is at least some correlation between team cohesion and collective commitment.

According to one informant the team cohesion and collective commitment was greater in the EU framework programs than in these European projects.

**During the project, there was an average or even high collective commitment, although the collective commitment was unequally distributed over the partners.**

Now, we will pay special attention to ftf meetings that can be seen as a platform for several other interventions, aiming to sustain strategic momentum.
Ftf-Meetings and sustenance of momentum

Inside the project there were different statements. There was the consortium meeting, the task meeting, where each company had a representative of his company in the development of each task. And the project coordinator, all the work package leaders and task leaders are in a group called PMT (Project Management Team). This PMT dealt with all the matters and all the problems in the life of the project.

Every two months there was a formal ftf-meeting; when there was too less progression, an extra ‘informal’ ftf-meeting was planned. The formal ftf-meeting lasted for two days. First one and a half day workshops, and then a half day project management meeting. All informants said that these workshops were necessary for sustaining the momentum. According to one of these informants ‘people worked to reach the deadline (which was at the ftf-meeting) in time, because they could show things there’. Another informant said ‘It depends on the moment in the project, because it is not constant. You work on this project depending on the deadlines. If you have a deadline at the project, you will do a lot of effort to reach that deadline. Leaving the rest of the projects a bit outside’. The third informant added ‘it is just technical work. It must be integrated and tested and then it is not good when the participants are distributed (…) The specialists are available and can help each other a hundred times faster than when distributed (…) From time-to-time you must put those people physically together, that has a positive impact (momentum)’.

This effect, where resources are not spread equally over the whole project time, i.e. the momentum differs over the project time, is already called the momentum roller coaster effect.

Concerning the workshops these meetings were meant for tuning in within and between tasks, and planning. For tuning in, during these meetings workshops were held in which partners presented their progression. Then intensive and passionate discussions took place concerning the content. Sometimes, on task level, small meetings took place for deliberation. The discussions had a positive influence on collective commitment and empowerment. The discussions also led to technical adjustment.

Beside the official program, there was also room for social activities. Every organiser of a meeting (somewhere in Europe) organised an activity. Mostly this was a diner, but visiting a museum etceteras also belonged to the possibilities. According to one informant these social aspects lead to good relationships in the team, although there was ‘group forming’ on company or task level. However, according to one informant this did not bring people more together, because ‘a big part of the team knew each other already from the previous project, so you already knew on whom you could count’. This intervention in the cultural domain had a positive influence on the team cohesion and collective commitment, and therefore a positive influence on the alpha.

Concerning the project management meeting, the main topic was the progression of the project. Beside the project leader, work package leaders and task leaders were members of this group. According to one informant these ftf-meetings were necessary, because otherwise there would have been more divergence in the project. So, the project management meetings were necessary for the technical domain, i.e. for increasing the team task insight, so the beta remained 1 during the project.

There were two special ftf-meetings in the project, one after six months and one after eighteen months, which lasted for one whole week. During this week the team members lived and worked together, which had a positive influence on the relationships. The team cohesion became higher, and had a positive influence on the cultural domain and the collective commitment. The collective commitment was also increased by the social activities during this week. On the basis of this higher collective commitment and the fact, that people could only deploy activities for the project, the alpha during these weeks became higher than 1, leading to a higher momentum.
There were also workshops during these weeks, having a positive influence on team task insight (technical domain), on the basis of technical knowledge sharing and feedback. In this way, the beta remained close to 1.

Interferences and sustenance of momentum
There were also some critical incidents in the project, threatening the alpha or beta. A partner (university) was not able to find another partner (a company) in their country to join the project. While this was a requirement from the funding office in their country, they did not get resources, and their momentum became nil after nine months.

Management intervened in the technical domain and the cultural domain. They wrote a change request for the international project organisation, in which they pointed the consequences for the plan and the results. As a consequence of these new agreements, the collective commitment and the relative momentum of the project remained normal (although resources were withdrawn from the project, decreasing the absolute momentum; but now this was based on agreements with the project management and the international project organisation). So, by writing a new project description (or change request), the collective commitment and the relative momentum of the project remained normal. As were the activities carried out in the right direction.

In the middle of the project there were some frictions with one partner. The development goal could not be achieved within the time frame of the project. So the representative of this partner tried to push the original development goal through the consortium. Here, the team (and not the project management!) intervened in the technical domain, which is a momentum effect. By giving the representative of this partner arguments why the original development goal could not be reached, his task insight increased. With these arguments he could convince the company. This intervention could also have effect in the cultural domain, because the commitment of the partner remained normal, and also the collective commitment, as the alpha.

When the project was conducted for about one year and four months, a partner had a reorganisation for some time. Meanwhile, their contribution to the project was very low. People were put on other places in the organisation, or even left the organisation. On the basis of the political intervention (i.e. resources withdrawn intern from the project) by the management of the partner, the alpha < 1, decreasing their momentum. But there were always some people who were involved in the project, although they almost never came to the ftf-meetings. Other partners in their country partly took over the tasks of this partner (task reallocation), who had an alpha > 1. On the basis of this momentum effect, the momentum for the whole project remained normal.

Five or six months before the end of the project it became clear that the first two work packages did not reach in time to demonstrate to the developers on the software and other fields. This lead to problems in the third work package. The partners put more resources into the development, so the deadline was reached before the end of the project.

According to one informant, after some consortium meetings there were some doubts whether the project would end in time with some good results. But at the end of the project more resources were put into the project, so the objectives could be reached. So, to the end of the project the momentum became greater than normal, because more resources were put into the project. (Here, it is not clear if the extra amount of resources put into the project was the result of agreements with the project management. So, it is not clear if the relative momentum stayed normal; at least the absolute momentum increased).

When the project was conducted for about one year and six months, the collective commitment of another partner decreased, because they expected to collect some case studies from the project, although it was not written down in the project proposal. They could not give exact criteria for the case studies, so other partners did not know which information they should deliver. To break through this chicken-or-egg situation, they found a member of a partner on a workshop with a suitable case. This contact ended up with a usable case study,
increasing the collective commitment. This expectation was a threat for strategic momentum, but it solved itself in the end.

In some parts of the project, the objectives changed during the project process, because during the project some partners realised that some questions in the global development were more important than as was defined in the beginning. An important reason for this was the increase of team task insight, because during the life of the project each partner was also involved in other projects, in other technologies. Is already learning in other matters, and all these new insights could change some objectives of the project. These changes had their consequence for the direction of the momentum in some parts of the project, and so for the beta. On the other hand, one can argue to what extent these changes fit into the tolerance interval of the project objectives.

**Actual strategic momentum**

![Graph showing strategic momentum over time](image)

Figure 4.7. Visualisation of the creation and development of strategic momentum in time
The figure is mainly focused on the magnitude of strategic momentum

**Explanation of the illustration**
The illustration is an estimation of strategic momentum by the researcher, on the basis of empowerment, collective commitment, and team task insight. The thick line entirely above in the illustration is an estimation of strategic momentum at group level. This is not on equal scale. It is also not the sum of the unit strategic momentums. But, as said earlier, the estimation of strategic momentum by the researcher. It gives the actual strategic momentum.

Unit strategic momentum:
(1) University
(2) Company

Momentum PMT: _______

Unit strategic momentum: 

Collective strategic momentum: 

**Momentum effect**
There were several momentum effects in the project. A momentum effect is a manifestation of a momentum. The momentum effects in the Berlin project were:
- The aim of the kick-off meeting was to refresh the memories of the partners concerning the project and to make agreements. To make agreements was necessary because
otherwise partners continued with their development activities for the previous project (sustaining momentum from the previous project; momentum effect)

- In the middle of the project there were some frictions with one partner. The development goal could not be achieved within the time frame of the project. So a representative of this partner tried to push the original development goal through the consortium. The other partners intervened by giving the representative of these partner arguments why the original development goal could not be reached, to convince the company (change in objective; pressure from within the partner; organisational factor) (momentum effect).

- A partner had a reorganisation for some time, and meanwhile their contribution to the project was very small. People were put on other places in the organisation, or even left the organisation. (small empowerment: resources withdrawn intern from the project; organisational factor). But there were always some people who were involved in the project, although they almost never came to the ftf-meetings. Because this partner had internal problems, the tasks were partly taken over (task reallocation) by the other partners from their country (great momentum). So, in the end the total contribution from the partners in this country was reasonable (momentum effect).

- After the Berlin project, there was another follow-up project, in which most of the partners from the Berlin project joined (momentum effect).

4.5.3. Commentary
The process of the Berlin project was conducted well, because from the beginning much attention was spend on the development of the magnitude and right direction of strategic momentum, especially by the project leader. In this way, it was more an action approach than a plan approach concerning the project. There was enough momentum in the project, as can be seen at the many momentum effects, and the very less interventions from the project management to keep the momentum alive (i.e. sustained). So, for sustaining the momentum during the project, the project management did not have to use many TPC-interventions. If there were (project management) interventions for sustaining strategic momentum, these were mostly technical. This means that most of the interventions tried to influence the team task insight of the partners in the project.
Striking in this project is the great number of face-to-face meetings, because the team leader was not very fond of working virtually in this kind of teams. This great number certainly also had a positive effect on the sustenance of strategic momentum.

4.6. Paris case

4.6.1. Project structure
Eight European organisations joined the project, from four different countries: Belgium, France, The Netherlands, and Portugal. About eighty people participated in the project. The project was divided in three work packages, which were phased over time. Each work package had a work package leader. There were also tasks, on which sub teams were active.

Project management structure
There was an informal project management team, which met on an ad-hoc basis, and consisted of several big (industrial) partners in the project. The ‘top manager’ of the Paris project was the project co-ordinator or manager. The project manager had to be responsible for the organisational co-ordination within the project and for contact with Eureka. When this project manager went away, the original project leader role was divided into two separate roles. The role of the project leader was predominantly monitoring the progress in the project. Another role was coordinating the half-year cycle of reporting. A third role was the contact with the national funding organizations. It was not the role of the project leader to intervene in
any way in the operational process, or the collaboration style of the sub teams. The work package leaders had the technical-content overview.

The project was divided into three work packages. Each work package had a work package leader. Work package leaders were responsible for organising and managing the work within the individual work packages. They extracted information concerning the results from the team members in their work package, and used this for the frequent reports. Every work package consisted of four task teams. Every task had its own task leader, who was responsible for technical-content of the work within the task.

*Project management (informal)*

![Management structure of the Paris project](image)

Task teams. Every task team had a task team leader

*Communication structure*

There were different kinds of communication levels in the Paris project:

*Project Management Team level*

The project management team level was an informal level in the project, consisting of the big (industrial) partners in the project. Their meetings were held on an ad-hoc basis. A teleconference was held when a topic could not wait until the next ftf-meeting for discussion, especially financial aspects. Other communication resources used were e-mail (and the ftf-meetings, actually on consortium level twice a year). The project management level did not take decisions on their own, but prepared proposals for the whole project team. The team was aimed on consensus.

*Consortium level*

There were progress meetings twice a year (according to another informant three or four times a year), mostly lasting for two days. In the progress meetings, one, maybe two persons of each partner participated. This level used ftf-meetings and teleconferences as communication resources. The people, who took part in these ftf-meetings, were technical specialists. They told what they had done since the last meeting, what the problems were, how they solved them, and
how they saw the progression of the objectives. There were no workshops or parallel sessions. There were only plenary sessions. On the basis of the fact that every topic got only a small amount of attention, off-line appointments were made between partners who wanted to discuss further concerning a topic. Dependent on the representatives of the different partners on the consortium level, task team members of different tasks could communicate with each other. Once a year there was an ftf review meeting.

**Work package level**
Only one or two ftf-meetings on work package level were held, because it worked out that this was hard to organise. According to one informant it was probably difficult for (some) team members to travel more than twice a year for a meeting.

**Task level**
Mostly two or three partners worked in a task team, in which team members from the collaborating partners participated. Some task teams had ftf-meetings on a regular base (mostly collaboration between an industrial partner and an institute), others met on an ad-hoc basis (mostly between two industrial partners). For example according to one informant, in one task (collaboration between an industrial partner and an institute), there were two ftf-meetings with the collaboration partners a year. There was also a frequent contact by telephone, if they had questions or things to change. E-mail was used also. An informant said ‘E-mail is a very good tool that help us to save a lot of time and get the lowest to prepare efficiently of the real meetings we have had together’.
Communication resources used on this level were ftf-meetings, telephone, and e-mail.

Communication in the team was according to the hierarchy.

**4.6.2. Within-case analysis: The emergence and sustenance of strategic momentum**

*Emergence of strategic momentum*

*Preface*
The Paris project was a follow-up project, so it was possible to build up some momentum in the previous project already. Also, because from a general point of view the aims were the same as in the Paris project. And this is exactly what the team did; some partners on a meeting in the previous project proposed several topics for a new project, including possibilities for collaboration. The total number of topics turned out to be too much for one project and the scope was narrowed. When on a meeting one week later a smaller group of partners had thought over their own project, a new project team could be formed. In the Paris project team most of the partners from the previous project participated. These were industrial partners. They descended new partners, at least academic partners, from a network of potential partners. So, most partners knew each other directly or indirectly beforehand, and this ‘partner selection’ can have a positive influence on collective commitment.

Then a project proposal was written, for which all partners wrote some text. The project leader and work package leaders played an important role in completing the contributions to a full proposal. With an intervention in the cultural domain – by letting the partners write some text for the proposal – collective commitment was encouraged. The partners were also empowered for writing their contribution. In this phase of the project, the alpha came close to 1. So, participation can have a positive influence on empowerment and collective commitment. A small group – the project leader and the work package leaders – completed the contributions to a full proposal, and by doing this the (team) task insight of this particular
group increased, increasing the beta. So, the project description can have a positive influence on (team) task insight.

After the first proposal was send back by Eureka, the proposal was improved. Approved by the other partners, it was submitted again at the Eureka board and finally approved. Then the partners could start achieving their national funding for the project.

There were some concrete objectives, but according to one informant ‘it is something else than developing a product together. It is a patchwork of some topics with which you can continue almost endlessly’.

Most team members were intrinsically motivated for the Paris project. One informant was curious about what other organisations did in the field. Another informant was very interested in the test topic. For another informant it was a ‘dream’ to organise such kind of collaboration. The fourth informant said the motivation was the ‘benefits to belong to such kind of consortium and the project is of course to be able to first want some collaboration with partners’.

Also the partners were mostly intrinsically motivated, because they were already busy in the field of test and debugging in their organisation. Now they could exchange information in this field with other partners. There was also an external motivator for the partners for taking part in the project: they got funding for their participation. To receive this funding, they had to prove that they had indeed executed the things for which they received their funding. This intrinsic motivation stimulated the development of collective commitment, bringing the alpha close to 1. Extrinsic motivation does not have to lead automatically to a greater collective commitment. This (intrinsic) motivation can also lead to a spontaneous emergence of momentum.

At the pre-start of the Paris project, some momentum was build up at the partners who were going to become active in this project. Especially the project leader and the work package leaders already had a normal momentum, and in the right direction.

Start project

The project started with a kick-off meeting. It was not specifically organized as a kick-off meeting, so it was at the same time of the first ftf-meeting, when all partners came together. The duration of this meeting was two days. The first day the meeting started late in the morning or in the afternoon, with lectures. In the evening there was a diner, the social aspect, and the next day till the afternoon. The lectures as a form of technical knowledge sharing increased team task insight, increasing the beta, so one could operate into the right direction. So, technical knowledge sharing and a kick-off meeting have a positive effect on team task insight. The kick-off meeting also had, on the basis of the social activity, a positive influence on the collective commitment, and alpha coming close to 1.

Team members, who did not participate in the Paris project from the beginning, increased their team task insight by several forms of technical knowledge sharing: by reading documentation concerning the project, or talking with other team members about the project. Attending the ftf-meetings further increased their collective commitment.

However, the informants agree that the project started with a kick-off meeting and probably some ftf-meetings before with a smaller group, in which the project management intervened in the cultural and technical domain. I.e. by having social activities to develop the collective commitment and technical knowledge sharing concerning the content of the project, increasing the team task insight. In this way the alpha and beta increased and both came close to 1.

At the start of the project, an ftf kick-off meeting was organised. The activities during this ftf kick-off meeting decreased team task insight (e.g. by knowledge sharing) and collective commitment (e.g. by social activities).
Sustenance of strategic momentum

Team task insight
The team task insight developed during the course of the project. But this team task insight was not equally distributed over the partners from the beginning. As one informant said ‘Most of the partners knew what they had to do, but during the project course one learns more about what others are doing’. So, there were partners who were working in the direction of the project objectives from the beginning, having a beta close to 1. But another informant said ‘There was not really much team task insight at the beginning. Because in fact this is for example the same situation for us than that when I start a new PhD project, in this case I start a new topic for the PhD thesis. (…) Because this is a research project, so there was no clear idea of the results or the way to achieve these results. It developed over time, yes. Of course at the very beginning we knew we had to look at what had been done on the topic’. So, other partners had a beta that came closer to 1 when the project progressed in time.

Technical knowledge sharing played a very important role in the project. The main objective of the Paris project was, according to the project description and Eureka, developing tools concerning test and debugging. For Eureka it was important that deliverables were developed, to be able to measure the output. Developing tools together was not the most important objective for the partners - the main players in Europe concerning test and debugging methods - but learning from each other concerning the underlying methods for these tools. So, technical knowledge sharing to increase (team task) insight played an important role in the project.

Partners were at least busy with developing their own tools on this topic, to be able to share and use information. To overcome the tension between the formal objectives of Eureka and the informal objectives of the Paris project partners, the project description was globally defined. As a consequence it was not necessary to submit a change request every month. That is also why, concerning one informant ‘there is not much going wrong in the project when a partner does not function properly in the team’. As a consequence, the tolerance interval of the project was very broad.

For technical knowledge sharing (and of course communication), and technical adjustment, different media types were used. Beside ftf-meetings, there were many e-mail contacts, telephone contacts, and sometimes a teleconference. Face-to-face meetings were important ‘(…) because sometimes communication is not easy over the phone. For example, when you want to explain/describe a technical thing, it is difficult to exchange by phone. If you want to explain a complex behaviour it is not easy, so you really need that face-to-face contact. I think we couldn't have worked efficiently without seeing us’.

A teleconference was held when a topic could not wait until the next ftf-meeting for discussion, especially financial aspects. The teleconferences were mostly not held with all partners; mostly only with the bigger partners, who had the lead in the project. As one informant said ‘You often start with e-mailing. Dependent on the topic and the urgency you decide that it would be better to talk it over than to e-mail. Teleconferences have the advantage over e-mail that you can react directly on what is said by the other. And you hear the nuances much more. Concerning e-mail; or the e-mail message is too short, so people do not get the message. Or it is too much text and people reply also with a lot of text, which can have as a disadvantage that the opinions diverge instead of converge’. Another informant was more positive about the use of e-mail ‘E-mail is a very good tool that helps us to save a lot of time and get the lowest to prepare efficiently of the real meetings we have had together. I think it is a very efficient and fantastic tool’. Teleconferences were also held concerning technical topics. According to one informant ‘someone could prepare a presentation and send this around beforehand. This can be a Word document or a PowerPoint presentation with some background information and some thesis. This could be discussed in a teleconference’.

113
Chapter 4 Case studies

Most teleconferences were held at the end of the Paris project, when the new project was developed. Technical knowledge sharing has a positive influence on team task insight. And different media types can have a different influence on team task insight. Ftf-meetings have the greatest (positive) influence on team task insight, followed by a teleconference, and then e-mail. The main reason is, that during ftf meetings more social cues can play a role in the interaction process than, for example, communication by e-mail.

Feedback was given during the three ftf progress (according to two other informants, this were two ftf progress meetings each year) meetings, as once-a-year feedback of the reviewers on the reportage. Another informant added that there was also feedback by reading the project report every six months in which all the work from the partners was reported. This feedback can probably have a positive influence on team task insight, increasing the beta.

There were differences in professional background. Although they all were engineers, some had a background, which was focused more on research and test topic, and others on memories. This difference was positive, because there were two different views of the same issue, which led to synergy. In this case, differences in professional background did not lead to communication disturbances, but the differences were fruitful. So, a difference in professional background can have a positive influence on team task insight, increasing the beta.

There were differences in cultural background between the partners. It had its influence on communication, as one informant said ‘We had no cultural problem; in our task team we were all French. I worked also with people from Germany within a former project, and there were some differences. E.g. when a German person doesn't reply to your e-mail, that's when he agrees. When a French person doesn't answer to an e-mail, you don't know if he agrees or not. So this is a bit different’. Actually there were some communication disturbances, on the basis of the differences in cultural background. But one can ask if these differences had any effect on team task insight.

Over all, there were differences in team task insight from the beginning in the Paris project team. There were partners who were working in the direction of the project objectives from the beginning, because they knew what they had to do. Other partners had a low team task insight at the beginning, but this team task insight increased when the project progressed in time.

Empowerment

Most partners, except a Portugal partner who did not get funding during the first year, were much empowered for their own piece of work, as long as this work was done within the tolerance interval of the objectives. Every year there was a review from the funding authority, in which this was verified. One informant said ‘(…) let's say that we had within the definition of our goal and within the definition of our task we were free to address things we consider most important. Let's say that we were free’. According to another informant ‘the autonomy was great, because the connection between the partners was relatively loose’. Another informant also saw autonomy as an attribute of empowerment. The project management style was facilitative, not directive, because the project management had no legitimate power over the partners (except threatening to write things down into the report for the funding office). The objectives of the project fitted within the objectives on which the partners were already working. A reason for this was that the partners did not only get funding from the national authority, but they also invested money into the project by themselves. Because most partners were empowered, the $\alpha$ remained close to 1.
Chapter 4 Case studies

There was participative decision making in the Paris project team. This had a positive influence on (the perception of/ or actual use of the) empowerment.

There were differences in cultural background between the partners. This had its influence on empowerment. In countries were the power distance is greater, for example France, people were not empowered to take decisions in the Paris project. They first had to consult others in their organisation. So, cultural background can have (positive or negative) influence on empowerment, increasing or decreasing the alpha.

*Over all, the empowerment was great, but not equally distributed over the partners or team members. The empowerment of the partner from Portugal was small during the first year of the project, on the basis of the fact that they did not receive funding during the first year. The empowerment of the French representative in the project was small during the project.*

**Collective commitment**

Concerning the whole Paris project team, according to one informant, the first project leader steered more on collective commitment – and collaboration - than his follow-up. As a consequence, the collective commitment in the whole project team decreased after six months, decreasing the alpha. This became obvious in the lesser amount of collaborations in the Paris project team. On the other hand, at least one work package leader tried to increase the collective commitment in the part of the project in which his organisation participated, increasing the alpha. Although there was a decrease of collective commitment after six months concerning the whole Paris project team, the collective commitment on team task level was normal or even great. So, the alpha remained close to 1 or even an alpha >1 on team task level. Concerning the team task level, an informant said ‘And I think people were really...that the project was doing well. And people were really involved’. So, involvement can be seen as an attribute of collective commitment. The informant also points on the collective commitment in her part (task team level) of the project ‘As I said before we were closely working with a French organisation. During meetings we had with them we decided what would be the next plan to address and things like that (…) When we had phone calls or face-to-face meetings we decide which was interesting for us and which was interesting for them, and we tried to make it fit. We summed common points to address. And it was pretty easy to find common issues to address.(…) and when we had global meetings with the global team we took also decisions in this meetings. So there were face-to-face decisions, face-to-face commitment’. The third informant adds ‘One can say that the will to collaborate was good’. This will to cooperate was based on mutual trust, according to an informant ‘The collaboration is, that is I think that if one feels that the other partner delivers interesting work and is willing to talk about it, it is based on mutual trust’. So, trust has a positive influence on collective commitment.

At the end of the project, in some task teams the alpha became greater than 1, because on the basis of the dissemination activities the collective commitment increased. As one informant said ‘(…) in the end we have regularly presented some papers on conferences in collaboration with two partners, so this is also something that has contributed to us in the conference world. In the past we already had a lot papers, but a lot of the papers now are written in collaboration with two partners’.

The team cohesion in the team as a whole was low. A reason for this is that the project was structured in such a way that there were not too many interdependencies between the partners. Under the umbrella of the Paris project there were several loose projects. As an informant said ‘it was a relatively loose collaboration’. According to the same informant ‘by experience I know that when people are together (i.e. collocated team) the collaboration is more intense’. (RO/ According to me, the team cohesion was greater on task team level). So, as the collective commitment and team cohesion was lower on project team level and higher on
team task level, there probably is a positive correlation between team cohesion and collective commitment.

Over all, according to one informant the collective commitment in the whole project was high during the first six months, and then decreased, on the basis of a change of the project leader. On the other hand, the collective commitment in the team tasks was normal to high during the project, according to other informants. A reason for this difference in perception can be that the first informant thought that more partners could have collaborated with each other, but that the project now was structured in such a way that there were not too many interdependencies between the partners. But when partners collaborated with each other, the commitment was high, according to the other informants.

As before, special attention will be paid to ftf meetings as a platform for several other interventions.

Ftf-Meetings and sustenance of momentum

On consortium level, there were two (to four) ftf-meetings each year, at which presentations were held. The people who took part in these ftf-meetings were technical specialists. They told what they had done since the last meeting, what the problems were, how they solved them, and how they saw the progression of the objectives. In these meetings there was exchange of information (technical knowledge sharing) and discussion (feedback). (It is unclear if the outcome of these discussions was technical adjustment). By using ftf-meetings as an intervention in the technical domain, team task insight increased, and the beta remained close to 1. According to one informant ‘it had the highest value that partners were together for these days’.

The meeting lasted mostly for two days. The meeting started late in the morning or in the afternoon. In the evening there was a dinner, and the next day the meeting lasted till the afternoon. It sometimes happened that people stayed half a day longer to visit some place. Concerning the ftf-meetings one informant said ‘If your objective is to learn from each other, then it is necessary to sit physically next to each other, to have this personal interaction’.

A result of these plenary meetings was that one-on-one contacts (via e-mail and ftf-meetings) emerged between an institute who did research and a firm who was interested in it. One informant said ‘And we had meetings and let's say we had the project meetings with only the French university and this was about two times a year. So we had the two meetings plus two other meetings’.

Once a year there was also an ftf review meeting, so there were three formal ftf-meetings per year.

According to one informant, the management could have steered more on collaboration. This was only the case during the two ftf-meetings. When a management topic, it could have lead to more collaboration, and thus to more collective commitment, or a higher alpha.

As a follow-up of these meetings, some partners who worked on a specific objective, and who shared the same interests, had a more intense collaboration (on team task level). For example a small software firm developed a tool, and another partner was interested and wanted to test the tool. They had their own e-mail contact and sometimes ftf-meetings, and a more intensive exchange of knowledge, which lead to more team task insight (and according to one informant ‘more synergy’) in this specific sub team, and the beta remained close to 1. So, there were different levels of communication and technical knowledge sharing in the Paris project.

Because people could meet during ftf-meetings, and could meet each other informally (at the diner and the excursions), collective commitment was sustained, and the alpha remained close to 1.
Interferences and sustenance of momentum

There were also some critical incidents in the project, threatening the alpha or beta. In the beginning of the project, some small partners (development firms) had expectancies, which could not be fulfilled. They thought that one of the outcomes of the project was that they could deliver tools, which would be bought by the bigger partners. This was not the case. First this led to conflicts, because the bigger partners could not meet their expectancies. This led to a decrease of their collective commitment, and thus the alpha. But very soon they readjusted their expectancies, which increased their momentum. There was no project management intervention.

One (academic) partner had difficulties concerning the collaboration with another (industrial) partner. The goal was to share experience. A task was defined in the beginning of the project, but this task has never been reached jointly with the partner. Eventually, the academic partner reached the task, but by the work in their own lab. The problem was solved in the political domain by task reallocation.

The partners in Portugal joined the project, but their contribution was small in the beginning, on the basis of the fact that it lasted a year before they heard that they would receive funding from the national authority (low momentum, because they got no financial resources (empowerment) from the national authority). This had no effect on the project, because they had to test methods developed by other firms, what was minimal during the first year (no impact on the total momentum of the project). There was no specific project management intervention. From the beginning the project management intervened in the technical domain by structuring the project in such a way that there were not too many interdependencies. The Portuguese partners, who received funding when the project already went into its second year, received funding for the first of three years (as was the duration of the project). When the project ended, they still received funding for a third year, so they still had the obligation to report for this third year. This was of course not synchronized with the project.

When the project was conducted for a half year, one of the partners was split up in two separate firms. One firm stayed in the project; the other not. This had a negative consequence on empowerment and collective commitment, decreasing the alpha. The project management intervened in the technical and political domain. First they looked what the partner who stayed could do. This lead to a second project proposal, which turned out to be only a small update. Most topics continued. According to another informant ‘there were no changes in the objectives of the project’. In this way, the alpha remained close to 1, as the beta. An outcome of this splitting up of one partner was also a change of project leadership. The original project leader was a member of the firm that did not stay in the project. The firm that stayed in the project delivered a new project leader. The management style of the new project leader was a facilitative management style.

The first project leader was more ambitious with the project than the second project leader. He kept the project on a sufficient level, but had no ambition to go beyond that level. According to one informant ‘such a momentum does not sustain on its own. You need someone with enough drive, faith, who steers the momentum. After the first project leader disappeared, the momentum (RO/in the Paris project) crumbled off’. So, on the basis of the change in leadership of the project, the momentum in the whole project decreased after six months.

After eighteen months, one partner readjusted his objectives in the project. The cause was that his commercial aims were changed during the project. Originally they had two blocks of objectives. One block was almost eliminated, and all the efforts (and resources) were focused on the second block. Project management intervened in the cultural, technical and political domain by agreeing their readjustance. So, it had no influence on the momentum. Some partners – according to an informant one out of three - intended at the start of the project to distribute his resources equally over the three work packages. Halftime the project it became clear for one partner that the distribution was 40% for work package one, 40% for work package three, and 10 to 20% for work package two. Some other partners also had an unequal distribution of resources. The momentum of these partners was unequally spread over the project.
Chapter 4 Case studies

Project ending
The project was ended with the last reportage. According to one informant ‘it ended when we...when we had the new project, and we know we had to pursue new goals. At the end of the project we had defined the new project. It not clearly ended, it's not the same name, but clearly the same topic’. So the momentum continued.

Actual strategic momentum

Figure 4.9. Visualisation of the creation and development of strategic momentum in time
The collective strategic momentum decreased some time after the start of the project on the basis of a change in project management.
The figure is mainly focused on the magnitude of strategic momentum.

Explanation of the illustration
The illustration is an estimation of strategic momentum by the researcher, on the basis of empowerment, collective commitment, and team task insight. The thick line entirely above in the illustration is an estimation of strategic momentum at group level. This is not on equal scale. It is also not the sum of the unit strategic momentums. But, as said earlier, the estimation of strategic momentum by the researcher. It gives the actual strategic momentum.

Unit strategic momentum:
(1) Small partners
(2) Portuguese partner
(3) Partners with unequal distribution of resources

Momentum PMT: 

Unit strategic momentum: 

Collective strategic momentum:

Momentum effect
There were several momentum effects in the project. A momentum effect is a manifestation of a momentum. The momentum effects in the Paris project were:
- Two partners launched a new joined lab in France. So, this is an example of how collaboration in such kind of project can be something really more formal and can become long time collaboration.
- At the end of the project, a new project was defined, in which all the project partners were involved from the Paris project.
4.6.3. Commentary
Although it was a good process, with not too much negative critical incidents (and they were not a serious threat to the momentum), it would have been fruitful for the project when management would have steered more on collaboration between the partners. This would have increased the collective commitment and probably the momentum. One of the factors that could have increased collaboration was ftf-meetings. But there were only two or three ftf-meetings on consortium level each year. Although there was momentum in the project, there were not much momentum effects during this project.
The project management did not have to intervene often in the project to sustain the momentum. When they intervened, the interventions were mostly technical and/or political. This means that most of the interventions tried to influence the team task insight and/or empowerment of the partners in the project.

4.7. Lisbon case

4.7.1. Project structure
Twenty European organisations joined the project, from eight different countries: Austria, Finland, France, Germany, Italy, The Netherlands, Norway, and Spain. About hundred and fifty people participated in the project. The project was divided into four work packages. Each work package had a work package leader. This was a more experienced team member; they also had their experience with the former project. There were also thirteen tasks, with a task leader of each task.

The project was finished successfully, within the time-frame (two years). The project outcome consisted mainly of Word and Power point documents. At partners also software tools could be developed, but these were not exchanged, on the basis of the competitive character. One partner said they developed a prototype that was evaluated in different case studies.

Management structure
There was a project board, which consisted of the project leader and the different work package leaders. Their aim was integration of the project results. Also making agreements for the simulation activities. Internal project meetings, where they could look if there was progression in the project, and controlling this progression. The work package leaders were responsible for organising and managing the work within the individual work packages. Each work package consisted of several task teams. Three of the four work package leaders were responsible for three task teams. One work package leader was responsible for four task teams. Every task team had a task team leader, responsible for organising and managing the work within the task.
Chapter 4 Case studies

Project Board level
There was a project board, which consisted of the project leader and the different work package leaders. This project board had six meetings a year; every two months. There was also occasionally (bilateral) e-mail or telephone communication between the members of the project board. Thus, e-mail messages were mostly send between two members of the project board. There were no telephone conferences.

Project level
Every half year there was an ftf project meeting, organised by the project leader. These meetings lasted for three days. The project leader took care that from every partner at least one team member attended this workshop. According to another informant, management tried to involve as much team members as possible at the workshop on meetings to sustain motivation, and therefore also the collective commitment. Beside the project leader and ‘ordinary’ team members, also the work package leaders attended these meetings. So, in theory during these project meetings, every team member could communicate with the other team members.

The project leader sent information to the team members by e-mail, on a regular base. At least these e-mails contained the notes of the project board meetings. So, management also gave information about actualities in the Lisbon project by e-mail. Unfortunately most team members did not read these e-mails, according to one informant.

Work package level
During the three-day workshop (the project meetings, held every half year) all the work package leaders presented what they have done. All team members could participate at these ftf-meetings.

Figure 4.10. Management structure of the Lisbon project
Between two project ftf-meetings, one or two meetings on work package level were organised. Thus, there were four ftf-meetings, one for each work package, at the same time. The task team leaders had the obligation to regularly present the results of the task group during these meetings. So, in these meetings, some amount of time was spent on a specific task.

Team members from one task team could communicate with team members from another task team, but within the same work package, not with team members from another work package. So, at these work package meetings, the work package leader, task team leaders and task team members from that particular work package participated.

There was also e-mail and telephone communication between work package leader and task team leaders, and between task team leader and task team members.

**National level**

Beside the ftf kick-off meeting for the whole team, there were also separate ftf (kick-off) meetings for the partners of the same country. Because most partners already knew each other from the previous project (at least concerning the Germans), not much introduction was necessary. At least one member of each partner in the country participated.

4.7.2. Within-case analysis: The emergence and sustenance of strategic momentum

*Emergence of strategic momentum*

**Preface**

Originally, the initiators of the previous project and the Lisbon project intended to start a project for four years. This was not possible, and the project was split into two parts of two years each. So, the Lisbon project was a follow-up project in which (some of) the momentum could continue from the previous project. The project management already started halfway the previous project with the preparations for the Lisbon project. The project leader intervened in the cultural and political domain, by putting the Lisbon project on the agenda of one of the ftf-meetings for discussion with the other partners. Collective commitment and empowerment emerged, and the alpha could come close to 1. The project leader also intervened in the technical domain, by discussing with the partners the objectives of the Lisbon project. In this way team task insight was created and beta also came close to 1. So, an ftf-meeting has a positive influence on team task insight and collective commitment, and participative decision making has a positive influence on empowerment.

After the partners agreed concerning the objectives of the Lisbon project, other partners were asked to participate in the project. This was to a great extent done by a smaller group of six partners, one from every country that participated in the previous project. Most of these partners were acquaintances, and most of them were already participating in the previous project. This led to trust and collective commitment, because the partners knew what they could expect from each other, increasing the alpha. Some of the partners were chosen by the national authority of a country that was responsible for the funding. Their collective commitment - and their momentum - was (as we will see at the interferences) mostly low. So, partners were not always acquaintances. For the Lisbon project, 16 out of 22 partners from the previous project decided to join the new project. Four new partners, under which partners from two new countries (Italy and Austria), were added to the team.

Then the project management intervened in the technical and political domain by empowering the core team of six partners to write each a part of the project proposal, before the start of the Lisbon project, which was based on a project outline. In this way, team task insight increased for these six partners, and the beta of this core group remained close to 1. Because they were
empowered to contribute to the project proposal, the alpha of this core group also remained close to 1. So, the project proposal (or description) has a positive influence on team task insight. At a follow-up meeting, project management intervened in the technical and cultural domain by discussing the written parts for the proposal. As a result of this discussion – as a form of participative decision making - and feedback, team task insight increased, and the beta remained close to 1. On the basis of the discussions - as a form of participative decision making -, collective commitment increased. So the alpha remained close to 1. In this case, (participative) decision making also led to technical adjustment. So, (participative) decision making and feedback have a positive influence on team task insight. (Participative) decision making has a positive influence on collective commitment. (Participative) decision making can lead to technical adjustment.

In the end, the project leader integrated the parts in the project proposal, and sends it to the Eureka organisation. This organisation agreed the proposal some six months before the start of the Lisbon project. Then the partners could send the proposal to their national funding office, mainly with the request for financial resources. Meanwhile, the momentum for the small group who was involved in the preparations of the Lisbon project decreased for several months, because the activities were focused on the previous project.

One month before the start of the project, on the basis of changes in the partner organisations and developments in the world, a change request was send to Eureka, and agreed. So, this had no consequence for the momentum.

Partners had different motivations to participate in the project, although these can be divided in extrinsic and intrinsic motivations.

Most partners were intrinsically motivated for participating in the project. Firstly because they were interested in the content of the project. Secondly some partners already wanted to do the specific research, but thanks to the Eureka projects they could do this in collaboration with other partners. Some of the partners were also extrinsically motivated, because it was their policy to be involved in funding projects. This intrinsic motivation stimulated the development of collective commitment, bringing the $\alpha$ close to 1. Extrinsic motivation does not have to lead automatically to a greater collective commitment.

The (intrinsic) motivation can also lead to a spontaneous emergence of momentum.

**The Lisbon project was a follow up project, in which (some of) the momentum of the previous project could continue.** Team task insight was (further) decreased by the fact that the six core members could contribute in writing the project proposal. This participative decision making also had a positive influence on collective commitment.

**Start project**

The kick-off meeting was organised when the project was already conducted for two months. Project management intervened in the cultural domain by organising a boat trip to an island one afternoon. In this way the collective commitment could develop, and increase the alpha. Collective commitment also emerged by lunch and diner during the two day kick-off meeting, because people learned to know each other better. To develop the collective commitment, there was also room for introduction during the meeting. Especially, because some new partners joined the project team, and there were changes of team members from the ‘old partners’. So, collective commitment could develop in an artificial way, by organising ‘social’ events, and in a natural way, because people could talk with each other ftf.

The empowerment of the Lisbon team was high from the beginning. In the first place, because the project leader (and the other project managers) did not have legitimate power over the team members. In the second place, because there were enough resources (especially in terms of manpower) in the project. In the third place, because team members were autonomous to work at the tasks at stake at their own insights and responsibility. All was leading to an alpha close to 1.
Chapter 4 Case studies

Although there were changes in the composition of the team, 80% of the team members remained the same. The advantage was that they ‘spoke the same language’ as one informant said, which had a positive influence on team task insight. Project management intervened also in the technical domain by explaining the objectives and the process to the team. With process was meant the art of the deliverances, and how status reports and the project management looked like. After this explanation a big part of the kick-off meeting consisted of distributing the team members over the different work packages and tasks. Then the team members could discuss about the planning, e.g. meetings and deadlines, of the work package and tasks. So, participative decision making has a positive influence on team task insight and on technical adjustment. In this way, by increasing team task insight, the team could work into the direction of the objectives, and the beta could come close to 1. But in this case there were also a lot of discussions going on concerning the requirements and goals in the project description, threatening the collective commitment and the direction of working (so, this is also a critical incident!). One cause was that the proposal was formulated one year to six months before the project started. Meanwhile, things have changed at several partners. Another cause was that the national funding office had the power, which they also used, to make modifications in the project description. Project management intervened in the cultural and technical domain. They discussed the goals and requirements with the partners, and when there was over-all commitment, the goals, i.e. the deliverables, of a partner could be changed. In this way, the collective commitment was developed, and the alpha came close to 1. Team task insight was also developed, on the basis of participative decision making, and the beta also came close to 1. So, participative decision making has a positive influence on team task insight and on technical adjustment. The main outcome of the discussions was that after the kick-off meeting a change request was send to the Eureka organisation. When agreed by Eureka, this was the project description at stake for the whole project. Because small changes were made during the first two or three months of the project, there was some tolerance interval concerning the objectives.

Besides the kick-off meeting for the whole team, there were also separate kick-off meetings for the partners of the same country. Because most partners already knew each other from the previous project (at least concerning the Germans), not much introduction was necessary.

An ift kick-off meeting was organised at the start of the project. By organising social activities, collective commitment decreased. Empowerment was high, because team members had enough autonomy and there were enough resources in the team. Team task insight decreased by discussions concerning the content of the project.

Sustenance of strategic momentum

Team task insight

According to one informant it lasted for about a half year before the task teams had enough (team) task insight developed, that they all worked in the direction of the objectives of the project, and so the beta could come close to 1. First, the members of the work packages had to know each other better, increasing the team cohesion and the collective commitment. Then it became clearer to the team members what had to be approved concerning the topics in the project, and so (team) task insight developed. On the basis of the increased team task insight, plans were made. During the project, several ftf-meetings and workshops were held. Team members who did not participate in ftf-meetings and workshops, according to one informant mostly had a low team task insight; only focused on his/her own tasks and objectives, not on the global objectives of the project. They did not know, or did not want to know, what was going on in the whole project. According to one informant, most team members did not read the e-mails, in which the project management gave information about actualities in the Lisbon project. So, in this case technical knowledge sharing had no influence on team task insight. But this had
no consequence for the beta, because the team members had enough task insight concerning the tasks and objectives they were pursuing in the task teams. So, the beta remained close to 1.

For the technical knowledge sharing, but also for discussions on technical adjustments, several media types were used, such as ftf-meetings, e-mail, and teleconferences. There was also a website, which was not used much in this project, and portals. Ftf-meetings were often held, which was better for a project like this, according to one informant ‘(…) on an innovation project you are building an innovation. So usually when you start, you don’t know what you innovate. I am not sure that a big researcher, when he starts, he knows exactly the planning when he discovers what. So in that case you have no rule to manage that. In that case it is better to work face-to-face, on a white board, than having a conference call’, and ‘During an innovation, or when you are building an innovation, when you are building something new, it is a kind of brainstorm. You confront different ideas. Usually it is a researcher. The researcher is a passionate guy, so they have a passion on their technology, and they want to increase, they want to build on something. So it is a passionate discussion. It is difficult to do that in a conference call’.

E-mail was used very often, but when participants started to discuss, according to one informant ‘it is important to stop and wait for an ftf-meeting, where real discussions can take place. With e-mail, discussions last too long. At one point it is even possible to lose the threat of the discussion’. In this way, e-mail can lead to communication disturbances that have a negative influence on team task insight and technical adjustment or technical knowledge transfer. It is not clear on which of the latter two exactly, because the topic of the discussions was unclear.

Teleconferences were only used at the end of the project. According to one informant, they never lasted longer than one hour, because it was to tiring on the basis of the fact that the partners did not see each other. Another informant added ‘When you start having more than five people on the phone, it is very difficult to manage that. When you have more than five people on the phone it is very difficult just to recognise the voice, recognise the people. So you need to give the speech to everybody. And to speak with everybody. So it is difficult, it is not so easy. Sometimes it is better to have a chat with five or a few people by email, because you see immediately who is speaking, because you have a name. Usually by phone it is very difficult especially when you join a telephone conference, and you are a little too late. So in that case you are completely lost. With three or four it can be done, because your memory is big enough to recognise the voice each time. But when you have eight or nine people it is finished. You have one manager and the manager needs to give the authorisation to speak. It is impossible to take it, because in that case you need to follow some rules. Because in that case you can imagine that when five or six people are speaking together in a conference call you are out, it is just noise. So you need to follow a rule. So these rules are not voluntary’. According to another informant, team members behaved in another way at the telephone than with an ftf contact. ‘Some people behave more dissociated and often also aggressive at the telephone’. So, different media types can have a different influence on team task insight. Ftf-meetings have the greatest (positive) influence on team task insight (and technical adjustment), followed by e-mail and teleconferences. The use of e-mail has a slight advantage on teleconferences. But all media types, when used properly, have a positive influence on team task insight.

Team members had a different cultural background, which according to one informant led to communication problems. E.g. the Fins spoke very bad English, and did only give a minimum of information. Another informant thinks that there were no communication problems, and people learned to see through the cultural differences and got more respect for each other. A third informant thought that cultural differences are an enrichment ‘The different culture is very important, to have new ideas’. So, a difference in cultural background can lead to communication disturbances, in its turn having a negative influence on team task insight. On
the other hand, differences in cultural background can be an enrichment, leading to new ideas, and thus having a positive influence on team task insight.

The tasks consisted of activities which could be done separately by the partners who were involved in a task. The partners send their output to the task leader, who integrated this input from the partners. According to the informant who gave this information ‘When working in virtual teams, it is important to try to divide the labour in such a way, that in the beginning of the project interactions between the partners of a task are reduced to a minimum’. In this way, the task characteristics have an influence on team task insight.

Concerning feedback the second work package got feedback from the people of the first work package. But according to the informant there was not much feedback from other people in the workshops, because ‘it was my feeling that when some people presented, it was more information given, than a presentation to receive feedback, during the workshop’. According to this informant ‘during the activities, during the building of the deliverables, the people were involved and feedback was given’ According to another informant there were discussions in the workshops, and so people got feedback. This feedback on its turn can have a positive influence on team task insight.

Over all, it lasted for about a half year before the (task) team members had enough (team) task insight that they all worked in the direction of the objectives of the Lisbon project. But team task insight was also unequally distributed over the partners in the team. At some partners, who were not very committed to the project, there were changes concerning the members who participated in the project (Also see interferences). Their team task insight was nil when they started somewhere in the project, reducing the sum of team task insight for the partner.

To increase and/or sustain the team task insight, for the transfer of knowledge different media were used. Also feedback was given on several occasions.

Empowerment

The leadership style of the project leader was mainly facilitating. There was a lot of enthusiasm in the team (indicator for momentum). According to the project leader this was necessary, ‘because I had very few power tools to put people on to work’. On the other hand, the project leader had legitimate power (attribute of management style): ‘It has happened several times that on a meeting, what I heard from others, people said ‘the project leader said we must do this and this, so let us do it that way’’. The only power tool the project leader had was threatening that when a partner did not do his part of the work, it would be written down in the status report. These reports were written every half-year, and also send to the national authorities who gave the funding.

The project leader organised a project workshop every half year. He took care that from every partner at least one team member attended this workshop. He also co-ordinated by sending information to the team members, mostly by e-mail. When there was a meeting in the neighbourhood of a partner, the project leader visited the organisation, to familiarise. So, the management style was focused on empowering the team members as much as possible, and thus the alpha remained close to 1.

There was a project structure, with different layers. Every layer had its own responsibilities. First there was the project leader, then the work package leaders, and under them the task leaders. The task leaders had the responsibility to achieve some results, and to present about their achievements. They were empowered for doing this; i.e. they could use the resources at their will. As one informant said ‘Empowerment is in essence that the task leaders had the technical responsibility’. Only when problems occurred, work package leaders or the project leader were asked to intervene. Team members were also empowered for doing things; they were very independent.
According to one informant the empowerment in the team was great, but according to the analyses of the three interviews the empowerment was unequally distributed over the partners in the team. The participants in the Lisbon project did not receive resources (funding) from Eureka, but from their national authorities. They had to justify to the national authority. One of the results of this structure was that different partners received different resources (funding), or stayed in doubt for a long time if they would receive some.

The (national) cultural background of the partners was different. This had in some cases impact on empowerment. E.g. French participants in a meeting were not empowered (in the sense of delegated responsibility; an intangible resource) to make decisions about the topics at stake. Project management intervened in the political domain by phoning the manager of the French participant who was empowered to make decisions. So, a difference in cultural background can have a negative effect on empowerment.

Over all, most team members were empowered in the Lisbon project. But empowerment was not equally distributed over the partners in the project. When one partner did not get financial resources from their national funding office, project management sustained the empowerment by intervening in a creative way (Also see interferences).

Collective commitment
The collective commitment for a lot of team members was high, having a positive influence on sustaining the alpha close to 1. According to one informant, team members were very independent (because they were empowered), did a lot of things on their own without asking for permission, and in this way a lot of results were presented (momentum effect). So, one can argue if the collective commitment even was high, having an alpha\textgreater 1.

But collective commitment was also unequally distributed over the partners in the team. As one informant said ‘Some partners put a lot of effort, very good, maybe they are doing more than they are showing, some other partners are more involved in this project just, lets say, to see and to take money’. Thus, while the commitment of some partners was high, the commitment from team members from some other partners was very low. One of the causes of this problem was that the latter partners were less committed to the project, and team members also participated in other projects inside the partners. As a result, the momentum of these partners was low.

To sustain the commitment (and the motivation), project management intervened in the cultural domain by trying to involve as much team members as possible at the workshop on meetings.

Critique from the project management was that there were too less reviews from the national authorities, but project management had no influence concerning this review process. According to one informant ‘it would have helped the motivation (RO: and the commitment). When people who produce something see, that it is seriously reviewed, and the bad and the good things are mentioned’. When things were delivered, only the project leader gave positive or negative feedback. So, feedback does not only have a positive influence on team task insight, but also on collective commitment.

Concerning team cohesion, one of the informants said ‘That was a result of the labour. People, who worked together often, could get along well together. And because we had national meetings, this contributed to the fact that in the international groups the Germans could also get along well together. And they could represent each other, when one was absent. It helps of course a lot when people meet each other more often, or doing things together’. So, team cohesion has a positive influence on commitment (Here, it is not clear if it also has a positive influence on collective commitment. Team cohesion has a positive influence on commitment in the task teams).
Chapter 4 Case studies

Over all, the collective commitment during the project was unequally distributed over the partners in the team. For most of the team members the collective commitment was great. Some of the partners had a small commitment, as for the team members of these partners. Ftf-meetings and feedback were used to sustain the collective commitment, and the alpha remaining close to 1 (or even >1).

As in the other cases, above we looked at several interventions (and some starting conditions) and their influence on team task insight, empowerment and/or collective commitment. Now we will pay special attention for the ftf meetings, because it can be seen as an intervention that forms the platform for several other interventions with the aim to sustain strategic momentum.

Ftf-Meetings and sustenance of momentum

There was a project board, which consisted of the project leader and the different work package leaders. This project board had six meetings a year; every two months. These meetings were ftf, by e-mail, or by telephone. For these meetings, the project leader made the agenda. On this agenda, there was also room for points brought in by the other board members. The project leader also prepared a decision proposal for things that were according to him important to decide about. But he always gave plenty of room for discussion. According to one informant, in the project board, discussions took place about changes and the achievement of objectives. This was discussed with the work package management, and then told to the task leaders.

There was also discussion about the changes and the achievement of objectives in the workshops. ‘Mostly the objectives were reached as originally formulated. In some cases the objectives had to be changed (RO/ which was a slight change in momentum)’. So, during the ftf-meetings there was room for participative decision making, having a positive influence on team task insight, technical adjustment and empowerment. An important task of the project board was to monitor the progress of the Lisbon project. In this way, they assured that the project was carried out into the direction of the objectives, so the beta remained 1. Further, one can ask if the changes in the objectives were so fundamental that it changed the direction of the momentum, because there was a great tolerance interval.

Every half year there was an ftf project meeting, organised by the project leader. These meetings lasted for three days. Between two project meetings, one or two work package meetings were organised. So there were ftf-meetings on work package level, never on task level. In these meetings, some amount of time was spend on a specific task.

The task leaders had the obligation to regularly present the results of the task group. When the team approached a deadline, sometimes the results were presented by e-mail, but mostly there was an ftf- meeting with workshops, in which the results were presented. During the workshops, according to one informant there was room for discussion. But according to another informant ‘the work package 2 got feedback from the people of work package 1. It was the case. There was not a lot of feedback from other people. (…) During the activities, during the building of the deliverables, the people were involved and feedback was given’. So, ftf-meetings have a positive influence on (the sustenance of) team task insight, and the team continued working into the right direction, remaining the beta close to 1.

Beside the formal program of the meetings, also social activities were organized, e.g. a visit to a castle. This had its impact on the collective commitment, because people learned to know each other much better. As one informant said ‘They talked independent from technical things; they could learn to know each other. It is important that people know each other not only as anonymous names on e-mail, but as people. For this purpose social activities are very helpful’. According to this informant, ftf-meetings were necessary because ‘only by these ftf-
Chapter 4 Case studies

meetings good cooperation was possible’. So, ftf-meetings have a positive influence on collective commitment, remaining the alpha close to 1.

Independent from the international project structure, there also were national project structures, in which ftf-meetings were held only for the national partners.

Interferences and sustenance of strategic momentum
There were also some critical incidents in the project, threatening the alpha or beta. New partners in this project had expectancies, which could not be fulfilled directly, threatening the collective commitment, and thus the alpha. They asked especially for more technical details. Project management intervened in the cultural and technical domain, by asking them what could be improved. This lead to workshops in which there was one central theme, with more details, sustaining the collective commitment and team task insight of the new partners, and thereby sustaining the momentum.

One of the problems in the project was to sustain the motivation of the individual team members (and their collective commitment), because this motivation was vulnerable during the project. One of the reasons was that they did not know, or did not want to know, what was going on in the complete project. According to one informant, most team members did not read the e-mails, in which the project management gave information about actualities in the Lisbon project. To sustain the motivation, project management intervened in the cultural and political domain by trying to involve as much team members as possible at the workshop on meetings, where they also had influence on the planning. By trying to involve team members at the meetings, collective commitment was sustained. Giving people the possibility to participate in the decision making concerning the planning sustains the empowerment (and also led to technical adjustment). On the basis of these interventions, alpha remained close to 1.

One Italian partner did not know if they would receive funding from the national authority. Even when the project was ended they were not sure if they would receive funding. By not receiving the funding, the partner was not empowered (not able, as an attribute of empowerment) to travel (much). A consequence was that at a certain point the partner had not enough money to join the meetings. Project management decided to intervene in the technical and political domain by organising meetings close to the Italian partner, organise meetings at places where the partner already went to a conference, and in some cases the results of the partner was presented on meetings by other partners. As a result, the Italian partner could participate fully in the project. On the basis of these interventions, alpha and beta remained close to 1.

Halfway the project, a German partner was withdrawing resources from the project, because they were a small partner and had to deliver products in time to a customer. This led to a decrease of the momentum, although their motivation was high (high collective commitment). As a result there was a delay in communication from this partner. The project leader first asked for the information. When the information was not delivered after some time, he 'threatened' with making remarks in the status report about the partner, which could have financial consequences for this partner. Project management intervened in the cultural domain by asking a manager from the country of the partner to talk with the partner. The country manager tried to get the information from the partner. He understood what happened, and talked with the national fonder, who understood this situation too. The firm could continue, although there was a delay at some times, without financial consequences. Eventually, the 'results reports' were send to the country manager one year after the end of the project.

Some partners were less satisfied with the project, because they received lesser funding than partners from other countries (France versus Spain, Germany and the Netherlands). The cause was that the partners in a Eureka project were funded by their national organisation. This created differences in the amount of funding between the countries. Project management could not intervene in this problem.
Some partners were not committed to the project and had almost no contribution. Their momentum was low. This was on the basis of the fact that partners in some countries were not chosen by other partners in the consortium (or acquaintances of acquaintances), but it was an obligation of the national government that those partners participated in the Lisbon project. Otherwise the other partner(s) of the country would not have got funding. Because they had no legitimate power to do anything about this, management tried 'to live with it' (i.e. no special intervention). This had a negative effect on strategic momentum of the team.

The commitment from team members from some partners was very low, and there was an exchange of team members, whom had no team task insight. The cause of this problem was that the partners were less committed to the project, and team members also participated in other projects inside the partners. As a result, the partners’ momentum was low. In this case team members from other partners intervened by trying to integrate the newcomers in the project (momentum effect).

**Actual strategic momentum**

![Diagram of actual strategic momentum](image)

*Figure 4.11. Visualisation of the creation and development of strategic momentum in time*

*The figure is mainly focused on the magnitude of strategic momentum*

**Explanation of the illustration**

The illustration is an estimation of strategic momentum by the researcher, on the basis of empowerment, collective commitment, and team task insight. The thick line entirely above in the illustration is an estimation of strategic momentum at group level. This is not on equal scale. It is also not the sum of the unit strategic momentums. But, as said earlier, the estimation of strategic momentum by the researcher. It gives the actual strategic momentum.

Unit strategic momentum:

1. Firms with small momentum
2. German partner
3. Partner with ‘changing team members’
4. Other partners

Collective strategic momentum:
Chapter 4 Case studies

Momentum effects
There were several momentum effects in the project. A momentum effect is a manifestation of a momentum. The momentum effects in the Lisbon project were:
- Most of the team members were very autonomous. They did a lot of things without asking for permission, and a lot of results were presented. They also organised workshops themselves, without noticing beforehand the project leader (momentum effect).
- The commitment from team members from some partners was very small, and there was an exchange of team members, whom had no team task insight. The cause of this problem was that the partners were less committed to the project, and team members also participated in other projects inside the partners. As a result, the partners’ momentum was small. (internal influence) In this case team members from other partners intervened by trying to integrate the newcomers in the project (momentum effect).
- At the end of the project, a new project was defined, in which most of the project partners were involved from the Lisbon project (momentum effect).
- One partner has developed a very good relation with some of the other partners. In a professional context. And this collaboration was implemented in common collaborative actions, in common research projects on open level (momentum effect).

4.7.3. Commentary
The project can be called a good project, when you are prepared beforehand that writing a project description a half year before the start of the project will definitely bring discussions and changes with it at the start of the project. The project ftf-meetings were once every half-year, so lesser than e.g. the Berlin project, but also having a positive effect on team task insight, empowerment, collective commitment and/or strategic momentum. The project process was a good process, because it had an average to great momentum, there was a lot of enthusiasm in the team, and there were several momentum effects. It was also a good process, of course, because there were intended results in the end.
Because the legal power of the project management of the virtual team was very limited, the leadership style of the project leader was facilitative. There were not much critical incidents, in which the project management intervened, mostly in the cultural (C) or technical (T) domain, to sustain the momentum. This means that most of the interventions tried to influence the collective commitment and team task insight of the partners in the project. Though, there was also attention concerning the political (P) domain, because the management thought that the empowerment was very important too. At some critical incidents, which were the result of choices made by national fonders, management could not interfere. One critical incident was solved by other team members, as an effect of the momentum.

4.8. Jiaozuo case

4.8.1. Project structure
Three Dutch organisations joined the project: two universities and one school for vocational studies.
About sixty people participated in the Jiaozuo project. A virtual team of four persons conducted the design and development. The pilot study was conducted from mid September till the end of December 2002 by five virtual teams with each about six team members (students) from the three institutions.
There were three coaches for these ‘student’ virtual teams: one from each institution. These people were also involved in the project team. They evaluated the contribution of the students, on the basis of their deliverables.
About 25 students Commercial Economy at a school for vocational studies used the first part of the E-Practicum in January 2003.
Chapter 4 Case studies

The project was structured corresponding to the following committees and functions:

Project management team: The project management team consisted of four people. One from each institution and a project manager of the ‘bigger project’. This team was responsible for conducting the design and development of the Jiaozuo project. They were also responsible for conducting (and coaching) the pilot study. They also had their (reporting) responsibilities to the organisation they originated from.

Project leader: The project leader was responsible for coordination and fine-tuning of the deliverables of the different partners. He was also responsible for the reporting of the Jiaozuo project in the ‘bigger project’, for which he attended their meetings. Beside the managerial tasks, he had a content task.

Virtual ‘student’ team coach: These were the same people as in the project management team, except the project manager of the ‘bigger project’. They coached the virtual ‘student’ teams during the pilot phase, and they evaluated the contribution of the students, on the basis of their deliverables.

There were six milestones planned in the Jiaozuo project:
- design (scheduled deadline February 2002)
- development (scheduled deadline May 2002)
- readjust test (scheduled deadline June 2002)
- readjust (scheduled deadline August 2002)
- deliverance (scheduled deadline September 2002)
- hand over (scheduled deadline December 2002)

The project was finished on February 1st 2003, five month later than scheduled.

4.8.2. Within-case analysis: The emergence and sustenance of strategic momentum

Emergence of strategic momentum

Pre-start
The initiator of the project was a university. Via a consortium, in which this university participated, a project idea was launched, and other partners of the consortium could join the project. For this project, the project leader had written a project framework. In the beginning there were more than three partners whom were interested in the program. But others did not continue, according to one informant on the basis of political reasons, but actually because the product could not be tailor-made what is a task characteristic and a decision in the technical domain. The different team members did not know each other beforehand (F1). The team members were chosen on the basis of expertise. So, the whole team was build up from scratch, with no momentum beforehand.

At the pre-start, partners who would participate in the project did not know each other beforehand. So, the virtual team was build up from scratch.

Start project
The project started with an ftf kick-off meeting. Afterwards, there were three more ftf-meetings. In these meetings, besides spending time to learn to know each other better, attention was spent to the question how the aspirations and inspirations of the team members could be formed. By paying attention to the cultural domain, collective commitment could develop. So, a kick-off meeting and follow-up meetings have a positive influence on the collective commitment.
Concerning the political domain they were empowered to deploy the resources (time, finances etc.) to their own insight. In this way the alpha could rise steadily into the direction of 1. It was the aim of the project leader to get ‘all noses into the right direction’, or conversion, during these meetings. Therefore, he intervened in the technical domain and the cultural domain, by discussing with the other team members about their definition of the terms he used, the form and content of the project, the division of tasks, the deadlines for the deliverables, and the end responsibility to each partner organisation. An outcome of the discussions was a project description, written by all team members, which fitted into the project framework. In this way, the team worked in the right direction, and beta was 1. The fruitful discussions, as the participation in writing the project description, had a positive influence on the collective commitment, and the alpha. In this way, strategic momentum was developed in the team. So, participative decision making has a positive influence on collective commitment and team task insight.

Then the team members started searching for people in their organisation with (probably) sufficient capabilities.

All informants were intrinsically motivated. Informant F1’s motivation was ‘very high’; he asked himself if it was possible to achieve the same goals virtually as physically. The project resulted in a positive answer to this question. Informant F2 was very curious, and there were interfaces with his experiences and his projects at stake.

At the start of the project, strategic momentum could emerge during the ftf kick-off meeting and several follow up meetings. During these meetings, the interaction had a positive influence on collective commitment. The discussions had a positive influence on team task insight, and the team member was empowered to deploy the resources to their own insights.

Sustenance of strategic momentum

Team task insight

According to informant F1, team task insight was low in the beginning of the project. During the ftf meetings, also the content was discussed in the team, and team task insight grew. Informant F2 had difficulties in the beginning concerning team task insight. It became clearer to him when a tool that was used in his organisation could be used in the project of the Jiaozuo team.

Feedback was given when the team members delivered different parts of the project, and the others judged it. This feedback did not only lead to more team task insight, but also to technical adjustment.

For the sharing of technical knowledge, as for technical adjustment, several media types were used. Beside ftf-meetings, the team communicated via e-mail, MSN-messenger, Net meeting, and telephone. According to informant F1, virtual communication (by e-mail or by MSN messenger) is to some amount constrained, and people can get confused concerning the meaning of written sentences. Therefore, when irritations occurred, one must telephone as soon as possible to solve the misunderstanding. ‘It also leads to shorter messages, when communicating virtually’, according to informant F1.

Beside e-mail, and MSN messenger, also Net meeting (more complex than MSN messenger) was used for communication. According to informant F2, this was used every Tuesday (during the pilot project); first thirty minutes with the lecturers and than one-and-a-half hour with the students. According to informant F1 ‘with net meeting you need another communication discipline. You must work with a chairman. You must let people finish what they want to say, you must wait how and when you can respond on a message. It is based on rules, good rules, to cooperate.’

Also, an electronic tool was used for making the end product. Informant F1 ‘we used a standard package, a package that dictated what had to happen. When you uploaded
something, the other ones got automatically a message and could work with the delivered document (review or things alike).

Concerning decision making, the team members could participate in this decision making, also leading to a greater team task insight.

The professional background of the three team members was different, and this led concerning to informant F2 in the beginning to communication problems ‘I still remember that I was startled by the ICT language, which I did not understand’. So, a difference in professional background can lead to communication problems that delay the development of team task insight.

Concerning the task characteristics, it consisted of complex tasks, which were made in an electronic learning environment. For achieving the tasks, creativity was needed.

Over all, team task insight was low in the beginning of the project (whereas ‘the beginning’ is before the end of the ftf-kick off and the three follow up meetings!). Although the professional background was different, and team members had difficulties with understanding the language used, leading to communication disturbances (and less team task insight), the project leader intervened in the technical and cultural domain by discussing with the other team members about their definition of the terms he used. In this way team task insight increased. Team task insight was also increased by technical knowledge sharing via different communication media, feedback, and participative decision making. In this way team task insight could develop steadily, and the beta could rise steadily into the direction of 1.

Empowerment

Empowerment was an important point of attention in the Jiaozuo team. Every partner had his own field of responsibility. And every partner had to search for people (human resources) in his organisation who were able to fulfil the tasks. According to informant F1 ‘tasks could be delegated in a fast way, but one must soon find out if the one to whom the task is delegated is able to fulfil the task. After some time, the responsibilities etceteras were delegated to the right (i.e. able) people’. According to informant F2, there were no clear agreements concerning the execution of the tasks.

Concerning the financial resources, first the team was empowered to use the budget at their own insights. Halfway the project, an external organisation started with planning and control. This decreased the empowerment concerning the financial resources.

Over all, empowerment fluctuated during the project. It was not always possible for the team members to deploy the human resources, on the basis of factors in their organisation. By task allocation to another partner, empowerment was restored several times. Concerning the financial resources: first the team was empowered, but this empowerment decreased halfway the project when an external organisation started with planning and control.

Collective commitment

There was collective commitment according to informant F1, but there was doubt in the beginning concerning the empowerment.

Informant F2 said that working virtually was less bad than expected beforehand. ‘ I thought it would be more impersonally, but you learn to know each other well. And when you meet each other in person, there is a personal connection’. So, the ftf-meetings sustained the collective commitment.

Halfway the project there was an evaluation session, in which feedback was given concerning the team process till then. According to informant F2 it was mend to function better as a team in the second half of the project. Feedback was also given in the electronic learning environment, when other team members reviewed one’s deliverable.

Several media types were used. Beside ftf-meetings, the team communicated via e-mail, MSN-messenger, Net meeting, and telephone.

Concerning decision making, the three main team members wrote the project description, which also had a positive influence on collective commitment.
Team cohesion was high concerning respondent F1 ‘After three months we had a real good team. (...) Concerning the content it has become a beautiful product because we stood firm aside and we were somewhat autonomous concerning the bigger project team’.

**Over all, the collective commitment in the Jiaozuo team was normal during the project for the whole virtual team, with only a minor disturbance halfway the project. But the collective commitment was not equally distributed over the whole team. Two partners were very committed, but one partner lesser. According to informant F2 ‘according to me concerning this partner one can speak about social loafing’.

Now, we will pay attention to ftf meetings, because they form a platform for several other interventions.

**Ftf-Meetings and sustenance of momentum**

Ftf-meetings were held once a month with the three team members. During these meetings the development of the project was conducted. These ftf meetings sustained the collective commitment. Technical knowledge sharing during the development of the project in these meetings sustained the team task insight further.

**Interferences and sustenance of momentum**

There were also some critical incidents in the project, threatening the alpha and/or the beta. In the beginning of the Jiaozuo project, the collective commitment and the empowerment was threatened because a member of a partner was not able to fulfil the expectancies (informant F1). As a consequence, agreements were not fulfilled and partners became a bit upset. The project leader intervened in two domains. By using conflict management, he intervened in the cultural domain. He allocated the tasks from one partner to another partner, and capacity was also reallocated from partner F1 to partner F2, so this was also an intervention in the political domain. Partner F2 was more successful in dealing with the task. On the basis of the interventions in the cultural and political domains, collective commitment and empowerment were restored again to a normal level, and alpha remained 1. In this way, strategic momentum sustained normal. So, task reallocation can have a positive impact on empowerment and collective commitment.

After about six months, partner F2 showed a tool to the other team members. The other team members adopted the tool immediately, although some changes had to be made. As a consequence, the presentation and adoption of the tool was a breakthrough in the virtual team, and the alpha >1, or an increase of the momentum above normal. Informant F2 ‘and I was very surprised, because everything went fast from that moment on’ (...) ‘and I was surprised too that when I showed what we had done in our organisation, they were very enthusiastic’. In spring 2002, the consortium started a project team concerning standardisation, because the outcome of a project should be distributed in the end. The standardisation team could not come up soon with a standard, because there were a lot of discussions in this team. As a consequence, it was not clear if the Jiaozuo team could continue with their ICT program, because this depended on the outcome of the standardisation team. The Jiaozuo team decided to continue with their ICT program, without waiting for the outcome of the standardisation team. This is a momentum effect, emphasizing the higher than normal momentum. A starting condition was that the outcome of the Jiaozuo team had to be used in one of the partner organisations within a short time-frame (informant F2).

Halfway the project, planning and control of an external organisation consulting group were introduced, which led to a lot of bureaucracy in the Jiaozuo team. They put more pressure on the Jiaozuo team to deliver their products in time. They reacted from a quantitative point of view, whereas the team worked more qualitatively oriented, as it was an innovation. As a consequence, the professionalism of the Jiaozuo team members was questioned, because they could not always deliver in time. As a consequence of the attitude of the external group, the empowerment and collective commitment of the Jiaozuo team was threatened.
Chapter 4 Case studies

The project leader used a mediator role, intervening in the cultural domain. He took care that ‘annoying’ messages from the planning and control group were translated in a way that was not offending for the Jiaozuo team members. As a result, collective commitment was not harmed. Empowerment was threatened, but the planning and control group had not use power to force the Jiaozuo team in their time planning. Although the alpha probably decreased, the momentum was sustained.

From September to December 2002, the virtual student project teams started. These teams consisted of a mixed group of students. Mixed in the sense of age, life and work experience, and practical versus theoretical orientation. In these teams this often led to conflicts. As a consequence, the virtual student project teams, under the supervision of the Jiaozuo team, did not work well. The Jiaozuo team knew that they had to manage these teams firmly. Every week they held a virtual meeting of one hour, to answer questions from the students. Problems in virtual student project teams could be solved in this way. These interferences had no influence on the momentum of the Jiaozuo team.

At the end of the project it was agreed that partner (F1) would conduct the evaluation of the project. This partner did not succeed. Another partner (F2) conducted the evaluation.

The communication was very good in the Jiaozuo team, and was according to informant F1 a positive critical incident.

Strategic momentum during the project was normal during the first six months. The presentation of a tool, which was developed by one of the partners (F2), led to a breakthrough and strategic momentum increased. Although there were interferences, strategic momentum remained high probably till halfway the project, when planning and control was introduced.

Actual strategic momentum

![Graph showing the strategic momentum over time](image)

Figure 4.12. Visualisation of the creation and development of strategic momentum in time

Explanation of the illustration

The illustration is an estimation of strategic momentum by the researcher, on the basis of empowerment, collective commitment, and team task insight. The thick line entirely above in the illustration is an estimation of strategic momentum at group level. This is not on equal scale. It is also not the sum of the unit strategic momentums. But, as said earlier, the estimation of strategic momentum by the researcher. It gives the actual strategic momentum.
Chapter 4 Case studies

Momentum effect
There was one momentum effect in the project. A momentum effect is a manifestation of a momentum. The momentum effect in the Jiaozuo project was:
- In spring 2002, the consortium started a project team concerning standardisation, because the outcome of a project should be distributed in the end. The standardisation team could not come up soon with a standard, because there were a lot of discussions in this team. As a consequence, it was not clear if the Jiaozuo team could continue with their ICT program, because this depended on the outcome of the standardisation team. The Jiaozuo team decided to continue with their ICT program, without waiting for the outcome of the standardisation team. A starting condition was that the outcome of the Jiaozuo team had to be used in one of the partner organisations within a short time-frame.

4.8.3. Commentary
The process of the Jiaozuo project was conducted well, because from the beginning much attention was spend on the development of the magnitude and right direction of strategic momentum, especially by the project leader. The momentum even increased to above normal during the project, as an outcome of the introduction of a tool after the project was conducted for six months. An indicator for the momentum was the momentum effect. There were also very few negative critical incidents in the virtual project team. Project management mainly had to interfere when critical incidents occurred as a result of external threats, or these threats were smoothened by a momentum effect. The interventions for sustaining strategic momentum were mainly in the cultural domain. This means that most of the interventions tried to influence the collective commitment of the partners in the project. Striking is that it was an enthusiastic team with a great momentum, which would have continued with their activities after the first two objectives were achieved. Unfortunately, for political reasons beyond the scope of the virtual team, they could not succeed.

4.9. Groningen case

4.9.1. Project structure
Three Dutch organisations joined the project: two universities and one research institute. The project was divided into two parts: a study/development phase of four years in which a number of critical issues of the tool were investigated, and a demonstration/building phase. The tool consisted of three separate parts, which were each developed and build by one of the three organisations. In the study/development phase, all three groups worked quite separately from each other to develop their part of the tool. In the demonstration phase, they intended to combine the three elements to a working tool. In practice, on the basis of several critical incidents, in the end two tools were build.

The functional structure in the project was as follows:

Project leader: for the integral project. It was overall management; no specific tasks.

Group leader: There was one group leader at each organisation. These were responsible for the finances and the final decisions. They also communicated with the project funding organisation.

The project leader and the group leaders formed the project management team.

Project leaders (for every organisation one): These three project leaders functioned on an operational level. They worked together with AIO’s, post-docs, and other senior researchers on the project in their organisation.
4.9.2. Within-case analysis: The emergence and sustenance of strategic momentum

Emergence of strategic momentum

Preface
Some organisations, under which the organisations engaged in the later Groningen project, wrote a research proposal, which was rejected by a project-funding organisation. In this proposal, a paragraph was written about the tool at stake. This was reviewed positively. Therefore, the over-all project leader decided to intervene in the cultural and political domain, by writing a proposal concerning the tool with already committed participants. So, the project proposal was the outcome of participative decision making. The participants were empowered for this contribution, and probably their collective commitment increased, having a positive influence on the establishment of the alpha. These ideas were already launched in 1999, so a lot of participants already knew each other before the project started formally. Team members from the different organisations worked already together on previous projects. So, partner selection took to a great extent place on the basis of familiarity, probably having a positive influence on collective commitment. In the beginning of the project a fourth organisation was involved, but they withdrew because the project was not of their interest. The proposal was approved by the project-funding organisation.

The project description had a rough division of labour, a task description for the three participating organisations. All three organisations could make use of their expertise, and expand this expertise, to develop their part of the tool. So, characteristic for the task was that it could be built to a great extent independently from each other by the different partners.

Start
An ftf-kick-off meeting was held in 2001. At this meeting the fundamental ideas of the project description were presented by the different groups. In this way, there was technological knowledge sharing, leading to more team task insight, and the development of the beta. There was an opening session, a presentation, a lunch, presentations and discussion and a drink in the end. By having a lunch and a drink in the end of the meeting, team members could meet each other in person, having a positive influence on the collective commitment and on the development of the alpha. Not only project team members participated, but also people who were only interested in the project. According to one informant (H3) ‘the meaning of a kick-off meeting is to get the participants enthusiastic, and that is what it really did’. So, according to informant H3 the ftf-kick-off meeting established momentum in the team (enthusiasm is an indicator for momentum). Also, the ftf-kick-off meeting had a positive influence on team task insight and collective commitment.

By organising an ftf kick-off meeting at the start of the project, strategic momentum could emerge.
Sustenance of strategic momentum

Team task insight
During the first phase of the project, the three participating organisations were each on their own busy with literature study, internal discussions, and experiments concerning their component of the tool. According to informant H3 ‘What do you do in such a project? First you begin with replicate what others in the world have done. And when you master this, that is a learning process. This was planned in the first two years. And then you start putting your own ideas in it. That is mostly the way it goes’. According to informant H1 ‘We looked around what was going on in the world (concerning the components of the tool) and we talked about it, so we all could work in some way into the same direction’. There was some technical knowledge sharing during the first phase, leading to team task insight, and decision making leading to technical adjustments.

When the team member at organisation H2 was replaced by another one at the end of 2004, he knew little in the beginning about the project; task insight decreased at organisation H2. To overcome this knowledge gap rapidly, and to familiarise with the people in the team, he organised an ftf project meeting with the team members from the participating organisations. On this meeting a presentation was held and the planning for the project was synchronised. On the basis of this meeting (his) team task insight increased, as did the technical adjustment, leading to a beta that came close to +1. So, an ftf meeting can have a positive influence on team task insight (and technical adjustment).

H2 was also a warm supporter for ftf meetings. One reason was the possibility to give feedback, probably leading to a greater team task insight.
(Team) task insight developed over time. For example, according to informant H6 after some time some other components for the tool were bought which were not the same as in the project description. In this way – a change in the technical domain - , there was an unproblematic change of direction of strategic momentum.

For the technical knowledge sharing (and technical adjustment), several media types were used. Beside ftf meetings, a telephone meeting or e-mail communication was held once a week, or once every two weeks. This high communication frequency started at the beginning of the second phase. Informant H1 had especially much contact during the second phase with informant H2 ‘to take care that the project leader there has the same view as I have’ These e-meetings had to a great extent as an outcome to increase the technical adjustment. It was also technical knowledge sharing, leading to a greater task insight. According to informant H2 it is more difficult to coordinate the planning of the project by telephone than ftf.

Concerning technical knowledge sharing during the first phase the three organisations in the team talked with each other about the development of the three components of the tool to be sure that they all were developing into one direction. But one can ask if the beta remained close to +1 during the first phase of the project, i.e. if all participating organisations were developing their component in the same direction. An indication for this is that a team member of H2 build a formation in this first phase which did not lead to results (RO/expected by the other participating organisations).

Technical knowledge transfer was reduced during March 2006 till March 2007. The knowledge exchange between organisation H1 and H3 was more about ‘what are you doing at the moment’. According to informant H6 the lack of communication is on the basis of a delay in deliverances of components.

Organisation H2 has done less than agreed in the project description. They have only copied a product that was already developed somewhere else; they did not come up with an improvement as agreed.

One can conclude that the team task insight increased slowly during the first phase, on the basis of a lack of communication between the team members from the different participating
organisations. As a consequence of the evaluation halfway the project in 2004, the direction of the momentum changed at organisation H3, on the basis of changes in task insight, but not at the other two participating organisations.

The team task insight during March 2006 till March 2007 was small, because there was almost no sharing of knowledge between the partners. But this must be more differentiated. Actually, the team has decided to produce two end products on two different geographic places, instead of one end product on one geographic place. The two partners built their end product almost single-handed. There is only some exchange of components that can be used in both end products. So, the task insight at both partners is great.

**Empowerment**

In the first phase of the project, the study/development phase, the project management made strategic choices. During this first phase the autonomy of the team members was great, but there was a lack of communication between the team members.

In the second phase, the demonstration phase, and so during March 2006 till March 2007, team members were empowered to use the financial resources at their own insights, e.g. for buying components for the tool. The ‘extra’ empowerment had a positive influence on the development of the alpha. According to informant H6 ‘(every partner) has his own budget and takes his own decisions’. So, an attribute of empowerment is autonomy.

Although the ‘extra’ empowerment in the second phase had a positive influence on the alpha, alpha could not come close to 1, because the collective commitment remained small.

According to informant (H1), in the second phase all decisions were actually taken by the operational level, because ‘we speak a lot with each other and therefore know which choices have to be made’. Informant H2 agrees when he said that ‘everyone who joins the team has so much sense of responsibility that we can not talk anymore about a management from above’.

Concerning the product of organisation H2: outcome of a discussion was that this resource first would go to organisation H1, and then to organisation H3. This was already agreed beforehand, but on the basis of circumstances, it had to be discussed all over again. So, in the end both organisations could deploy this resource to their own insight.

Empowerment was not distributed equal over the participating organisations. There were especially differences in autonomy. As H2 said ‘I think that my group leader has a greater distance to this project, so I think I have got more autonomy than the rest of the team’ So, an attribute of empowerment is autonomy.

One can conclude that the empowerment during the project time was great, i.e. the resources could be used at the virtual team members’ own insights.

**Collective commitment**

During the first phase of the project, the collective commitment was low; the team members were more focused (and committed) on what was going on concerning their part of the project in their own organisation, than in the whole project. So, during this period the alpha did not come close to 1. (And also the beta did not come close to +1, because at least one participant (organisation H2) developed in the wrong direction). Although the different partners used all resources, the effective component of strategic momentum was lesser than average (see chapter 2, figure 3.1.).

Halfway the project, an evaluation took place that led to choices the team had to make concerning the different parts of the tool. The writing of the evaluation report by the team members led to more intensive collaboration, and to more collective commitment. So, participative decision making has a positive influence on collective commitment.
This collective commitment became more important at the beginning of the second phase. Although informant H1 thinks that the collective commitment is not equally distributed over the three participating organisations when he said ‘I think that at least I, but also the team at organisation H2 are fully committed to get this job done. In organisation H3 to a lesser extent’. In this way, there was a short revival of the collective commitment during the writing of the evaluation report and at the beginning of the second phase; the alpha could come close to 1 during these periods.

The collective commitment during March 2006 till March 2007 was very low again, so the alpha decreased and did not come close to 1. The interests from the own organisation were placed above the interests of the whole project (low team cohesion). On the other hand, conflicts were managed in such a way that the partners came to consensus concerning conflicting interests. Main reason was that they have to go along with each other after the project. So, project management did not interfere in a negative way concerning the empowerment.

Most decision making in the project during March 2006 till March 2007 was on the basis of compromise or consensus. Although there were differences in perception concerning this decision making. For example the decision concerning which organisation would use the product from organisation H2 first was taken, according to informant H3, in a directive way. According to informant H6, the agreement was a compromise. Main reason also for this behaviour was that they have to go along with each other after the project. So, consensus is an attribute of (participative) decision making.

According to informant H2 there was team cohesion in the project ‘if I do not understand something, I take up contact with organisation H1, and they help me to solve the problem’. But this team cohesion occurred in the second phase and more between organisation H1 and H2, until the end of 2006, when organisation H2 finished its job; during the first phase the team cohesion was small. Informant H3 ‘More could have been possible within this project, when we would have operated more as one team. With more ftf communication, very intensive, as if we all had been on one location’. But, as mentioned earlier, the interests from the own organisation were placed above the interests of the whole project (low team cohesion). According to informant H3 ‘you have a good developed we-feeling in that group. And you have two of those groups with a strong developed we-feeling who have to collaborate, and that is not possible. For sure when there is an amount of competition between the two groups (...)’.

Over all we can conclude that the team cohesion in this team was low. So, team cohesion probably has influence on collective commitment. In this case, low team cohesion probably leads to low collective commitment.

Concerning media types, beside ftf meetings, there was a telephone meeting or e-mail communication once a week, or once every two weeks. This high communication frequency started at the second phase, in this way increasing the collective commitment. Informant H1 had especially much contact during the second phase with informant H2 ‘to take care that the project leader there has the same view as I have’. These e-meetings had to a great extent as an outcome to increase the technical adjustment. It was also technical knowledge sharing, leading to a greater task insight. According to informant H2 it is more difficult to coordinate the planning of the project by telephone than ftf.

The communication between the partners was very low during March 2006 till March 2007, according to informant H3. Informant H1 said that there was e-mail contact with organisation H2 every one or two weeks, and e-mail and telephone contact with organisation H3 once in six weeks. The technical knowledge sharing between organisation H1 and H3 was more about ‘what are you doing at the moment’. According to informant H6 the lack of communication is on the basis of a delay in deliverances of components. The lack of communication (or media use) had a negative influence on the collective commitment, and therefore on the alpha.
Media types used during March 2006 till March 2007 were mainly telephone and e-mail. Sometimes team members met each other ftf on congresses.

One can conclude that on average the collective commitment was low. Only during the beginning of the second phase there was more collective commitment, but to a great extent between organisation H1 and H2. The collective commitment during March 2006 till March 2007 was low. There was less team cohesion, and less communication. But this lack of collective commitment must be more differentiated. Actually, the team has decided to produce two end products on two different geographic places, instead of one end product on one geographic place. And the commitment at the partners was high.

Ftf-Meetings and sustenance of momentum
During the development phase (first phase) of the project, there were two ftf-meetings for the virtual project team each year. These meetings were very formal, with presentations. As a consequence of this technical knowledge sharing, team task insight could develop, as the beta (although it did not reach +1). Also, at these meetings the people in the team learned to know each other better, although almost nothing was organised during these meetings for the socialising aspect. On the other hand, the team members met each other in this project also on national and international conferences. In this way, collective commitment could develop, as the alpha. So, an ftf meeting has a positive influence on team task insight.

But, according to informant H3, there were not enough ftf-meetings in the beginning of the project, so that every organisation could go their own way in the project, without much technical knowledge sharing or coordination (technical adjustment). As informant H3 said ‘there was a meeting at one time, and I was surprised what the others had done, or were intended to do’. According to informant H3 ‘just to avoid subgroups in the team, you have to have more ftf meetings. This did not happen’. So, according to informant H3, on the basis of the fact that there were too less meetings in the beginning of the project, collective commitment and team task insight did not develop properly, and there was too less technical adjustment.

Although there were too less (formal) ftf meetings for the whole virtual team, there were ftf-meetings at the different participating organisations. At organisation H3 these meetings were organised once a month and open to all virtual project team members. The project leader from organisation H2, who joined the virtual team in 2004, went often to these meetings: ‘it was more or less an informal meeting. Just sitting around the table. To talk about the tasks at stake’. Organisation H1 sends the report of their ftf meetings to at least the project leaders from the other organisations. So, in this way there was (to some extent) technical knowledge sharing, sustaining team task insight, and sustaining the beta.

In the beginning of 2006, according to informant H1 there were more informal meetings by telephone, once a week or once in two weeks. During these meetings there was technical knowledge sharing and communication concerning the planning of the project (technical adjustment), thus sustaining the beta. According to informant H2 there are still too less ftf-meetings (with the whole team). According to him, these ftf-meetings should be held once a month with the whole team, to get more agreement about the deadlines. According to informant H3 there are more ftf-meetings in the beginning of 2006, with the deadline of the project in sight: ‘we are thinking about the most efficient way to bring this project to a good end’. But he also admits that the shortage of ftf-meetings was a serious handicap in this project ‘the communication was lacking, too less ftf-meetings, too less informal contacts etcetera’.

Between March 2006 and march 2007, only one general ftf-meeting was held. No project ftf-meeting was held during this year.
Interferences and sustenance of strategic momentum

According to informant H2, the management style (at least during the first phase) was more like a laissez faire style ‘I sometimes have the feeling that when important decisions have to be taken, group leaders do not interfere. Fortunately the team members have the responsibility to interfere’. Informant H3 agreed when he said ‘there is no clear coordination and no clear managing from the project management, so everyone goes his own way’.

There were also some critical incidents in the project, threatening the alpha or beta. At one organisation, the (more practical) post-doc went away after three months for a better job within the same organisation. As a consequence, the financial resources were spoiled for three months, and there was a (temporary) decrease of human resources (and therefore momentum) in the project. The project leader of the organisation intervened, trying to establish an outcome in the political domain, by attracting a new post-doc, but more a theoretical than a practical one. As a result, the momentum was restored, and they could come up to the requirement of publications.

At the same organisation, one PhD-candidate had to stop after a year with the project, on the basis of a bad health. The result was ‘a big hole’ in the project, and a decrease of momentum. The project leader of the organisation intervened, trying to establish an outcome in the political and technical domain, by attracting a new PhD-candidate and telling him – by the former PhD - what to do. As a consequence, momentum restored after some time, when the task insight of the new PhD candidate increased.

A new interference manifested after two years (in 2004), for which there were three causes:
1. Method inferior to method from other partner.
2. Brilliant idea from team member organisation H3.
3. Broad orientation on the total subject by the organisation H3, what resulted in increased team task insight.

As a consequence, the organisation H3 decided after two years to make a radical change in their project contribution. The project management intervened in establishing an outcome in the technical domain and in the cultural domain, by making an update of the project description, reviewed and approved again by the project-funding organisation. Before, the updated proposal was discussed with and approved by the other two participating organisations. So, the updated project proposal was the outcome of participative decision making, probably having a positive effect on the collective commitment. The alternative became manifest since 2004. While the new alternative was a greater challenge for some participants, the intrinsical motivation increased (H3).

As a result:
1. The components developed at the organisations H1 and H2 were the same as intended before. The component, developed at organisation H3 changed dramatically, compared with the component agreed on beforehand in the project proposal. So, there undoubtedly was a momentum change (of direction) at the H3 organisation concerning the project. This momentum change (of direction) had no consequences for the (magnitude and/or direction of) momentum in the other two organisations. As a result, the total strategic momentum changed (of direction) for the whole project.
2. The project in the organisation (H3) was two years behind schedule than in the other organisations.

What is important to know about the context is that the three teams of the participating organisations had less contact during the development phase (phase 1), so every team could follow on its own plan. As informant H3 said ‘(On the basis of the bad communication in the beginning of the project) a disadvantage was that the idea could have been picked up by the other participating organisations, and could have lead to a collective project change. That did not happen. They just went their own way’. So, the momentum only changed in direction at
organisation H3. The tools of the other partners were still, although organisation H3 added some changes to their tool, adaptable with the tool of organisation H3.

This interference led to another interference. The cause was that the project management made an intervention, trying to establish an outcome in the political domain, by labeling a great part of the financial resources to the organisation H3 with the new idea. This money would be used for building a second tool. According to an informant ‘this is a political game’. As a consequence, first the other two organisations received lesser (and minimal) resources; according to H3 on a voluntary base (decrease of absolute momentum, but the relative momentum stayed the same). Although the project management decided this, not all team members were satisfied with this decision, probably having a negative influence on the collective commitment, and so on the alpha. Mainly because they thought that the new option was not realisable in the given project time. Secondly, also the organisation, which got the biggest piece of the cake, thought that it was not possible to build the tool in time (according to informant H1).

The intervention (concerning the dissatisfaction of team members) was - although it is not clear if the project management intervened, or the management of the separate partners -, trying to establish an outcome in the technical domain, according to informant H1, that two tools would be build. One in organisation H1, and one in organisation H3. The deliverable of organisation H2 was finished at the end of 2006, and was copied by both organisations. In this sense, both projects would lead to a tool with a high amount of overlap. An important reason for this intervention was that both organisations are also part now of a European project. So, the intervention was not the end result of a discussion, but the ‘logical’ outcome of participation in a European project.

Another problem was that the development phase, i.e. what is possible in this field, was completed too slowly. Cause of the problem was that team members were too much busy with their own publications, too much focused on their own research; not focused on the practical team task (building a tool). So, the collective commitment in the first phase of the project, the development phase, was low. E.g. a team member of H2 builds a formation in this phase which did not lead to results. According to H1 the problem was solved without an intervention. The team member in H2 was replaced (probably she got a better job elsewhere) at the end of 2004 and the new team member had a greater collective commitment. As informant H1 said ‘I think that his enthusiasm fitted better with my enthusiasm in the project’. According to H2, he received a request with a deadline from organisation H1: to build a new and working formation before the summer of 2005. H2 made this challenge to a success. Then they became enthusiastic in H3 too about the topic.

During March 2006 till March 2007, no ftf-meetings were organised by the over-all project leader. There has only been one ftf-meeting, and this was not a special project meeting. As a consequence, communication during the last year was minimised. As a result, there was too less cooperation between the partners.

According to one informant (H6), although there was too less communication, there can be given a good argument for this. There were delays in the project in organisation H3 and H1. Some components of the total product broke, or did not fit, which became obvious during the experiments. So, the cause for these delays was the long delivering times of producers for these components. And during the time between ordering and receiving the components, the project could almost not be continued. As a consequence, there was almost nothing to communicate about. There was no specific intervention. This delay of delivering time of components had its consequence for the outcome of the project, but strategic momentum remained great (at the different partners).

During March 2006 till March 2007 a lack of resources (finances and manpower, at least in organisation H3) occurred. According to informant H3, one colleague in the organisation of H3 left the project for another job at the organisation of H3. There was also the threat of
moving the department to another building, in which there is no room for the project formation. This threat still exists; informant H3 thinks that the moving will take place at the end of 2008, begin 2009.

As a consequence, the project process was endangered at the organisation of H3. Informant H3, who is the project leader at the organisation H3, tried to intervene by proposing to work more tightly together (organisations of H1 and H3) to the management. And this would lead to one, instead of two tools. But the management at organisation H3 did not adopt this proposal, probably according to informant H3 because the interests of the separate organisations were more important than the interests of the whole team. According to informant H3 ‘what the exact motives were of my manager and the people in organisation H1 is unclear. According to me, there was too less communication about this’. Informant H6 confirms this. Informant H6 adds as an argument for building two separate tools that it is too much time and money consuming to let the people from organisation H3 come to the organisation of H1 to do their experiments; then it is better to have two tools. Informant H1 gives as an important argument (extrinsical motivator) for the choice of building two tools that both partners take part since the end of 2006 in a European project ‘(..) and in that project it is important to compare different methods, in which the end product of the two partners differ’. So, according to informant H1 the discussion concerning whether or not two tools would be build is overruled by the developments on European level.

Concerning the loss of manpower, informant H3 said that the colleague who left the project for another job within the organisation of H3 has tried for some time to transfer his knowledge to a PhD candidate. This had a reasonable result. But the PhD candidate will leave the organisation too in March 2008. As a consequence of these shortages, both projects will probably not be finished, according to informant H3. But informant H3 thinks of another intervention to let the project succeed in the end at his organisation. Therefore, organisation H3 intends to submit a follow-up plan at the subsidising organisation. They are already investing in the project, by buying components, which can be used, in the follow-up project. Then, a new PhD candidate can be attracted again.

On the basis of a lack of resources in organisation H3, strategic momentum in this *collocated* team was low in the end.

At organisation H3, fewer human resources are available for the project. But on the other hand, more financial resources are put into the project of organisation H3. As informant H1 said that at organisation H3 they managed to put new financial resources into this project, directly distributed by organisation H3 and withdrawn from other projects at organisation H3. But although the financial resources are greater, there are less team members available to ‘clear the job’. So, the over-all magnitude of the momentum at organisation H3 is probably lower than normal (an argument for this is also that the project proceeds slower than foreseen. The project will probably not succeed in time).

Organisation H2 could deliver its product in 2006. Because the team member at this organisation left for another job, the project stopped at organisation H2, and momentum in this *collocated* team became nil. According to informant H6 they have done a bad job, because they only copied what has been done before, and did not improve the technology, as agreed in the project description.

There was also a ‘reallocation’ of human resources in the end of 2006. Because the project leader of H2 has become a professor at the organisation of H3, there is much contact between organisation H2 and organisation H3. So, there is much communication according to informant H3. But on the basis of the fact that the project leader of organisation H2 became a professor at organisation H3, another interference occurred, according to informant H1. Before the project leader of organisation H2 became professor at organisation H3, the agreement was that the product of organisation H2 would be brought to organisation H1. After he had become a professor, he intended to send the product to organisation H3. Organisation H1 had good arguments for using the product of organisation H2 first. One of
these arguments was that organisation H1 will probably come to results earlier than organisation H3.

During the discussions about this interference, starting in December 2006, organisation H1 came up with the idea to copy the product of organisation H2 first. Then it would be send to organisation H3. When this led to a quarrel between the two organisations, the over-all project leader decided in a direct way that the product first would be send to organisation H1. Informant H6 said that it was more of a compromise between the two partners. So, the project leader intervened by establishing an outcome in the political and cultural domain. (According to informant H6, the kind of conflict is confrontation (Prein, 1988)).

In this way, strategic momentum in the collocated team of organisation H1 remains high, because they can use the component of organisation H2 directly. Concerning the transfer of the project leader from organisation H2 to organisation H3, this had no consequences for the empowerment and strategic momentum for the project as a whole, but strategic momentum in organisation H2 decreased, and in organisation H3 increased. Respectively by a decrease and increase of resources.

The total strategic momentum remains the same by this transfer.

According to informant H2, there was also an external reason to establish collective commitment ‘because we have our competitors in Scotland who are busy with the same. We want to stay ahead of them. And that gives some stronger collective commitment concerning the time planning’ (outcome first measurement 2006). According to informant H3, this ‘threat’ has disappeared, because they have to deal with the same difficulties as the Groningen project. In the first place because their project is as difficult and time consuming as the Groningen project. In the second place because they have chosen a somewhat different direction with their project. And in the third place because they also have to deal with a lack of manpower (resources). Informant H6 adds that the project in Scotland is probably to some extents a copy of the Groningen project, so they are always somewhat behind. There are good contacts between the Scotland and the Groningen project, and organisation H1 sends students to the Scotland project to work on it (and keep an eye on it).

This interference has no effect on strategic momentum.

In August 2006, a European project in the field of tools started. Organisation H3 and organisation H1 decided each on their own to participate in this project with their research. The Scotland project also participates in this European project.

Till now, the interferences have not had any consequence for the financial resources, transferred by the subsidising organisation. There has been an evaluation at the end of 2006, and critical questions were asked. For example, is this project not too big for a university.

According to informant H7, the project ended formally in May 2008. Both projects are almost on the same track. At the end of 2008, the first experiments can be conducted.
Chapter 4 Case studies

Actual strategic momentum

Figure 4.13. Visualisation of the creation and development of strategic momentum in time

Explanation of the illustration
The illustration is an estimation of strategic momentum by the researcher, on the basis of empowerment, collective commitment, and team task insight. The thick line entirely above in the illustration is an estimation of strategic momentum at group level. This is not on equal scale. It is also not the sum of the unit strategic momentums. But, as said earlier, the estimation of strategic momentum by the researcher. It gives the actual strategic momentum.

Unit strategic momentum:
(1) Organisation H2

X: turning point where strategic momentum changed direction

Unit strategic momentum: 

Collective strategic momentum: 

Momentum effects
There was a momentum effect in the project. A momentum effect is a manifestation of a momentum. The momentum effect in the Groningen project is:
- The problem was that the development phase, i.e. what is possible in this field, was completed too slowly. Cause of the problem was that team members were too much busy with their own publications, too much focused on their own research; not focused on the practical team task (building a tool'). E.g. a team member of H2 builds a formation in this phase which did not lead to results. According to H1 the problem was solved without an intervention. The team member in H2 was replaced (probably she got a better job elsewhere) at the end of 2004 and the new team member had a greater collective commitment. As informant H1 said ‘I think that his enthusiasm fitted better with my enthusiasm in the project’. According to H2, he received a request with a deadline from organisation H1: to build a new and working formation before the summer of 2005. H2 made this challenge to a success. Then they became enthusiastic in H3 too about the topic.
4.9.3. Commentary
The process was not a good process for the development and sustenance of strategic momentum. Main reason probably was that the interests of the separate organisations/partners were more important than the interests of the whole virtual project team. Also, as a result of too less communication (and ftf-meetings), collective commitment was below average during almost the whole project time. Only at the beginning of 2006, collective commitment became average for some time. On the basis of a lack of communication, in the beginning of the project the partners – at least organisation H2 – developed their part of the project into the wrong direction. This all led to a strategic momentum with a small effective component.

To some extent, the probability that the interests of the separate organisations/partners were more important than the interests of the whole virtual project team, is also stressed by the fact that most interferences by the project management were in the political domain. This means that most of the interventions tried to influence the empowerment of the partners in the project. There was only one momentum effect during this project, stressing the lack of collective commitment.

4.10. Conclusions
On the basis of the within-case analyses in this chapter we can give an answer on the second central research question ‘Can strategic momentum be more or less a stable property of a virtual team?’. As we already saw in chapter 3, strategic momentum can not be seen directly, but only indirectly when momentum effects occur. These momentum effects are the phenomenons that the self-propelling-force of the momentum becomes manifest. So, did momentum effects occur in the teams, and if yes, which? The momentum effects found in the eight cases are rehearsed in table 4.1.

<table>
<thead>
<tr>
<th>Case</th>
<th>Momentum effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dewey project</td>
<td>There was a vague project description in this team, leading to divergence concerning the fulfilment of the tasks. Although after twelve months the project management intervened to stop the divergence, the requirements remained unclear. So, divergence continued. Much of these problems 'were however smoothened', not by the project management, but in the development group.</td>
</tr>
<tr>
<td>Goa project</td>
<td>During the project process it became clear that there were difficulties concerning technical adjustment in the team, as the technology of partner A could not be used by partner B and vice versa. The team tried to intervene by suggesting an advanced technology.</td>
</tr>
<tr>
<td>Print project</td>
<td>The collective commitment of an End user decreased because bad cooperation between them and a Dutch partner, and because of a bad experience with two other organisations which participated in the team. The collective commitment of the end user increased again when she improved her contact with the initiator of the project.</td>
</tr>
<tr>
<td>Print project</td>
<td>On the basis of a shortage of money, less ftf meetings were held than planned. The team intervened by using other media (telephone conferences, e-mail) than ftf meetings.</td>
</tr>
<tr>
<td>Print project</td>
<td>There was negative ‘chemistry’ between the coordinator of the project and a member of the commission which was responsible for the budget. The team intervened, by inviting the</td>
</tr>
</tbody>
</table>

147
assistant of the coordinator to attend these meetings. As a result, there were no negative disturbances between the commission and the team anymore.

Berlin project
The kick-off meeting was meant in the first place to refresh the memories of the partners concerning the project. In the second place to make agreements, because otherwise the partners would continue pursuing the objectives of the former project (sustaining momentum from the previous project).

Berlin project
Although a development goal could not be achieved within the time frame of the project, one partner tried at all costs to stick to the original development goal. The other partners intervened by giving the representative of this partner arguments why the original development goal could not be reached, to convince the company.

Berlin project
When a partner in a country had a reorganisation for some time, and their contribution to the project was minimised, other country partners took over their tasks. So, in the end the total contribution from the partners in this country was reasonable.

Berlin project
Most of the partners participating in the Berlin project also participated in the follow-up project.

Paris project
Between two partners in this project long term collaboration was established by launching a new joined lab in France.

Paris project
All the project partners participating in the Paris project were also involved in a follow-up project.

Lisbon project
A lot of things in the project were done without noticing beforehand the project leader, such as organising workshops. In this way, a lot of results were presented.

Lisbon project
Some partners were less committed to the project. This had its influence on the team members from these partners, who were less committed too. Also, there was an exchange or team members from these partners in the team, whom had no team task insight. In this case team members from other partners intervened by trying to integrate the newcomers in the project.

Lisbon project
Most of the project partners in the Lisbon project participated in a follow-up project.

Lisbon project
One partner developed a very good relation with some of the other partners. In a professional context. And this collaboration was implemented in common collaborative actions, in common research projects on open level.

Jiaozuo project
In spring 2002, the consortium started with a standardisation team. On the basis of discussions in this standardisation team, they could not deliver a standard in time. The Jiaozuo team decided to continue with their project, although they were dependent from the outcome of the standardisation team.

Groningen project
The development phase was completed too slowly. A cause of this problem was that team members were too much focused on their own
Chapter 4 Case studies

research, instead of the project as a whole. E.g. one team member builds a formation during the development phase which did not lead to results. The problem was solved without an intervention. She was replaced by a new team member who had a greater collective commitment. He received a request with a deadline from organisation H1: to build a new and working formation before the summer of 2005. H2 made this challenge to a success. Then they became enthusiastic in H3 too about the topic.

Table 4.1. The momentum effects in the eight cases

In all cases one or more momentum effects occurred, so we can conclude that strategic momentum can be more or less a stable property of a virtual R&D project team.

In chapter 5 we will analyse the variables (team task insight, empowerment and collective commitment) which probably have an influence on emerging and sustaining strategic momentum. In chapter 6 we will analyse the variables (i.e. starting conditions and management interventions) which have their influence on creating and sustaining team task insight, empowerment and collective commitment. These starting conditions and management interventions are derived from the template presented in figure 3.10 (chapter 3). We will not take all starting conditions and management interventions into the analysis.

The starting conditions that appeared in the cases, but will not be taken into (cross-case) analysis are as follows:

- Technical adjustment
  This is a condition which does not have influence on team task insight, but belongs to the technical domain (of Tichy, 1983)
- Task characteristics
  All projects were high tech research and development projects, so all tasks were complex.
- Partner selection (or: partner acquaintance)
  In a lot of cases there was partner selection, but if this was not the case people mostly became familiar during the ftf kick-off meeting
- Team cohesiveness
  This condition was found in too less cases in the within-case analyses.
- Trust
  The fact that there is a collective commitment in the team to achieve the objectives implicitly gives account to the presence of trust
- Expectations of the outcome
  This condition was almost not found in the within-case analyses.

The management intervention that appeared in the cases, but will not be taken into (cross-case) analysis is as follows:

- Task characteristics
  All projects were high tech research and development projects, so all tasks were complex.
Chapter 4 Case studies
Chapter 5. Emergence and sustenance of strategic momentum

5.1. Introduction
In this chapter, I want to give an answer to the third and the fifth central research question of this research. The third central research question is as follows:

- Do team task insight, empowerment and collective commitment lead to the emergence and sustenance of a strategic momentum?

On the basis of the third central research question, and derived from the causal model (Figure 3.4. in chapter 3), I have composed hypothesis concerning the variables in question (team task insight, empowerment and collective commitment). These hypotheses are presented in section 5.2. In this chapter, we are going to look if these hypotheses can be verified, or falsified, i.e. if there are internal valid outcomes. To test the hypotheses, I conducted a cross-case analysis (see also Yin, 2003; see also chapter 3 of this dissertation). The cross-case analysis is based on the within-case analyses, presented in chapter 4, of eight cases: the Berlin, Lisbon, Paris, Goa, Dewey, Print, Jiaozuo and Groningen projects. A short description of each of these cases is given in section 5.3 concerning strategic momentum at the start, approximately at midterm and at the end of project. In section 5.4., the eight cases were compared concerning the emergence and sustenance of strategic momentum, and the variables (team task insight, collective commitment, and empowerment) which can have their influence on this creation and sustenance. This comparison was conducted at the start, approximately about midterm, and at the end of the project.

The fifth central research question is as follows

- Can the management of a virtual team use the emergence and sustenance of a strategic momentum to realize the objectives of the team?

In section 5.5., I will look at the rating of the project results of each project, and the development of strategic momentum over time (figure 5.1.).

The conclusions concerning the research questions in this chapter are made in section 5.6.

Remark: TTI stand for Team Task Insight, E for Empowerment, CC for Collective Commitment, and SM for Strategic Momentum.

5.2. Presentation of hypotheses
In this section, I will present the hypotheses based on Tichy (1983) concerning the variables in question - team task insight, collective commitment, and empowerment - derived from the causal model (Figure 3.4. in chapter 3). The causal model is the outcome of the theory concerning the emergence and sustenance of strategic momentum, developed on the basis of literature in chapter 3.

According to the TPC-model of Tichy (Tichy, 1983), and applied to strategic momentum, I assume that strategic momentum can be created and sustained when it is managed simultaneously in three domains: the technical, political and cultural domain. The key outcome in the technical domain of management interventions is team task insight in the project plan and in its background. The key outcome in the political domain is the availability of (sufficient) resources, the infrastructure needed and the authority to use these resources and infrastructure according to own insight. This can be summarized as empowering the actors, who have to realize the strategy of the virtual R&D project team. The key outcome in the cultural domain is the collective commitment to pursue the goals of the project. The hypotheses concerning the impact of team task insight, empowerment and collective commitment on strategic momentum, are as follows:
Chapter 5 Emergence and sustenance of strategic momentum

a1. Team task insight positively contributes to the emergence of strategic momentum

a2. Team task insight positively contributes to the sustenance of strategic momentum

b1. Empowerment positively contributes to the emergence of strategic momentum

b2. Empowerment positively contributes to the sustenance of strategic momentum

c1. Collective commitment positively contributes to the emergence of strategic momentum


c2. Collective commitment positively contributes to the sustenance of strategic momentum


d1. The combination team task insight, empowerment and collective commitment contribute positively to the emergence of strategic momentum.


d2. The combination team task insight, empowerment and collective commitment contribute positively to the sustenance of strategic momentum.

So, team task insight enables people to know what to do, empowerment gives them the means to do it and collective commitment gives them the will to do it. (Concerning the model, TTI, E and CC lead to strategic momentum. But we are also interested in the question if each of these factors are necessary, or if they are additive).

5.3. Description of the projects
The description of the projects in this chapter, especially concerning strategic momentum, is based on the analyses of the effective component of strategic momentum and the analysis of the actual strategic momentum. These descriptions are not exhaustive, but a summary of the within-case analyses presented in chapter 4.

As we could see in chapter 3, the actual strategic momentum can be decomposed in effective and ineffective components (figure 3.1). Beforehand I can say that this analysis of the emergence of the effective component of strategic momentum and the analysis of the emergence of the actual strategic momentum only makes a difference concerning the Goa case (see chapter 3, figure 3.1.).

Berlin case

Start of the project
The ftf kick-off meeting was good, because strategic momentum was high after the ftf kick-off meeting. One must take into account that the Berlin project was a follow-up project, in which most of the participants of the former project still participated, and strategic momentum from this former project could continue. Although in a new direction. On the other hand, as in the Print and Jiaozuo project, after the ftf kick-off meeting some follow up meetings were held to increase the team task insight.

Approximately at midterm of the project
Team task insight was unequally distributed over the partners. For some it lasted a long time before team task insight grew. Other partners could work on a task, which was the same as in the previous project. There was at least an average or even great collective commitment in the team. Also because partners used more resources to reach the deadlines. The management style of the project leader was empowering the work package leaders and task leaders as much as possible, by trusting them and giving them much freedom and responsibilities. Approximately about midterm of the project strategic momentum was medium.
Chapter 5 Emergence and sustenance of strategic momentum

End of the project
According to one informant, after some consortium meetings there were some doubts whether the project would end in time with some good results. But at the end of the project more resources were put into the project, so the objectives could be reached. So, to the end of the project the momentum became higher than normal, because more resources were put into the project. (Here, it is not clear if the extra amount of resources put into the project was the result of agreements with the project management. So, it is not clear if the relative momentum stayed normal; at least the absolute momentum increased).

Paris case

Start of the project
It is discussible what the magnitude of strategic momentum was after the ftf kick-off meeting (at least it was into the right direction). In the first place, some momentum from the previous project – as the Paris project was a follow-up project – was taken into the new project. When according to one informant the ftf kick-off meeting lasted for two days and attention was given to interventions which have their influence in the technical and cultural domain, this could lead to a high momentum (but not as high as the Berlin project). When according to another informant the ftf kick-off meeting lasted for only one day and interventions only had their influence in the technical domain, it could lead to a lower (i.e. medium) momentum.

Approximately at midterm of the project
There were differences in team task insight from the beginning in the Paris project team. There were partners who were working in the direction of the project objectives from the beginning, because they knew what they had to do. Other partners had a low team task insight at the beginning, but this team task insight increased when the project progressed in time. Although there was a decrease of collective commitment after six months concerning the whole Paris project team, the collective commitment on team task level was medium or even high. So, the \( \alpha \) remained close to 1 or even an \( \alpha > 1 \) on team task level. Concerning the team task level, an informant said ‘And I think people were really...that the project was doing well. And people were really involved’. The empowerment was high, but not equally distributed over the partners or team members. The empowerment of the partner from Portugal was low during the first year of the project, on the basis of the fact that they did not receive funding during the first year. The empowerment of the French representative in the project was low during the project. Strategic momentum approximately at midterm of the project was medium.

End of the project
At the end of the project, in some task teams the \( \alpha \) became greater than 1, because on the basis of the dissemination activities the collective commitment increased. As one informant said ‘(…) at the end we have regularly presented some papers on conferences in collaboration with two partners, so this is also something that has contributed to us in the conference world. In the past we already had a lot papers, but a lot of the papers now are written in collaboration with two partners’. The empowerment was high, while team task insight was medium. Strategic momentum at the end of the project was medium.

Lisbon case

Start of the project
It was a good ftf kick-off meeting, because the outcome was a high strategic momentum. One must take into account that the Lisbon project was a follow-up project, in which most of the participants of the former project still participated, and strategic momentum from this former
Chapter 5 Emergence and sustenance of strategic momentum

project could continue. Also, because the initiators of the previous project and the Lisbon project intended to start a project for four years, which was not possible, and therefore the project was split into two parts of two years each.

**Approximately at midterm of the project**
It lasted for about a half year before the (task) team members had enough (team) task insight that they all worked into the direction of the objectives of the Lisbon project. But team task insight was also unequally distributed over the partners in the team. At some partners, who were not very committed to the project, there were changes concerning the members who participated in the project. Their team task insight was (very low) nil when they started somewhere in the project, reducing the sum of team task insight for the partner and the virtual R&D team. The collective commitment during the project was unequally distributed over the partners in the team. For most of the team members the collective commitment was high. Some of the partners had a low commitment, as for the team members of these partners. Ftf-meetings and feedback were used to sustain the collective commitment, and the $\alpha$ remained close to 1 (or even $>1$). According to one informant the empowerment in the team was high, but according to the analyses of the three interviews the empowerment was unequally distributed over the partners in the team. Strategic momentum approximately at midterm of the project was medium.

**End of the project**
The project ended with a follow-up project. Two months before the end of the project the last workshop was held. Here, the results were presented. The deliverables of the Lisbon project were mainly Word and Power point documents. At partners also software tools could be developed, but these were not exchanged, on the basis of the competitive character. One partner said they developed a prototype that was evaluated in different case studies. After this meeting, only review work was conducted by the project management. According to one informant ‘Many team members were disappointed because they had expected results from such a project that were the same as commercial results, or industrial results. But that is not possible. This has to do with the fact that competitors work together’. We suppose that team task insight and collective commitment stayed medium until the end of the project. Empowerment stayed high until the end of the project. Strategic momentum at the end of the project was medium.

**Dewey case**

**Start of the project**
It was a bad ftf kick-off meeting, because strategic momentum did not become very much greater than 0. The project proposal was vague, and the aims remained vague for a long time for the partners, so team task insight could not develop properly. Collective commitment was not equally distributed over all partners. Some had a high collective commitment, what became obvious from the clear will to come with an end product. Some had a very low collective commitment, because the aims were vague and the partners wanted to invest less in this project.

**Approximately at midterm of the project**
Team task insight was very low in the beginning of the project, and became not much greater until an ftf meeting after twelve months, were some knots were cut. As one informant said ‘the first year most partners did not know what to do’. A core team (of five partners) was formed, which already had a higher team task insight, which steered the other partners into the right direction. So, their team task insight was high. Team task insight was also high in the developers team in the project. Collective commitment in the team increased when a developers team was formed and started to work. This development group was formed after about 14 to 18 months in the project.
Chapter 5 Emergence and sustenance of strategic momentum

According to the informant ‘It was very hard time for all of developers working more than 38 hours without sleeping and only small breaks for breakfast, lunch and dinner. I was very proud to say that nobody escaped from the group - the moral was very high - and everybody seemed to expect good results from our work’. So, collective commitment has a positive influence on strategic momentum, which was high in this developers team. The partners were much empowered. After a year, when a knot was cut during an ftf meeting, the core team dictated more what the other partners had to do, probably decreasing their empowerment. Strategic momentum approximately at midterm of the project was medium.

End of the project
Team task insight was probably high during the end of the project. Collective commitment of most team members increased, when the developers group presented a ‘nice looking prototype’. During the last half year of the project, the collective commitment was high, because the team wanted to achieve the goal. After a year, when a knot was cut during an ftf meeting, the core team dictated more what the other partners had to do, probably decreasing their empowerment. So, empowerment was medium at the end of the project. Strategic momentum at the end of the project was high

Print case

Start of the project
Strategic momentum could not increase during the ftf kick-off meeting. Therefore, it was a very bad ftf kick-off meeting (they asked the participants if they understood the tasks, but they did not check it). Having more ftf meetings in the beginning of the project compensated this, increasing the team task insight. So, the ftf kick-off meeting in itself at the Print case was more bad than the ftf kick-off meetings of the Dewey and the Goa case, but strategic momentum could develop much faster after the ftf kick-off meeting at the Print case because more ftf meetings where held shortly after the ftf kick-off meeting, increasing at least team task insight. Strategic momentum at the start of the project was very low.

Approximately at midterm of the project
Team task insight could increase by the ftf meetings in the beginning of the project, where the initiator commented the proposals of the work package leaders. In this way, after a while team task insight could develop further, developing the β to get closer to +1. Although the collective commitment was medium to high for some participants in the project during the project, and certainly after the breakthrough, for most of the participants the collective commitment was low or became lower. The initiator kept on managing, although they formally did not have the lead, in a more or less directive way. As they said ‘Someone always has to take charge’. The partners were partly empowered. As one informant said ‘They were stuck with what was written in the proposal as this became part of the contract. Therefore they were stuck with timescales, budgets and deliverables and tasks. But within those constraints they could do whatever was necessary to be able to produce the deliverables on time’. Strategic momentum at approximately midterm of the project was medium.

End of the project
Probably there was a medium team task insight at the end. According to one informant there was less knowledge sharing ‘I have told once a story concerning A., but this was on a request of the commission (…) There was also no need for knowledge sharing, because everyone knew his place’. Certainly at the end, the collective commitment was low in the virtual team. There was empowerment in the team, although the initiator had a directive way of managing. Strategic momentum at the end of the project was medium.
Chapter 5 Emergence and sustenance of strategic momentum

Goa case

Start of the project
The ftf kick-off meeting was not very good, because on the basis of a vague project proposal the effective component of strategic momentum did not become too great. (But better than the Dewey case, on the basis of the collective commitment). The project proposal was vague, and some partners were more focused on their own interests, instead of the interests of the whole team. On the basis of this, in the beginning the team task insight did not develop properly; instead it developed into different directions. But although the effective component of strategic momentum at the start of the project was low, the actual strategic momentum was high. As I concluded at the start of the Goa project in chapter 4: It can be concluded that indeed a strategic momentum was created at the beginning of the project, the magnitude of this strategic momentum was great, but not the desired strategic momentum, because it was caused by sufficient commitment (only concerning the own activities), empowerment, but a lack of team task insight. This lead to a high ineffective component of strategic momentum, which can be made clear with vectors.

(The greatest difference between the vague project description in the Dewey and Goa project is, that in the Dewey project people did not know what to do, while in the Goa project people thought to know what to do, but during the project it became clear that different parts of the project where developed into the wrong direction. So, in the Goa project the project description gave too much room for different interpretations).

Approximately at midterm of the project
After nine months this became obvious to the project management. After their intervention, team task insight could increase, increasing the β into the direction of +1. According to one informant there was (collective) commitment during the whole project ‘the most successful was the active participation of all participants. The fact that they all were motivated to reach the end result’. On the other hand, one informant said ‘most participants were strongly focused on the aim of their own activities. And the use of their results. They were to a lesser extent focused on the broader, publicly use of the results’. So, we may conclude that there was commitment in the team, but a less than average collective commitment in the team during the project. There was empowerment, sustaining the α close to 1. But this empowerment was not equal during the whole project. The intervention of the management after nine months was directive, probably decreasing the empowerment. Strategic momentum at approximately midterm of the project switched from low to medium.

End of the project
After the intervention of the management in the ninth month of the project, team task insight could increase, increasing the β into the direction of +1. Then it stayed medium until the end of the project.

According to an informant, there was a (collective) commitment for sure at the end of the project. There was empowerment in the team. Strategic momentum at the end of the project was medium.

Groningen case

Start of the project
According to one informant ‘the meaning of a kick-off meeting is to get the participants enthusiastic, and that is what it really did’. So, according to this informant the ftf-kick-off meeting established momentum in the team (enthusiasm is an indicator for momentum). So, there was a strategic momentum as a result of the ftf kick-off meeting, but this strategic momentum was medium.
Chapter 5 Emergence and sustenance of strategic momentum

**Approximately at midterm of the project**
Team task insight increased slowly during the first phase of the project, on the basis of a lack of communication between the team members from the different participating organisations. Halfway the project, an evaluation took place that led to choices the team had to make concerning the different parts of the tool. The writing of the evaluation report by the team members led to more intensive collaboration, and to more collective commitment. The empowerment during the project time was high, i.e. the resources could be used at the virtual team members’ own insights. Strategic momentum at approximately midterm of the project was medium.

**End of the project**
The team task insight during March 2006 till March 2007 (and till the end) was low, because there was almost no sharing of knowledge between the partners. The collective commitment during March 2006 till March 2007 was low (and till the end of the project). One can conclude that the empowerment during the project time was high, i.e. the resources could be used at the virtual team members’ own insights. So, strategic momentum at the end (on team level) was low.

**Jiaozuo case**

**Start of the project**
Because there was an ftf kick-off meeting and three follow-up meetings, it does not become clear what the contribution of the ftf kick-off meeting sec was concerning strategic momentum. Strategic momentum was high after the ftf kick-off meeting and the three immediately follow-up meetings during the initial phase of the project. Convergence, as in the Berlin project, was great.

**Approximately at midterm of the project**
Team task insight was sustained by technical knowledge sharing via different communication media, feedback, and participative decision making. In this way team task insight could sustain and the β could stay at 1. The collective commitment in the Jiaozuo team was normal during the project for the whole virtual team, with only a minor disturbance halfway the project. But the collective commitment was not equally distributed over the whole team. Two partners were very committed, but one partner lesser. According to one informant ‘according to me concerning this partner one can speak about social loafing’. The empowerment fluctuated during the project. It was not always possible for the team members to deploy the human resources, on the basis of factors in their organisation. By task reallocation to another partner, empowerment was restored several times. Concerning the financial resources: first the team was empowered, but this empowerment decreased halfway the project when an external organisation started with planning and control.

Strategic momentum during the project was normal during the first six months. The presentation of a tool, which was developed by one of the partners, led to a breakthrough and strategic momentum increased. Although there were interferences, strategic momentum remained high probably till halfway the project, when planning and control was introduced. Then it decreased to medium, until the end of the project.

**End of the project**
Strategic momentum at the end of the project was medium.

In table 5.1. we see strategic momentum of each project respectively at the start, approximately at midterm and at the end of the project. We also see in time what the distance of strategic momentum was between the different projects.
Chapter 5 Emergence and sustenance of strategic momentum

5.4. Relation Team task insight, Empowerment and Collective commitment
In this section, an answer will be given on the third research question ‘Does team task insight, empowerment and collective commitment lead to the development and sustenance of a strategic momentum?’ Therefore, I look at strategic momentum at the start of the project, at approximately midterm, and at the end of the project. I also look at team task insight, empowerment and collective commitment during these three moments in time. I conduct crisp set Qualitative Comparative Analyses (csQCA)\(^\text{14}\). In the first place to see whether or not team task insight, empowerment or collective commitment have a positive contribution to the development and sustenance of strategic momentum. In the second place to see which configurations of these three factors do or do not positively contribute to the emergence and sustenance of strategic momentum.

5.4.1. Emergence of strategic momentum at the start of the project
The emergence of strategic momentum can be spontaneous, but can also be the outcome of management interventions at the start of the project. In this set of cases all projects started with an ift kick-off meeting, after which different strategic momentums emerged.

Based on the pictures emerging at the within-case analyses, I have distinguished four levels of strategic momentum (and team task insight, empowerment and collective commitment). In this section, for the following csQCA we only need + and – ([1] and [0]). We still show four levels, because it can help at step 5 of the analysis: the interpretation.

In the tables that follow in this section (5.4.), I use a level system, which is as follows:
++: High team task insight/empowerment/collective commitment/strategic momentum;

---

\(^{14}\) Beside csQCA I could also choose for Multi-Value (mv)QCA or Fuzzy set (FS)QCA. The latter two analysis did not produce any extra information compared with csQCA. Therefore in this research only csQCA is used.
This means that strategic momentum or variable in question has a value of 1 or greater than 1.

+: Medium team task insight/empowerment/collective commitment/strategic momentum;
This means that strategic momentum or variable in question has a value of about 1.

_: Low team task insight/empowerment/collective commitment/strategic momentum;
This means that strategic momentum or variable in question has a value smaller than 1.

_ _: Very low / absent team task insight/empowerment/collective commitment/strategic momentum
This means that strategic momentum or variable in question has a value much smaller than 1 or even 0.

/: unknown
This means that it is unknown what strategic momentum or variable in question was at that point in time.

For the analyses conducted with csQCA, I must use a dichotomy, rating strategic momentum and variables in question with [0], [1] or [-].

The category [0] is used for:
_: low team task insight/empowerment/collective commitment/strategic momentum;
_ _: very low or absent team task insight/empowerment/collective commitment/strategic momentum.

The category [1] is used for:
++: high team task insight/empowerment/collective commitment/strategic momentum;
+: medium team task insight/empowerment/collective commitment/strategic momentum.

The category [-] is used for:
/: unknown (e.g., because the data is missing)

When one can speak about a ‘turning point’, it is visualized as (for example) - / +.

Concerning this ‘turning point’, I have rated as follows;

_/+ becomes a [1]. The reason is, that [0] can also be seen as a decrease of strategic momentum or the variable in question (e.g. when going from [1] to [0]), and [1] can also be seen as an increase of strategic momentum or the variable in question (when going from [0] to [1]). In the example we can talk about an increase.

_/+ becomes a [1]. The reason is, that [0] can also be seen as a decrease of strategic momentum or the variable in question (e.g. when going from [1] to [0]), and [1] can also be seen as an increase of strategic momentum or the variable in question (when going from [0] to [1]). In the example we can talk about an increase.

++/+ is still a [1]. Although it is a decrease, it is still within the range of [1], specified before.

A1. TTI, E and CC and their impact on the effective component of strategic momentum at the start of the project

Here, the hypotheses are tested concerning the emergence of the effective component of strategic momentum (at the start of the project). To test the hypothesis, I start with analysing the data from table 5.2. with csQCA. I use five key practical steps for csQCA, based on Rihoux et al. (2009). With strategic momentum is meant the effective component of strategic momentum.
Chapter 5 Emergence and sustenance of strategic momentum

**Step 1. Building a dichotomous input table**

For the notation of data in this type of analysis, only a binary system can be used. So, all data have to be operationalised in [0], [1] or [-] when unknown (e.g., because the data is missing) (Table 5.2.).

<table>
<thead>
<tr>
<th>Name project</th>
<th>Team task insight [TTI]</th>
<th>Empowerment [E]</th>
<th>Collective commitment [CC]</th>
<th>Strategic momentum as the outcome of the ftf kick-off meeting (project start)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin case [BER]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Paris case [PAR]</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>+ [1] (There was some disagreement between informants. Some say ++, others +, but it does not make a difference for csQCA)</td>
</tr>
<tr>
<td>Lisbon case [LIS]</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Dewey case [DEW]</td>
<td>_ [0]</td>
<td>_ [0]</td>
<td>+ [1]</td>
<td>_ [0]</td>
</tr>
<tr>
<td>Print case [PRI]</td>
<td>_ [0]</td>
<td>_ [0]</td>
<td>+ [1]</td>
<td>_ [0]</td>
</tr>
<tr>
<td>Goa case [GOA]</td>
<td>_ [0]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>_ [0]</td>
</tr>
<tr>
<td>Groningen case [GRO]</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Jiaozuo case [JIA]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>++ [1] (after ftf kick-off and three immediately follow-up meetings during the initial phase of the project)</td>
</tr>
</tbody>
</table>

Table 5.2. Operationalisation of the data concerning TTI, E and C and their impact on strategic momentum at the start of the project

**Step 2. Constructing a ‘truth’ table (overview of configurations with outcome)**

As discussed in section 3.6.3., I used a software tool called ‘FSQCA’. It is freeware, downloaded from www.compasss.org on June, 23rd 2009. For both outcomes: [0] and [1], the ‘truth table’ must be conducted. For obtaining the ‘truth table’ I chose the ‘truth table algorithm’ (Table 5.3.).

<table>
<thead>
<tr>
<th>TTI</th>
<th>E</th>
<th>CC</th>
<th>number</th>
<th>sm</th>
<th>Consist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0.000000</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
</tr>
</tbody>
</table>

**Legenda**

*number:* the number of cases displaying the combination of conditions

*consist:* the proportion of cases in each truth table row that displays the outcome.

Table 5.3. Truth table (overview of configuration with outcome)

**Step 3. Resolving contradictory configurations**

As we can see in table 5.3., there are no contradictory configurations, because the outcome ‘Consist’ is a 0 or 1. This means that at every configuration found it is either 0 or 1. There are
Chapter 5 Emergence and sustenance of strategic momentum

no configurations that are 0 and 1 at the same time (which would be a contradiction). Therefore, there are no contradictory configurations.

Step 4. Boolean minimization (Determining the causal model)

In this step, I am going to determine the causal model, by determining one or more configurations (or patterns), leading to the outcome (in this case: strategic momentum).

I will take a look at the configurations in three different forms, or solutions. These forms, or solutions, are:

d. The complex solution; this is the formula in which no logical remainders are used.
e. The parsimonious solution; this is the formula in which all logical remainders may be used, without any evaluation of their plausibility.
f. The intermediate solution; this is the formula in which only the logical remainders that ‘make sense’ given the researcher’s substantive and theoretical knowledge are incorporated into the solution.

a. The complex solution

The [1] Configurations (i.e. the configurations with outcome [1])

For obtaining the most complex solution, I used the Quine-McCluskey algorithm, with the setting Positive cases ‘true’ and all others ‘False’. I obtained the following formula (formula 1):

\[ \text{TTI}\ast\text{E}\ast\text{CC} \rightarrow \text{SM} \]

(BER, PAR, LIS, GRO, JIA)

The ‘1’ outcome (emergence of strategic momentum) is observed in virtual teams that combine medium to high Team Task Insight AND medium to high Empowerment AND medium to high Collective Commitment.

The [0] Configurations (i.e. the configurations with outcome [0])

For obtaining the most complex solution, I used the Quine-McCluskey algorithm, with setting the Negative cases to ‘True’ and all others to ‘False’. I obtained the following formula (formula 2)

\[ \text{tti}\ast\text{CC} \rightarrow \text{sm} \]

(GOA, PRI, DEW)

The ‘0’ outcome (non-emergence of strategic momentum) is observed in virtual teams that combine low to very low Team Task Insight AND medium to high Empowerment AND medium to high Collective Commitment.

b. The parsimonious solution

The [1] Configurations

For obtaining the most parsimonious solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’, except the Remainders which I set to ‘Don’t Cares’ (which means: logical remainders included). I obtained the following formula (formula 3):

\[ \text{TTI} \rightarrow \text{SM} \]
Chapter 5 Emergence and sustenance of strategic momentum

(BER, PAR, LIS, GRO, JIA)

The ‘1’ outcome (emergence of strategic momentum) is observed in virtual teams that have medium to high Team Task Insight.

The [0] Configurations

For obtaining the most parsimonious solution, I used the Quine-McCluskey algorithm with setting the Negative cases to ‘True’ and all others to ‘False’, except the Remainders which I set to ‘Don’t Cares’ (which means: logical remainders included). I obtained the following formula (formula 4):

\[ \text{tti} \rightarrow \text{sm} \]

(GOA, PRI, DEW)

The ‘0’ outcome (non-emergence of strategic momentum) is observed in virtual teams that have a low to very low Team Task Insight.

c. The intermediate solution

For deriving the ‘intermediate solution’, I used the Quine-McCluskey algorithm with setting E(mpowerment), Collective) C(ommmitment) and T(eam) T(ask) I(nsight) should contribute to S(trategic) M(omentum) when cause is present. I obtained the following formula (formula 5).

\[ \text{TTI}*E*CC \rightarrow \text{SM} \]

(BER, PAR, LIS, GRO, JIA)

The ‘1’ outcome (emergence of strategic momentum) is observed in virtual teams that combine medium to high Collective Commitment AND medium to high Empowerment AND medium to high Team Task Insight.

In this analysis the intermediate solution is the same as the complex solution.

Step 5. Interpretation

The intermediate solution concerning the emergence of the effective component of strategic momentum at the start of the project, delivers one configuration. The presence of medium or high team task insight, empowerment and collective commitment (TTI*E*CC) is a sufficient (and necessary) combination of conditions leading to the outcome (i.e. medium to high effective component of strategic momentum). This combination is found in the Berlin, Paris, Lisbon, Groningen and Jiaozuo cases.

In the Berlin project, at the start of the project team task insight was high compared with the Paris, Lisbon and Groningen cases (in these cases, team task insight was medium). The reason is that the virtual team leader in the Berlin project took his time to build a shared vocabulary at the start of the project, leading to an easier communication concerning the goals of the virtual R&D project team. ‘Conversion’ was very important for this virtual team leader. A high team task insight was also found at the start in the Jiaozuo project. But here the start was after the ftf kick-off and three immediately follow-up meetings during the initial phase of the project. The virtual team leader did during these ftf meetings his utmost best to ‘get all noses into the right direction’. Therefore, he intervened in the technical domain and the cultural domain, by discussing with the other team members about their definition of the terms he
used, the form and content of the project, the division of tasks, the deadlines for the deliverables, and the end responsibility to each partner organisation.

In the Paris project, the effective component of strategic momentum was medium or high (In the Berlin, Paris, Lisbon and Jiaozuo cases it was high). According to the informant who said that the ftf kick-off meeting lasted for 2 days, it was high. The first day the meeting started late in the morning or in the afternoon, with lectures. In the evening there was a diner, the social aspect, and the next day the meeting lasted till the afternoon. The lectures as a form of technical knowledge sharing, increased team task insight, increasing the $\beta$, so one could operate into the right direction. So, technical knowledge sharing and a kick-off meeting have a positive effect on team task insight. The kick-off meeting also had, on the basis of the social activity, a positive influence on the collective commitment, and $\alpha$ coming close to 1.

But according to the informant who said that the ftf kick-off meeting lasted for only one day, it was medium. In this case the kick-off meeting was only meant for technical adjustment. It probably also increased team task insight, because probably all team members could participate in the discussions, increased the $\beta$, so one could operate in the right direction.

Looking at the complex solution concerning the emergence of the effective component of strategic momentum at the start of the project, I see that the presence of medium or high team task insight, empowerment and collective commitment (TTI*E*CC) is a sufficient (and necessary) combination of conditions leading to the outcome. This combination is found in the Berlin, Paris, Lisbon, Groningen and Jiaozuo cases. In this analysis, the complex solution is the same as the intermediate solution.

Looking at the complex solution concerning the non-emergence of the effective component of strategic momentum at the start of the project, I see that low to very low Team Task Insight and medium to high Collective Commitment (tti*CC) is a sufficient (and necessary) combination of conditions leading to the outcome. This combination is found in the Goa, Print and Dewey cases.

In the Dewey case, team task insight at the start of the project was very low. Team members knew that the project aim description was vague. The project developed itself, by the vague project aim description (and the low team task insight), at the beginning in all directions; it did not have a clear direction. This lead to a low effective component of strategic momentum. On the basis of the vague project aim description the collective commitment in the Dewey case was not equally spread over the partners. The collective commitment was medium.

Concerning team task insight in the Goa case it turned out to be low although people thought they were developing into the same (desired) direction, the effective component of strategic momentum turns out to be low to very low. The collective commitment was high. In the Print case, team task insight could not develop and was low at the start of the project, because there were no discussions concerning the content. The collective commitment was medium, on the basis of social activities. This lead to a low effective component of strategic momentum.

The parsimonious solution, which gives the minimal formula on the basis of the fact that all logical remainders can be used, concerning the emergence of the effective component of strategic momentum at the start of the project, shows that only medium to high team task insight (TTI) is a sufficient and necessary condition. This is found in the Berlin, Paris, Lisbon, Groningen and Jiaozuo cases.

The parsimonious solution concerning the non-emergence of the effective component of strategic momentum at the start of the project shows that only low to very low team task insight (tti) is a sufficient and necessary condition. This is found in the Goa, Print and Dewey cases.
A2. TTI, E and CC and their impact on the actual strategic momentum at the start of the project

Here, the hypotheses are tested concerning the emergence of the actual strategic momentum (at the start of the project). To test the hypothesis, I start with analysing the data from table 5.4. with csQCA. Like the analysis at A1., I use the same steps of analysis. With strategic momentum is meant the actual strategic momentum.

Step 1. Building a dichotomous input table
For the notation of data in this type of analysis, I used the same operationalisation as step 1 in A1. (Table 5.4.).

<table>
<thead>
<tr>
<th>Name project</th>
<th>Team task insight [TTI]</th>
<th>Empowerment [E]</th>
<th>Collective commitment [CC]</th>
<th>Strategic momentum as the outcome of the ftf kick-off meeting (project start)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin case [BER]</td>
<td>++[1]</td>
<td>++[1]</td>
<td>++[1]</td>
<td>++[1]</td>
</tr>
<tr>
<td>Paris case [PAR]</td>
<td>+[1]</td>
<td>++[1]</td>
<td>++[1]</td>
<td>+[1] (There was some disagreement between informants. Some say ++, others +, but it does not make a difference for csQCA)</td>
</tr>
<tr>
<td>Lisbon case [LIS]</td>
<td>+[1]</td>
<td>++[1]</td>
<td>++[1]</td>
<td>++[1]</td>
</tr>
<tr>
<td>Dewey case [DEW]</td>
<td>_[0]</td>
<td>[0]</td>
<td>+[1]</td>
<td>_[0]</td>
</tr>
<tr>
<td>Print case [PRI]</td>
<td>_[0]</td>
<td>_[0]</td>
<td>+[1]</td>
<td>_[0]</td>
</tr>
<tr>
<td>Goa case [GOA]</td>
<td>_[0]</td>
<td>++[1]</td>
<td>++[1]</td>
<td>++[1]</td>
</tr>
<tr>
<td>Groningen case [GRO]</td>
<td>+[1]</td>
<td>++[1]</td>
<td>++[1]</td>
<td>++[1]</td>
</tr>
<tr>
<td>Jiaozuo case [JIA]</td>
<td>++[1]</td>
<td>++[1]</td>
<td>++[1]</td>
<td>++[1] (after ftf kick-off and three immediately follow-up meetings during the initial phase of the project)</td>
</tr>
</tbody>
</table>

Table 5.4. Operationalisation of the data concerning TTI, E and C and their impact on strategic momentum at the start of the project (The only difference with table 5.2. is the outcome [1] for the Goa case).

Step 2. Constructing a ‘truth’ table (overview of configurations with outcome)
A software tool called ‘FSQCA’ was used, as discussed in section 3.6.3. The ‘truth table’ must be conducted for both outcomes: [0] and [1]. For obtaining the ‘truth table’ I chose the ‘truth table algorithm’ (Table 5.5.).
Chapter 5 Emergence and sustenance of strategic momentum

<table>
<thead>
<tr>
<th>TTI</th>
<th>E</th>
<th>CC</th>
<th>number</th>
<th>sm</th>
<th>Consist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.000000</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0.000000</td>
</tr>
</tbody>
</table>

**Legenda**

*number*: the number of cases displaying the combination of conditions  
*consist*: the proportion of cases in each truth table row that display the outcome.

Table 5.5. Truth table (overview of configuration with outcome)

**Step 3. Resolving contradictory configurations**

As we can see in table 5.5., there are no contradictory configurations, because the outcome ‘Consist’ is a 0 or 1.

**Step 4. Boolean minimization (Determining the causal model)**

As we saw under A1., step 4., I am going to determine the causal model, by determining one or more configurations (or patterns), leading to the outcome (in this case: strategic momentum).

I will take a look at the configurations in three different forms, or solutions. These forms, or solutions, are:

a. the complex solution  
b. the parsimonious solution  
c. the intermediate solution

**a. The complex solution**

**The [1] Configurations (i.e. the configurations with outcome [1])**

For obtaining the most complex solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’. I obtained the following formula (formula 6):

\[ E \cdot CC \rightarrow SM \]

(BER, PAR, LIS, GRO, JIA, GOA)

The ‘1’ outcome (emergence of strategic momentum) is observed in virtual teams that combine medium to high Empowerment AND medium to high Collective Commitment.

**The [0] Configurations (i.e. the configurations with outcome [0])**

For obtaining the most complex solution, I used the Quine-McCluskey algorithm with setting the Negative cases to ‘True’ and all others to ‘False’. I obtained the following formula (formula 7):

\[ tti \cdot e \cdot CC \rightarrow sm \]

(PRI, DEW)

The ‘0’ outcome (non-emergence of strategic momentum) is observed
Chapter 5 Emergence and sustenance of strategic momentum

- in virtual teams that combine low to very low Team Task Insight AND medium to high Empowerment AND low to very low Collective Commitment OR
- in virtual teams that combine low to very low Team Task Insight AND low to very low Empowerment AND medium to high Collective Commitment.

b. The parsimonious solution

The [1] Configurations
For obtaining the most parsimonious solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’, except the Remainders which I set to ‘Don’t Cares’. I obtained the following formula (formula 8):

\[ E \rightarrow SM \]

(BER, PAR, LIS, GRO, JIA, GOA)

The ‘1’ outcome (emergence of strategic momentum) is observed in virtual teams that have medium to high Empowerment AND medium to high Collective Commitment.

The [0] Configurations
For obtaining the most parsimonious solution, I used the Quine-McCluskey algorithm with setting the Negative cases to ‘True’ and all others to ‘False’, except the Remainders which I set to ‘Don’t Cares’. I obtained the following formula (formula 9):

\[ e \rightarrow sm \]

(PRI, DEW)

The ‘0’ outcome (non-emergence of strategic momentum) is observed in virtual teams that have a low to very low Collective Commitment OR a low to very low Empowerment.

c. The intermediate solution
For deriving the ‘intermediate solution’, I used the Quine-McCluskey algorithm with setting E(mpowerment), C(collective) C(ommitment) and T(eam) T(ask ) I(nsight) should contribute to S(trategic) M(omentum) when cause is present. I obtained the following formula (formula 10)

\[ E^*CC \rightarrow SM \]

(BER, PAR, LIS, GRO, JIA, GOA)

In this analysis, the outcome of the intermediate solution and the complex solution is the same.

The ‘1’ outcome (emergence of strategic momentum) is observed in virtual teams that combine medium to high Empowerment AND medium to high Collective Commitment.

Step 5. Interpretation
The intermediate solution delivers one combination concerning the emergence of the actual strategic momentum at the start of the project. The presence of medium or high empowerment and collective commitment (E*CC) is a sufficient (and necessary) combination of conditions
leading to the outcome. This combination is found in the Berlin, Paris, Lisbon, Groningen, Jiaozuo and Goa case.

Looking at the complex solution concerning the emergence of the actual strategic momentum at the start of the project, I can see that the presence of medium or high empowerment and collective commitment (E*CC) is a sufficient (and necessary) combination of conditions leading to the outcome. This combination is found in the Berlin, Paris, Lisbon, Groningen, Jiaozuo and Goa case. So, in this analysis the complex solution and the intermediate solution are the same.

Looking at the complex solution concerning the non-emergence of the actual strategic momentum at the start of the project, I see that low to very low Team Task Insight, low to very low Empowerment and medium to high Collective Commitment (tti*e*CC) leads to non-emergence of the outcome. This combination is found in the Print and Dewey case.

Concerning the Print case, too less attention was spend at the ftf kick-off meeting concerning the content of the project. Team members said that they understood the content of the project aim description, but this was not verified. So team task insight was low. Team members were also low empowered, because shortly after the start of the project several ftf meetings were held in which the proposals of the partners were discussed by the leading partner. Collective commitment was medium, because much attention was spend on social activities. Team task insight was very low at the Dewey case, because the project aim description was vague and team members did not know what to do. Empowerment was also low at the start of the project (leading partner). The collective commitment was not equally distributed over all partners. Some partners had a low collective commitment in the beginning. E.g. there was a German partner (not an initiator of the project), which resisted from the beginning against the project and had a very low collective commitment. Others had a greater collective commitment. So, collective commitment was medium.

The parsimonious solution concerning the emergence of the actual strategic momentum at the start of the project delivers one combination. The presence of medium to high empowerment (E) is a sufficient (and necessary) condition leading to the outcome. This condition is found in the Berlin, Paris, Lisbon, Groningen, Jiaozuo and Goa case.

The parsimonious solution concerning the non-emergence of the actual strategic momentum at the start of the project delivers the presence of low to very low empowerment (e), which is a sufficient (and necessary) condition leading to the outcome. This condition is found in the Print and Dewey case.

5.4.2. Midterm strategic momentum

B. TTI, E and CC and their impact on strategic momentum at approx. at the midterm of the project

Here, the hypothesis are tested concerning the sustenance of strategic momentum (at approx. at the midterm of the project). To test the hypothesis, I start with analysing the data from table 5.6. with csQCA. Like the analysis at the start of the project, I use the same steps of analysis.

Step 1. Building a dichotomous input table

In this type of analysis, for the notation of data I used the same operationalisation as step 1 in A1 (Table 5.6.).
Chapter 5 Emergence and sustenance of strategic momentum

<table>
<thead>
<tr>
<th>Name project</th>
<th>Team task insight</th>
<th>Empowerment</th>
<th>Collective commitment</th>
<th>Strategic momentum at approx. the midterm of the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin case (BER)</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>+ [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Paris case (PAR)</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>+ [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Lisbon case (LIS)</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>+ [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Print case (PRI)</td>
<td>+ [1]</td>
<td>+ [1]</td>
<td>_ [0]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Groningen case (GRO)</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>+ [1]</td>
<td>+ [1]</td>
</tr>
</tbody>
</table>

Table 5.6. Operationalisation of the data concerning I, E and C and their impact on strategic momentum at approx. the midterm of the project

**Step 2. Constructing a ‘truth’ table (overview of configurations with outcome)**

I used a software tool called ‘FSQCA’. It is freeware, downloaded from [www.compasss.org](http://www.compasss.org) on June, 23rd 2009, and further discussed in section 3.6.3. For obtaining the ‘truth table’ I chose the ‘truth table algorithm’ (Table 5.7.).

<table>
<thead>
<tr>
<th>TTI</th>
<th>E</th>
<th>CC</th>
<th>number</th>
<th>sm</th>
<th>Consist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

Table 5.7. Truth table (overview of configuration with outcome)

**Step 3. Resolving contradictory configurations**

As we can see in table 5.7., there are no contradictory configurations, because the outcome ‘Consist’ is only a 1.

**Step 4. Boolean minimization (Determining the causal model)**

By determining one or more configurations (or patterns), leading to the outcome (in this case: strategic momentum), I am going to determine the causal model in this step.

As before, I will take a look at the configurations in three different forms, or solutions. These forms, or solutions, are:

a. the complex solution
b. the parsimonious solution
c. the intermediate solution
Chapter 5 Emergence and sustenance of strategic momentum

\textit{a. The complex solution}

\textbf{The [1] Configurations}\nFor obtaining the most complex solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’. I obtained the following formula (formula 11):
\[ \text{TTI}^*\text{E} \rightarrow \text{SM} \]
(BER, PAR, LIS, DEW, PRI, GOA, GRO, JIA)

The ‘1’ outcome (emergence of strategic momentum) is observed in virtual teams that combine medium to high Team Task Insight AND medium to high Empowerment.

\textbf{The [0] Configurations}\nThere are no [0] configurations.

\textit{b. The parsimonious solution}

\textbf{The [1] Configurations}\nFor obtaining the most parsimonious solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’, except the Remainders which I set to ‘Don’t Cares’ (which means: logical remainders included).

The outcome is the message that ‘the 1 matrix contains all configurations’. We can interpret this as that the complex solution is equal to the parsimonious solution.

\textbf{The [0] Configurations}\nThere are no [0] configurations.

\textit{c. The intermediate solution}\nFor deriving the ‘intermediate solution’, I used the Quine-McCluskey algorithm with setting E(mpowerment), Collective C(ommitment) and T(eam) T(ask ) I(nsight) should contribute to S(trategic) M(omentum) when cause is present.

The outcome is that there is no intermediate solution.

\textit{Step 5. Interpretation}\nThere is no intermediate solution, according to the outcome of the csQCA analysis of the intermediate solution. The outcome of the csQCA analysis concerning the parsimonious solution is the message that ‘the 1 matrix contains all configurations’. We can interpret this as that the complex solution is equal to the parsimonious solution.

At approximately midterm of all projects, there was a medium strategic momentum. Looking at the complex solution concerning the sustenance of strategic momentum at approximately midterm of the project, I see that the presence of medium or high team task insight and medium to high empowerment (TTI*E) is a sufficient (and necessary) combination of conditions leading to the outcome. This combination is found in the Berlin, Paris, Lisbon, Dewey, Print, Goa, Groningen and Jiaozuo cases.

So, there is evidence that team task insight and empowerment positively contributes to the sustenance of strategic momentum. But we have to be more critical here. Seven out of eight cases show that collective commitment has a positive influence on the sustenance of strategic
momentum. The only exception is the Print case. Here, we can also talk about a low collective commitment. This is coded as [0]. On the basis of this ‘raw’ determination, collective commitment is not seen as a variable, which has influence on strategic momentum. We doubt about this. In the first place the commitment was unequally distributed over the partners. Some partners had a high commitment, while others had a low commitment. In the second place, there was a leading partner in this virtual R&D team, pushing the project into the right direction until the objectives were met, taking less account about the commitment of other partners. They even took over tasks, which had to be completed by other partners when these did not seem to be able to fulfil these tasks. So, according to us and on the basis of these arguments, the collective commitment positively contributes to the sustenance of strategic momentum.

A ‘weak point’ of the analysis is that there are no cases in which strategic momentum was (very) low or even absent during approximately midterm of the project.

What are the differences between the other cases at approximately midterm of the project?

In the Dewey case, at approximately midterm team task insight increased. Team task insight was very low in the beginning of the project, and became not much greater until an ftf meeting after twelve months, were some knots were cut. Although empowerment was low at the start of the project, it became high afterwards. At approximately midterm it decreased again. The reason was that after a year, when a knot was cut during an ftf meeting, the core team dictated more what the other partners had to do, probably decreasing their empowerment to medium. Collective commitment, which was medium at the start of the project, decreased after the start. A main reason is that during the first year it was unclear what the team had to do. At approximately midterm it increased again to medium. A reason for this increase to medium was the start of a development group after about 14 to 18 months in the project. Much of the problems concerning the unclear requirements were however smoothened in this development group.

In the Print case team task insight was medium on the basis of the ftf meetings after the start of the project, in which comments were made on the project proposals. Empowerment was also medium, because the team could do what they had to do within the boundaries of the project aim description. On the basis of a leading partner, collective commitment was low. This had no influence on the medium strategic momentum, because the lead partner – as we already saw - pushed the project into the right direction until the objectives were met, taking less account about the commitment of other partners.

In the Goa case team task insight was high at approximately midterm of the project. Team task insight did not develop properly, instead developing into different directions. After nine months this became obvious to the project management. After their intervention in an ftf meeting, team task insight could increase. On the other hand, because technical adjustment was the outcome of a directive decision making style, collective commitment at some partners was endangered, because they had to continue with their activities into another direction. This led to a decrease in empowerment and possibly to a decrease of the collective commitment.

During approximately midterm of the Groningen case, team task insight was medium. The empowerment during the project time, and approximately midterm of the project, was great, i.e. the resources could be used at the virtual team members’ own insights. During the beginning of the second phase, approximately at midterm of the project, collective commitment was medium, but to a great extent between organisation H1 and H2. At that time, an evaluation took place that led to choices the team had to make concerning the different parts of the tool. The writing of the evaluation report by the team members led to more intensive collaboration, and to more collective commitment.

In the Jiaozuo case, team task insight was high at approximately midterm of the project. Empowerment decreased to medium. An important reason for this decrease was that first the team was empowered to use the financial resources at will, but this empowerment decreased...
halfway the project when an external organisation started with planning and control. The collective commitment was medium. But the collective commitment was not equally distributed over the whole team. Two partners were very committed, but one partner lesser. According to one informant ‘according to me concerning this partner one can speak about social loafing’.

5.4.3. Strategic momentum at the end of the project

C. TTI, E and C and their impact on strategic momentum at the end of the project
Here, the hypothesis is tested concerning the sustenance of strategic momentum (at the end of the project). To test the hypothesis, I start with analysing the data from table 5.8. with csQCA. Like the analysis at the start of the project, I use the same steps of analysis.

Step 1. Building a dichotomous input table
In this type of analysis, I used the same operationalisation as step 1 in A1 for the notation of data (Table 5.8.).

<table>
<thead>
<tr>
<th>Name</th>
<th>Project</th>
<th>Team task insight</th>
<th>Empowerment</th>
<th>Collective commitment</th>
<th>Strategic momentum at the end of the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>(BER)</td>
<td>+ (according to L3); ++ (according to L1)</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>++ (higher than normal) [1]</td>
</tr>
<tr>
<td>Paris</td>
<td>(PAR)</td>
<td>+ (According to N1 it was medium; according to N3, it was high). [1]</td>
<td>++ [1]</td>
<td>++ [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Lisbon</td>
<td>(LIS)</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>+ [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Dewey</td>
<td>(DEW)</td>
<td>+/+ [1]</td>
<td>+ [1]</td>
<td>+/++ [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Print</td>
<td>(PRI)</td>
<td>+ [1]</td>
<td>+ [1]</td>
<td>_ [0]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Goa</td>
<td>(GOA)</td>
<td>+ [1]</td>
<td>+ [1]</td>
<td>+ [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Groningen</td>
<td>(GRO)</td>
<td>_ (this is the team task insight on virtual team level; team task insight at each of the partners was great) [0]</td>
<td>++ [1]</td>
<td>_ [0]</td>
<td>_ (this is strategic momentum on virtual team level; strategic momentum at each of the partners was great!) [0]</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>(JIA)</td>
<td>/ (data is missing) [-]</td>
<td>/ (data is missing) [-]</td>
<td>/ (data is missing) [-]</td>
<td>+ [1]</td>
</tr>
</tbody>
</table>

Because in case Jiaozuo it is unknown what the level of the causal conditions (team task insight, empowerment and collective commitment) are, I decided not to take this case into the analysis (Table 5.8.). Because at the end of the project the Groningen case is not real teamwork anymore, but the (separate) work of the different organisations, I also decided to exclude this case from analysis (Table 5.8.).

Table 5.8. Operationalisation of the data concerning I,E and C and their impact on strategic momentum at the end of the project
Step 2. Constructing a ‘truth’ table (overview of configurations with outcome)
The software tool ‘FSQCA’, which I used, is freeware, downloaded from www.compasss.org on June 23rd 2009. It is further discussed in section 3.6.3. For obtaining the ‘truth table’ I chose the ‘truth table algorithm’ (Table 5.9.).

<table>
<thead>
<tr>
<th>TTI</th>
<th>E</th>
<th>CC</th>
<th>number</th>
<th>sm</th>
<th>Consist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

Table 5.9. Truth table (overview of configuration with outcome)

Step 3. Resolving contradictory configurations

As we can see in table 5.9., there are no contradictory configurations, because the outcome ‘Consist’ is only a 1.

Step 4. Boolean minimization (Determining the causal model)

In this step, I am going to determine the causal model, by determining one or more configurations (or patterns), leading to the outcome (in this case: strategic momentum).

I will take a look at the configurations in three different forms, or solutions. These forms, or solutions, are:

a. the complex solution
b. the parsimonious solution
c. the intermediate solution

a. The complex solution

The [1] Configurations
For obtaining the most complex solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’. I obtained the following formula (formula 12)

TTI*E → SM

(BER, PAR, LIS, DEW, PRI, GOA)

The ‘1’ outcome (emergence of strategic momentum) is observed in virtual teams that combine medium to high Team Task Insight AND medium to high Empowerment.

b. The parsimonious solution

The [0] Configurations
There are no [0] configurations.

b. The parsimonious solution

The [1] Configurations
For obtaining the most parsimonious solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’, except the Remainders which I set to ‘Don’t Cares’ (which means: logical remainders included).
Chapter 5 Emergence and sustenance of strategic momentum

The outcome is the message that ‘the 1 matrix contains all configurations’. We can interpret this as that the complex solution is equal to the parsimonious solution.

**The [0] Configurations**

There are no [0] configurations.

c. **The intermediate solution**

For deriving the ‘intermediate solution’, I clicked the “Standard Analyses” button. Then I filled in that E(mpowerment), C(collective) C(ommitment) and T(eam) T(task ) I(nsight) should contribute to S(trategic) M(omentum) when cause is present. The outcome is that there is no intermediate solution.

**Step 5. Interpretation**

There is no intermediate solution, according to the outcome of the csQCA analysis of the intermediate solution. The outcome of the csQCA analysis concerning the parsimonious solution is the message that ‘the 1 matrix contains all configurations’. We can interpret this as that the complex solution is equal to the parsimonious solution.

At the end of the projects, there was a medium to high strategic momentum. Looking at the complex solution concerning the sustenance of strategic momentum at the end of the project, I see that the presence of medium or high team task insight and medium or high empowerment (TTI*E) is a sufficient (and necessary) combination of conditions leading to the outcome. This combination is found in the Berlin, Paris, Lisbon, Dewey, Print, Goa.

The outcome of the csQCA analysis is that strategic momentum at the end of the project is sustained by the variables in question team task insight and empowerment. So, there is evidence that team task insight and empowerment lead to the sustenance of strategic momentum. But we have to be more critical here too. Five out of six cases show that collective commitment has its influence on strategic momentum. The only exception (again) is the Print case. In this case, we can also talk about a low collective commitment. This is coded as [0]. On the basis of this ‘raw’ determination, collective commitment is not seen as a variable, which has influence on strategic momentum. We doubt about this. Concerning the Print project in the first place the commitment was unequally distributed over the partners. Some partners had a high commitment, while others had a low commitment. In the second place, there was a leading partner in this virtual R&D team, pushing the project into the right direction until the objectives were met, taking less account about the commitment of other partners. They even took over tasks, which had to be completed by other partners when these did not seem to be able to fulfil these tasks.

So, according to us and on the basis of these arguments, the collective commitment positively contributes to the sustenance of strategic momentum.

A ‘weak point’ of the analysis is that there are no cases in which strategic momentum was (very) low or even absent during the end of the project.

What are the differences between the other cases at the end of the project?

In the Berlin case, team task insight was medium according to one informant, and high according to another one. Empowerment was medium. Collective commitment was high. This resulted in a high strategic momentum at the end of the project.

In the Paris case, team task insight was medium according to one informant, and high according to another one. Empowerment was high. Collective commitment was high. This resulted in a medium strategic momentum at the end of the project.
Chapter 5 Emergence and sustenance of strategic momentum

In the Lisbon case, team task insight was medium. Empowerment was high. Collective commitment was medium. This resulted in a medium strategic momentum at the end of the project.
In the Dewey case, team task insight was high. Empowerment was medium. Collective commitment was high. This resulted in a high strategic momentum at the end of the project.
In the Print case, team task insight was medium. Empowerment was medium. Collective commitment was low. This resulted in a medium strategic momentum at the end of the project.

5.5. Project results
The fifth central research question formulated in section 3.4. was: can the management of a virtual team use the emergence and sustenance of a strategic momentum to realize the objectives of the team?
To give an answer to this question I must take a look at the ranking of the different project results, and the development of strategic momentum over time (figure 5.1).
### Chapter 5 Emergence and sustenance of strategic momentum

<table>
<thead>
<tr>
<th>Name project</th>
<th>Strategic momentum as the outcome of the FfT kick-off meeting (project start)</th>
<th>Strategic momentum at approx. the midterm of the project</th>
<th>Strategic momentum at the end of the project</th>
<th>Project results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin case [BER]</td>
<td>++ [1] (There was some disagreement between informants. Some say ++, others +, but it does not make a difference for csQCA)</td>
<td>+ [1]</td>
<td>++ (higher than normal) [1]</td>
<td>7</td>
</tr>
<tr>
<td>Paris case [PAR]</td>
<td>+ [1]</td>
<td>+ [1]</td>
<td>+ [1]</td>
<td>7</td>
</tr>
<tr>
<td>Lisbon case [LIS]</td>
<td>++ [1]</td>
<td>+ [1]</td>
<td>+ [1]</td>
<td>7</td>
</tr>
<tr>
<td>Dewey case [DEW]</td>
<td>_ [0]</td>
<td>+ [1]</td>
<td>++ [1]</td>
<td>9</td>
</tr>
<tr>
<td>Print case [PRI]</td>
<td>_ _ [0]</td>
<td>+ [1]</td>
<td>+ [1]</td>
<td>9</td>
</tr>
<tr>
<td>Goa case [GOA]</td>
<td>_ [0]</td>
<td>+/+ [1]</td>
<td>+ [1]</td>
<td>8</td>
</tr>
<tr>
<td>Groningen case [GRO]</td>
<td>++ [1]</td>
<td>+ [1]</td>
<td>_ (this is strategic momentum on virtual team level; strategic momentum at each of the partners was great!) [0]</td>
<td>6 (on virtual team level)</td>
</tr>
<tr>
<td>Jiaozuo case [JIA]</td>
<td>++ [1] (after FfT kick-off and three immediately follow-up meetings during the initial phase of the project)</td>
<td>++/+ [1]</td>
<td>+ [1]</td>
<td>8</td>
</tr>
</tbody>
</table>

**Legenda**

6 – enough  
7 – more than enough  
8 – good  
9 – very good

Figure 5.1. The development of strategic momentum over time and the ranking of the project results.

The ranking of the project results is based on the following analysis:

Berlin case (7). It was a successful project in meeting the requirements, but the end result was so vaguely defined, that it was always good!

Paris case (7). Also here, it was a successful project in meeting the requirements. But as was the case in the Berlin project, the end results were so vaguely defined, that they could always be reached.
Chapter 5 Emergence and sustenance of strategic momentum

Lisbon case (7). What is said about the Berlin and Paris case, can also be said about this project: successful in meeting the requirements, but vaguely defined end results so that they could always be reached.

Dewey case (9). This project was very successful, thanks to the development team, and the end result was reached. According to one informant the project ‘was successful because it has achieved its objectives, and these are justified by the EU’.

Print case (9). This project was successful by reaching the objectives, also because the ones who started the project, one firm, had a commercial aim with the project.

Goa case (8). The project was quite successful, although in the end the project did not deliver to the extend of what had been possible. The project objectives were as good as all achieved.

Groningen case (6). Although two tools were delivered in the end, it was not the product of the whole team.

Jiaozuo case (8). According to one informant ‘the project was a success in the perception of students and teachers’.

5.6. Conclusions concerning the research questions in this chapter
In section 5.2, I presented the hypotheses concerning the impact of team task insight, empowerment and collective commitment on strategic momentum, which are as follows:

a1. Team task insight positively contributes to the emergence of strategic momentum

a2. Team task insight positively contributes to the sustenance of strategic momentum

b1. Empowerment positively contributes to the emergence of strategic momentum

b2. Empowerment positively contributes to the sustenance of strategic momentum

c1. Collective commitment positively contributes to the emergence of strategic momentum

c2. Collective commitment positively contributes to the sustenance of strategic momentum

d1. The combination team task insight, empowerment and collective commitment contribute positively to the emergence of strategic momentum.

d2. The combination team task insight, empowerment and collective commitment contribute positively to the sustenance of strategic momentum.

The analyses showed that we deal with configurations, not with single variables which have their influence on, in this case, strategic momentum. So, we will only look on the level of configurations (or combinations). Therefore, we will only look at the hypothesis d1 and d2. In section 5.4.1., 5.4.2. and 5.4.3., I have looked at the configurations in three different forms, or solutions. These forms, or solutions, are the complex solution, the parsimonious solution, and the intermediate solution. According to Ragin (2008, p 111) ‘In general “intermediate” solutions are superior to both the “complex” and “parsimonious” solutions and should be a routine part of any application of any version of QCA’.
5.6.1. Emergence of strategic momentum at the start of the project

TTI, E and CC and their impact on the effective component of strategic momentum at the start of the project

From the intermediate solution, I can conclude that for the emergence of the effective component of strategic momentum, the presence of medium or high team task insight, empowerment and collective commitment (TTI*E*CC) is a sufficient (and necessary) combination of conditions leading to this outcome. This is also confirmed by the complex solution concerning the emergence of the effective component of strategic momentum at the start of the project.

On the basis of the parsimonious solution I can conclude that team task insight is an important condition for the emergence or non emergence of the effective component of strategic momentum at the start of the project.

This outcome of the parsimonious solution is not so surprising. When team task insight is low to very low, the project will develop in all directions, and the effective component of strategic momentum will be low, no matter if collective commitment and empowerment are high. So, team task insight has its effect on the direction of strategic momentum, and therefore on the beta.

The presence of team task insight has a very strong impact on the emergence of the effective component of strategic momentum. But it is not sufficient, because empowerment and collective commitment have their influence too.

TTI, E and CC and their impact on the actual strategic momentum at the start of the project

The difference between the analysis of configurations concerning the effective component and the actual strategic momentum is the outcome of the Goa case. Concerning the effective component of strategic momentum, the outcome of the Goa case is [0] at the start of the project. Concerning the actual strategic momentum, the outcome of the Goa case is [1] at the start of the project. The reason for this difference is that at the start of the project some partners thought they were developing into the same direction (i.e. had the same team task insight), but after some time the management found out that they were developing into different directions (i.e. team task insight turned out to be low or very low).

From the intermediate solution, I can conclude that for the emergence of the actual strategic momentum, the presence of medium or high empowerment and collective commitment (E*CC) is a sufficient (and necessary) combination of conditions leading to this outcome. This is also confirmed by the complex solution concerning the emergence of the actual strategic momentum at the start of the project.

This outcome is not so surprising. Concerning the actual strategic momentum, put people together with enough resources and enthusiasm, and strategic momentum will emerge. This strategic momentum can develop in every direction.

Over all conclusions concerning the emergence of strategic momentum at the start of the project

From the parsimonious solution I learn that the presence of team task insight has a very strong impact on the emergence of the effective component of strategic momentum. When team task insight is low to very low, the project will develop in all directions, and the effective component of strategic momentum will be low, no matter if collective commitment and
empowerment are high. So, team task insight has its effect on the direction of strategic momentum, and therefore on the beta. But it is not sufficient, because from the intermediate solution I learn that empowerment and collective commitment have their influence too. From the intermediate solution I learn that the presence of medium or high empowerment and collective commitment have a very strong impact on the emergence of the actual strategic momentum. Concerning the actual strategic momentum, the beta (which is equal to \( \cos q \), with \( q \) the angle between the actual and the desired direction of working (i.e. the effective component of strategic momentum)), is the angle between the vectors a and b in figure 3.1. (With \( q \) between 0 and 180 degree, \( \beta \) lies between +1 and −1) and thus team task insight does not matter. So, we can conclude that for the emergence of strategic momentum the combination (or configuration) medium to high team task insight, and medium to high empowerment and medium to high collective commitment is a necessary and probably sufficient configuration.

5.6.2. Sustenance of strategic momentum

**TTI, E and CC and their impact on the sustenance of strategic momentum at approximately midterm of the project**

Here, I did not make a distinction between the effective component of strategic momentum and the actual strategic momentum because at approximately midterm all projects were developing into the desired direction. So, the effective component of strategic momentum was the same as the actual component of strategic momentum.

At approximately midterm of all projects, there was a medium strong strategic momentum. We can conclude, also based on the interpretation at this phase, that the combination of medium to high team task insight, medium to high empowerment and medium to high collective commitment are a necessary and probably sufficient combination for the sustenance of strategic momentum in a virtual R&D project team.

**TTI, E and CC and their impact on the sustenance of strategic momentum at the end of the project**

In the end, all projects were developing in the desired direction. Therefore the effective component of strategic momentum was the same as the actual component of strategic momentum.

We can conclude, also based on the interpretation at this phase, that the combination of medium to high team task insight, medium to high empowerment and medium to high collective commitment are a necessary and sufficient combination for sustaining strategic momentum in a virtual R&D project team.

**Over all conclusions**

At the end we can conclude that the third central research question ‘does team task insight, empowerment and collective commitment lead to the emergence and sustenance of a strategic momentum?’ can be answered (within the constraints of this study) with yes. Because over all we can conclude that the combination of medium to high team task insight, medium to high empowerment and medium to high collective commitment are a necessary and probably sufficient combination for the emergence and sustenance of strategic momentum in a virtual R&D project team. I say probably, because with only eight cases there is the chance that there are valid ‘rival explanations’.
Concerning the fifth central research question, ‘can the management of a virtual team use the emergence and sustenance of a strategic momentum to realize the objectives of the team?’, our conclusion is as follows. As we saw in section 5.5, we have tried to make a differentiation concerning the ‘ranking’ of the cases, but concerning these cases the differentiation was small, with the exception of one case: the Groningen case. This was a case with a very small strategic momentum. Although two tools were delivered in the end, it was not the product of the whole team. The project result on team level was rated with a 6. So, concerning the question if the management of a virtual team can use the emergence and sustenance of a strategic momentum to realize the objectives of the team, there is only supportive evidence in the Groningen case.

The other cases were cases with a medium to high strategic momentum, like the Dewey and Print cases. Looking at these outcomes, we need more evidence on the relation between strategic momentum and eventual success.

5.7. Design proposition
As already said in section 3.5.4., the typical outcomes of design science research are solution-concepts and design propositions. I could now present ‘straightforward’ solution concepts on the basis of the former conclusions in section 5.6., but in Design Science Research the solution concepts follow CIMO-logic, meaning problem-in-Context (C), Intervention (I), Mechanism (M) and Outcome (O) (Denjer, Tranfield and van Aken, 2008). In other words, when you have a specific class of problematic Contexts, this intervention (I) type (which is the solution concept) may be used, leading to these outcomes. Generative mechanisms connect the intervention type with the outcome, and make this connection more transparent. The mechanisms (M) mentioned in this CIMO-logic will be presented in the form of design propositions. A design proposition is ‘a chunk of general knowledge, linking an intervention or artefact with a desired outcome or performance in a certain field of application’ (van Aken, 2004a; van Aken, 2004b). A design proposition is translatable in action that has to be contextualised. A design proposition is typically not totally general, but applicable to a certain application-domain, a class of problems, in this case virtual R&D project teams. So, it is not only important to know what intervention is used, but also to know why this intervention produces the outcome.

So, my first design proposition (as introduced in section 3.5.4.) was as follows:

Design proposition 1: In order to overcome the management problems, caused by the limited face-to-face contacts in virtual teams (C), team management and team members should use certain interventions (I) in order to increase its effectiveness (O) by the perseverance in goal seeking behaviour (M).

The main objective of my research was to develop and test these interventions.

On the basis of the TPC-model of Tichy (1983) I hypothesized that strategic momentum in virtual teams can emerge and be sustained through three factors, or independent variables. In the TPC-model TPC stands for the technical (T), political (P) and cultural (C) domains, for virtual teams operationalised through respectively the factors team task insight, empowerment, and collective commitment. These hypotheses have been confirmed in this chapter. So, three design propositions can be presented, which are as follows:

Design proposition 2: In order to overcome (management) problems that occur in a virtual R&D project team on the basis of the lack of face-to-face contacts (C), team manager and team members should develop and sustain team task insight (I) aimed to increase the effectivity of the virtual team (O) by the positive influence on the emergence and sustenance of strategic momentum (M).
Chapter 5 Emergence and sustenance of strategic momentum

Design proposition 3: In order to overcome (management) problems that occur in a virtual R&D project team on the basis of the lack of face-to-face contacts (C), team manager and team members should develop and sustain empowerment (I) aimed to increase the effectivity of the virtual team (O) by the positive influence on the emergence and sustenance of strategic momentum (M).

Design proposition 4: In order to overcome (management) problems that occur in a virtual R&D project team on the basis of the lack of face-to-face contacts (C), team manager and team members should develop and sustain collective commitment (I) aimed to increase the effectivity of the virtual team (O) by the positive influence on the emergence and sustenance of strategic momentum (M).

In this chapter, we analysed with crisp set Qualitative Comparative Analysis (csQCA) the variables team task insight, empowerment and collective commitment and their probable influence on the emergence and sustenance of strategic momentum. We saw, that these variables indeed lead to the emergence and sustenance of strategic momentum. Therefore, we could formulate several design propositions in the basis of CIMO-logic.

In chapter 6, we will give an answer to the fourth central research question of this research, ‘what starting conditions and what management interventions can lead to the creation and sustenance of team task insight, empowerment and/or collective commitment?’ We will also use crisp set Qualitative Comparative Analysis (csQCA) to conduct the analyses.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

6.1. Introduction
In this chapter, I want to give an answer to the fourth central research question of this research. The fourth central research question is as follows:
- What starting conditions and what management interventions can lead to the creation and sustenance of team task insight, empowerment and/or collective commitment?

The starting conditions and management interventions were originally gathered by analysing the explorative study and by literature research in the field of virtual teams. These starting conditions and management interventions were placed in a template, which was then used for the analysis of the eight different cases with support of the software program Atlas TI. On the one hand, when new starting conditions and/or management interventions were found in the text, i.e. cases, these were added to the template and all texts, i.e. cases were analysed again with this new template. This process was repeated until no new starting conditions and/or management interventions were found in the cases. On the other hand, when a starting condition or management intervention in the initial template was not found in the texts i.e. cases, this starting condition or management intervention was deleted from the template. On the basis of the outcome of the analysis with the template, a within-case analysis was written for each of the eight cases: the Berlin, Lisbon, Paris, Goa, Dewey, Print, Jiaozuo and Groningen projects.

As we saw in chapter 5, in these within-case analyses much attention was spend on the impact of a starting condition or management intervention on the variables TTI, E or CC. If there was an impact or not was derived literally from the text, or from logical reasoning. The same was done for the nature of this impact.

For the cross-case analysis (see also Yin, 2003; see also chapter 3 of this dissertation) presented in this chapter we have used the logic of hypotheses. By using hypotheses, we can look at the impact of the individual starting condition or management intervention on the creation and/or sustenance of TTI, E and/or CC. Then we can look if these hypotheses can be verified, or falsified i.e. if there are internal valid outcomes.

The final template (Figure 3.8 in chapter 3) was the starting point for the development of these hypotheses. We have looked at the most important starting conditions and management interventions and developed hypotheses for each of them. The hypotheses were developed on the basis of the qualitative within-case analyses. Some hypotheses were developed on the basis of the outcome of the cross-case analysis. When we assumed for example that a starting condition or management intervention in most cases (based on the qualitative within-case analyses) had a positive impact on TTI, E, or CC, this positive impact was incorporated in the hypotheses concerning that starting condition or that management intervention.

But I am not mainly interested in the impact of the individual starting condition or management intervention on the creation and/or sustenance of TTI, E and/or CC. I am more interested in the question which configurations of these starting conditions and management interventions do or do not positively contribute to the creation and sustenance of TTI, E or CC. Therefore, I conducted crisp set Qualitative Comparative Analyses (csQCA). As we will see, some starting conditions or management interventions, although hypotheses have been formulated, will not be enclosed in the csQCA. This will be the case when there is too less or no evidence for testing the hypothesis. A hypothesis will be tested if there are at least three cases in which an impact could be found of the starting condition or management intervention on TTI, E or CC.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

Concerning the structure of this chapter: I want to know more about the creation of TTI, E and CC and this will be analysed at the beginning of the projects (cases) in section 6.2. Here, the eight cases were compared concerning the starting conditions and/or management interventions that can have influence on the creation of the variables TTI, E and CC. I also want to know more about the sustenance of TTI, E and CC and this will be analysed at the continuation of the projects (cases) in section 6.3. Here, the eight cases were compared at approximately midterm of the project concerning the starting conditions and/or management interventions that can have influence on the sustenance of the variables TTI, E and CC. The conclusions concerning the research question in this chapter are made in section 6.4.

Remark: TTI stand for Team Task Insight, E for Empowerment, CC for Collective Commitment, and SM for Strategic Momentum.

### 6.2. Creation of team task insight, empowerment and collective commitment

In the tables that follow in this section (6.2.) and the following section (6.3. Sustenance), I use two different rating systems, which are as follows.

The first rating system is used for the covariance tables that present the impact of a starting condition or management intervention on team task insight, empowerment or collective commitment. These ratings are as follows:

++: positive impact;
+: medium impact;
_: negative impact;
_/_: no team task insight/empowerment/collective commitment;
_/: neutral/no effect (impact)

The second rating system is used when dealing with the csQCA analyses. Here, I need the binary system. These ratings are as follows:

The category [0] is used for:
_: Low team task insight/empowerment/collective commitment;
This means that the variable in question has a value smaller than 1.
_/_: Very low / absent team task insight/empowerment/collective commitment
This means that the variable in question has a value much smaller than 1 or even 0.

The category [0] is used, when the starting condition (starting condition) or management intervention is almost the same (e.g. difference in professional background) or absent.

The category [1] is used for:
++: High team task insight/empowerment/collective commitment;
This means that the variable in question has a value of 1 or greater than 1.
+: Medium team task insight/empowerment/collective commitment;
This means that the variable in question has a value of about 1.

The category [1] is used, when the starting condition (starting condition) or management intervention is present.

The category [-] is used, when it is unknown whether the starting condition (starting condition) or management intervention is present or absent. In other words: it is unknown what the value of the variable in question was at that point in time.
6.2.1. Team task insight

Team task insight can to some extent emerge spontaneously, but it can also emerge by management interventions and starting conditions.

The hypotheses concerning the management interventions and starting conditions and their impact on team task insight are as follows:

a. Different professional backgrounds of team members negatively contributes to the creation of team task insight (This is a starting condition)

b. Different (National) cultural backgrounds of team members negatively contributes to the creation of team task insight (This is a starting condition)

c. A clear project description positively contributes to the creation of team task insight (starting condition: project proposal content)

d. Planning or training (during the ftf kick-off meeting; as a ‘convergence of terminology/workshops’ intervention) positively contributes to the creation of team task insight

e. Participative decision making (starting condition: project proposal definition process; as a ‘management style’ intervention) positively contributes to the creation of team task insight

f. An ftf kick-off meeting (as a ‘content oriented’ intervention) positively contributes to the creation of team task insight

The hypotheses, which are the outcome of the cross-case analysis, are as follows:

g. A small difference in knowledge between the partners in the virtual R&D project team positively contributes to the creation of team task insight

h. Dominant leading partners have a negative influence on the creation of team task insight

Now, I will present the written outcome of the cross-case analysis concerning the management interventions and starting conditions. First, I will start with the six starting conditions. These do not belong to the project process, but have their impact on the creation of TTI. In some cases, e.g. when dealing with differences in cultural and professional background, these starting conditions also have their impact on the sustenance of TTI. The hypotheses concerning these starting conditions and their impact on the sustenance of TTI, although they will be used in the csQCA analysis in section 6.3., are verified/falsified here too. The main reason is that the written outcome of the cross-case analyses leading to the verification/falsification of both types of hypothesis (creation and sustenance of TTI) is the same.

Second, I will present the management interventions, which have their impact on TTI during the start of the project (which in all cases is the ftf kick-off meeting).
Cultural background (national) of team members

Impact of difference in (national) cultural background of team members on team task insight

In six out of eight cases there were differences concerning cultural background of the team members. In two cases, the cultural background of the virtual team members was the same (Groningen and Jiaozuo).

In the Berlin and Lisbon project especially the Fins were reserved, which sometimes had a negative impact on technical knowledge transfer and team task insight.

Differences in cultural background were in the Lisbon project also seen as an enrichment, ‘The different culture is very important, to have new ideas’, thus leading to more team task insight.

Communication disturbances were also on the basis of a difference in cultural background in the Paris project ‘For example when a German person doesn't reply to your e-mail, that's when he agrees. When a French person doesn't answer to an e-mail, you don't know if he agrees or not. So this is a bit different’. Probably having a negative influence on team task insight.

In the Print project, the difference in cultural background had no influence on the project.

According to one informant ‘This had no consequences for the project. I think that the individual differences within the Netherlands are greater than within that team’.

In table 6.1., we give an overview of the impact of difference in (national) cultural background of team members on team task insight.

<table>
<thead>
<tr>
<th></th>
<th>Difference in (national) cultural background</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>–</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
<td>–</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
<td>– and +</td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Dewey</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Groningen</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>No</td>
<td>/</td>
</tr>
</tbody>
</table>

Table 6.1. Impact of difference in (national) cultural background of team members on team task insight

Out of six cases in which cultural background of team members differed, two showed a negative impact (Berlin and Paris) on team task insight, one a negative and positive impact (Lisbon), and one no impact (Print).

So, there is an indication that the hypothesis that ‘Different (National) cultural backgrounds of team members have a negative influence on the creation of team task insight (This is a factor or a starting condition)’ can be verified.

Anticipating on the analysis in section 6.3., I can also state that there is an indication that the hypothesis ‘Different (National) cultural backgrounds of team members have a negative influence on the sustenance of team task insight (This is a factor or a starting condition)’ can be verified.
Professional background of team members

Impact of difference in professional background of team members on team task insight

The professional background of the team members in the Berlin project was *almost* the same. But small differences could lead to big problems. The same terminology was interpreted in a different way by different scientific fields, what could lead to ‘a Babel of tongues’. To prevent this problem, at the beginning of the project a scientific article was distributed under the team members in which the terminology, with one interpretation, was written down. This terminology, and interpretation, was adopted as the standard in the project. Communication disturbances were decreased in this way, probably increasing the team task insight during technical knowledge transfer.

In the Paris project, the professional background of the team members was almost the same, but the differences were perceived as fruitful. The different views could lead to a greater team task insight.

In the Lisbon project the professional background of the team members was almost the same and did not lead to communication disturbances.

In the Jiaozuo project the professional background of the team members was different. According to an informant this lead in the beginning to communication problems: ‘I still remember that I was startled by the ICT language, which I did not understand’. This lead to communication disturbances, delaying the development of team task insight. On the other hand, according to another informant the team talked much about the terminology used in the beginning of the project, so that team task insight could increase.

This was also the case in the Dewey and the Goa project, where the difference in professional background lead to a ‘Babel of tongues’, because team members had different views on the subject; different meanings for the same words. This had a negative influence on the team task insight.

In the Print and Groningen project the team members had a different professional background. No (communication) disturbances were reported on the basis of this.

In table 6.2., we give an overview of the impact of difference in professional background of team members on team task insight

<table>
<thead>
<tr>
<th></th>
<th>Difference in professional background</th>
<th>Convergence of terminology/workshops</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Almost the same</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Paris</td>
<td>Almost the same</td>
<td>No</td>
<td>++</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Almost the same</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Dewey</td>
<td>Yes</td>
<td>No</td>
<td>_</td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Yes</td>
<td>Yes</td>
<td>and ++</td>
</tr>
</tbody>
</table>

Table 6.2. Impact of difference in professional background of team members on team task insight

Two out of eight cases show a negative correlation between difference in professional background and team task insight (Dewey and Goa). In two other cases, the correlation between the aforementioned two variables would also be negative, but on the basis of convergence of terminology (Jiaozuo)/workshops (Berlin), this correlation turns out to be positive. One case shows a positive correlation between difference in professional background and team task insight (Paris). In the other three cases there was no correlation between the aforementioned two variables.
So, there is an indication that the hypothesis that ‘Different professional backgrounds of team members have a negative influence on the creation of team task insight’, can be verified. There is also an indication that convergence of terminology/workshops can change this negative hypothesis in a positive one.

Anticipating on the analysis in section 6.3., there is an indication that the hypothesis that ‘Different professional backgrounds of team members have a negative influence on the sustenance of team task insight’ can be verified.

**Partner differences in knowledge**

**Impact of differences in knowledge on team task insight**

Concerning the process leading to the development of the project description, in five cases - Print, Dewey, Berlin, Paris and Lisbon project - the project description was written by only a few partners. So, there were differences in knowledge between the partners; some partners had a lot of knowledge concerning the project, and others, who did not participate in the process, had little knowledge concerning the project before the start of the project (ftf kick-off meeting). This led to differences in team task insight, where the ones who participated in the process had a greater team task insight than the ones who did not participate. This difference in knowledge was the starting point of the project.

In the other projects – Goa and Groningen –, because all partners wrote their part of the project description, knowledge was more equally spread over the partners at the start of the project. At the start of the project in the Jiaozuo project, there was no project description written. This was done during the ftf kick-off meeting and the follow-up meetings. Here, knowledge was also more equally spread (or even absent) over the partners at the start of the project.

So, a great difference in knowledge has a negative influence on team task insight and on the development of the $\beta$ into the direction of $+1$. I.e. strategic momentum has a smaller effective component. On the other hand, when knowledge is more equally spread over the team members, this can have a positive influence on team task insight and on the development of the $\beta$ into the direction of $+1$. I.e. strategic momentum has a greater effective component.

In table 6.3., we give an overview of the impact of difference in knowledge on team task insight.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

<table>
<thead>
<tr>
<th>Difference in knowledge</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>(some great task insight/others less/no task insight)</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>(some great task insight/others less/no task insight)</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>(some great task insight/others less/no task insight)</td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>(some great task insight/others less/no task insight)</td>
</tr>
<tr>
<td>Dewey</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>(some great task insight/others less task insight)</td>
</tr>
<tr>
<td>Goa</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>++</td>
</tr>
<tr>
<td>Groningen</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>++</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>/</td>
</tr>
<tr>
<td></td>
<td>/</td>
</tr>
</tbody>
</table>

Table 6.3. Impact of difference in knowledge on team task insight

Five out of eight cases show that a (great) difference in knowledge between the partners has a negative influence on team task insight (Berlin, Paris, Lisbon, Print, Dewey). Two out of eight case show that a small difference in knowledge between the partners has a positive influence on team task insight (Goa, Groningen).

So, there is an indication that the hypothesis that ‘A small difference in knowledge between the partners in the virtual R&D project team positively contributes to the creation of team task insight’, is verified.

Anticipating on the analysis in section 6.3., there is an indication that the hypothesis that ‘A small difference in knowledge between the partners in the virtual R&D project team positively contributes to the sustenance of team task insight’ is verified.

Project proposal definition process

Decision making style leading to the project description and its effect on (variables) of strategic momentum

The project description is the outcome of a decision making process. Therefore we can distinguish two dimensions concerning the project description. The first dimension is the process leading to the project description, and its impact on the variables of strategic momentum and indirectly on strategic momentum itself, as will be discussed here. The second dimension is a good or bad project description, and its impact on the variables of strategic momentum and indirectly on strategic momentum itself, as will be discussed at ‘Project proposal content’.

Remark beforehand: In the Jiaozuo project, the project proposal definition process was not a starting condition, but the project description in the Jiaozuo project was written during the ftf kick-off meeting and some follow-up meetings. So, in the Jiaozuo project the project proposal definition process does belong to the process.

Impact of the process leading to the project description on team task insight

The Berlin, Lisbon and Paris projects all were (European) follow-up projects and funded by the national authorities. The project description in all three projects was the result of participative decision making of a subgroup. This had a positive influence on team task insight and the development of the β (the direction of strategic momentum), but only for this subgroup.
The project plan for the Dewey project was in the first place the outcome of (directive) decision making by the two initiators. The work package leaders could fill in their part of the project, as a form if participative decision making style, but not all partners delivered a work package leader. So, team task insight could develop, but only, as in the Berlin, Paris and Lisbon projects, for this subgroup. But although most partners participated in the process of writing (some part of) the project plan, the project plan itself was vague, and the aims remained vague for a long time for the partners. So, team task insight could develop (very) slowly, leading to a $\beta$ between 0 and +1. Participative decision making did not have a positive influence on team task insight, because the project plan itself was vague. A possible reason for this conclusion can be that there were no real discussions concerning the project aims, and every work package leader filled in their part of the project plan according to their own interpretation (which was not shared with the others in the team).

The project description in the Goa project turned out to be vague too. Here, the first draft of the project proposal was written by a subgroup, but the eventual project description was the result of participative decision making by all partners. Task insight was developed as a result of this participative decision making, but less team task insight, because the project description turned out to be vague. So, team task insight could develop (very) slowly, leading to a $\beta$ between 0 and +1. The greatest difference between the vague project description in the Dewey and Goa project is, that in the Dewey project people did not know what to do, while in the Goa project people thought to know what to do, but during the project it became clear that different parts of the project were developed into the wrong direction. So, in the Goa project the project description gave too much room for different interpretations.

In the Groningen project, the project description was written by all partners. As a consequence of this participative decision making, team task insight could develop, developing the $\beta$ (But as we could see in the beginning of the project one of the partners developed their part of the project into the wrong direction. This has probably nothing to do with a vague project description, but as a result of minimal communication, where the partner had too much room to develop its own product). This was also the case in the Jiaozuo project, but as a difference, the project description in the Groningen project was written some years before the official start of the project with the ftf kick-off meeting, while the project description in the Jiaozuo project was written during the ftf kick-off meeting and some follow-up meetings.

The initiator of the Print project, who saw a commercial advantage in this project, wrote a project proposal. So, the project proposal was not the outcome of a participative decision making process, but the outcome of a directive decision making style. As a consequence, team task insight at the partners could not develop, having a negative influence on the development of the $\beta$. As one informant said: ‘(...) they had everything ‘fore cooked’. It was not the case that they ‘fore cooked’ it in such a way that we were completely overruled. Perhaps they played it in a very smart way (…)’.

In table 6.4., we give an overview of the impact of the process leading to the project description on team task insight.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

### Table 6.4. Impact of the process leading to the project description on team task insight

<table>
<thead>
<tr>
<th></th>
<th>Participative decision making style</th>
<th>Clear project description</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>Yes</td>
<td>+ (for a subgroup)</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
<td>Yes</td>
<td>+ (for a subgroup)</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
<td>Yes</td>
<td>+ (for a subgroup)</td>
</tr>
<tr>
<td>Print</td>
<td>No</td>
<td>Yes</td>
<td>_</td>
</tr>
<tr>
<td>Dewey</td>
<td>Partly</td>
<td>No</td>
<td>_</td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
<td>No</td>
<td>_</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Yes</td>
<td>Yes</td>
<td>+</td>
</tr>
</tbody>
</table>

We can conclude that when the project description is the outcome of a participative decision making style, and the project description is not vague, this will lead to team task insight and strategic momentum will emerge into the right direction (Lisbon, Berlin, Paris Groningen and Jiaozuo project). When the project description is the outcome of a directive decision making style, as in the Print project, team task insight will not be developed. In this way, strategic momentum will not emerge into the right direction. This is also the case when the project description is vague (Dewey and Goa project).

So, there is an indication that the hypothesis ‘Participative decision making (starting condition: project proposal definition process; as a ‘management style’ intervention) has a positive influence on the creation of team task insight’ is verified.

### Project proposal content

**Impact of proposal content on team task insight**

As we could see in the cross-case analysis concerning the process leading to the development of the project description, in most of the cases the project description was clear before the beginning of the ftf kick-off meeting. The clear project description had a positive influence on (team) task insight and on the development of the $\beta$ into the direction of $+1$, but only for the ones who wrote the proposal. There were two exceptions: the Dewey project and the Goa project. In both cases, the project description turned out to be vague. As a consequence, partners in the team did not know what to do (Dewey project) or filled it in in their own way (Goa project). E.g. in the Goa project, this became clear to the management after nine months, after which they had to try to get the development of the project into the right direction again. So, a vague project description has a negative influence on team task insight and on the development of the $\beta$ into the direction of $+1$. I.e. strategic momentum has a smaller effective component.

In table 6.5., we give an overview of the impact of the project description on team task insight.
Table 6.5. Impact of project description on team task insight

In six (Berlin, Paris, Lisbon, Print, Groningen and Jiaozuo project) out of eight projects there was a clear project proposal content, leading to (team) task insight (but only for the ones who participated in writing the proposal). In two projects (Goa and Dewey) the project proposal content was not clear, having a negative impact on the creation of team task insight.

So, there is an indication that the hypothesis ‘a clear project description (starting condition: project proposal content) has a positive influence on the creation of team task insight’ is verified. But we must make a critical remark here. In most cases, the project proposal content was mostly written by a subgroup, and not by the whole team, by which we doubt if team task insight could emerge.

To emerge team task insight it would be the best when as much as possible team members would be involved in the process leading to the project proposal content.

**Dominant leading partners**

**Impact of dominant leading partner(s) on team task insight**

In two projects, there was a clear dominant leading partner or partner(s), the Print and Dewey project. In both projects, the dominant leading partner(s) wrote the project description. This had a negative impact on team task insight, because only the dominant leading partners knew what to do, and not the other partners.

In table 6.6., we give an overview of the impact of dominant leading partner on team task insight.

<table>
<thead>
<tr>
<th>Dominant leading partner</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>No</td>
</tr>
<tr>
<td>Paris</td>
<td>No</td>
</tr>
<tr>
<td>Lisbon</td>
<td>No</td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
</tr>
<tr>
<td>Dewey</td>
<td>Yes</td>
</tr>
<tr>
<td>Goa</td>
<td>No</td>
</tr>
<tr>
<td>Groningen</td>
<td>No</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 6.6. Impact of dominant leading partner on team task insight
In two cases (Print and Dewey), a dominant leading partner has a negative influence on the creation of team task insight. In five other cases, the absence of a clear dominant leading partner has a positive influence on the creation of team task insight. In one case (Goa), the absence of a clear dominant leading partner does not have a positive influence on the creation of team task insight. This is probably on the basis of a project description which was vague.

So, there is an indication that the (new) hypothesis ‘Dominant leading partners have a negative influence on the creation of team task insight’ can be verified.

The management interventions, which have their impact on TTI during the start of the project

All projects had a ftf kick-off meeting at the start of the project. Management interventions concerning the ftf kick-off meeting are as follows:

Management style

Impact of decision making style during ftf kick-off meeting on team task insight

In the Print project the tasks were prepared by one partner (initiator), and not by the whole team. During the ftf kick-off meeting no attention was paid to the content of the project, and team task insight could not develop. So, a directive decision making style has a negative influence on team task insight.

In the Jiaozuo project, the project description was the outcome of participative decision making during the ftf kick-off meeting (and probably some ftf meetings afterwards), having a positive influence on the development of team task insight, and their $\beta$ was $+1$.

In the Groningen, Berlin and Paris project, the participative decision making style was continued during the ftf kick-off meeting, having a positive influence on the team task insight and therefore on the development of the $\beta$ in the direction of $+1$.

In the Goa project, the participative decision making style was also continued during the ftf kick-off meeting. In the end, this participative decision making style did not have a positive influence on team task insight, because the project proposal turned out to be vague.

In the Dewey project, it is unknown what kind of decision making style was used during the ftf kick-off meeting. During the process after the ftf kick-off meeting, according to two informants, the Germans had clearly the lead in the project, using a more directive decision making style; they decided how partners had to work together. This only changed when a partner of Portugal joined the virtual R&D project team.

In the Lisbon project, project management spend a lot of attention concerning discussions about the planning, e.g. meetings and deadlines, of the work package and tasks during the ftf kick-off meeting. So, participative decision making has a positive influence on team task insight. In this way, by increasing team task insight, the team could work into the direction of the objectives, and the $\beta$ could come close to $+1$.

In table 6.7, we give an overview of the impact of the decision making style on team task insight.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

<table>
<thead>
<tr>
<th></th>
<th>Clear project proposal</th>
<th>Participative decision making style</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
<td>No</td>
<td>– (1)</td>
</tr>
<tr>
<td>Dewey</td>
<td>No</td>
<td>Unknown</td>
<td>–</td>
</tr>
<tr>
<td>Goa</td>
<td>No</td>
<td>Yes</td>
<td>–</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Yes</td>
<td>Yes</td>
<td>++</td>
</tr>
</tbody>
</table>

(1) Because we know there was no clear project proposal, the impact of the decision making style on team task insight was negative.

Table 6.7. Impact of the decision making style on team task insight.

We can conclude that a directive decision making style, like in the Print project, has a negative influence on team task insight. A participative decision making style, like in the Jiaozuo, Groningen, Berlin, Paris and Lisbon project, has a positive influence. An exception is, when the outcome of the participative decision making style is still vague, like in the Goa project. Then, the participative decision making style does not have a positive influence on team task insight, on the basis of a vague project description (and a less effective component concerning strategic momentum).

So, there is an indication that the hypothesis ‘Participative decision making (starting condition: project proposal definition process; as a ‘management style’ intervention) has a positive influence on the creation of team task insight’ can be verified.

Content oriented interventions

Impact of differences in knowledge during ftf kick-off meeting on team task insight

As we have seen in the cross-case analysis concerning the process leading to the development of the project description, in five cases - Print, Dewey, Berlin, Paris and Lisbon project - the project description was written by only a few partners. Because the project description was written before the ftf kick-off meeting, the difference in knowledge between partners was the starting point. In the Print project, this difference in knowledge continued during the ftf kick-off meeting. Although the partners got a paper version of the project description, it was not checked if they understood the content during the ftf kick-off meeting. In this way, knowledge and team task insight was not equally spread over the partners, and even low at most partners, so the β could not develop into the direction of +1.

In the Dewey project, although there were content meetings during the ftf kick-off meeting, this difference in knowledge also continued during the ftf kick-off meeting. An important factor was that the project description was vague, and most partners did not know what to do, so team task insight at most partners could not develop.

In the Berlin, Paris and Lisbon project, this difference in knowledge disappeared during the ftf kick-off meeting. The aim of the ftf kick-off meeting at the Berlin project was to refresh the memories of the partners concerning the project and to make agreements. So, a lot of effort was done by the management to disseminate the knowledge concerning objectives etc. of the project to the team members, e.g. by discussions of the tasks. In the Lisbon and Paris project, knowledge was more equally spread over the team members by presentations, lectures and/or discussions. This had a positive influence on the development of team task insight.

In the other projects, knowledge was also more equally spread over the partners during the ftf kick-off meeting. In the Groningen project by presentations and lectures. In the Jiaozuo
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

project by discussions. In this way the team task insight was developed, and the β developed into the direction of +1. In the Goa project knowledge could equally be spread by content discussions. But this had not a great positive influence on team task insight, because the project description was vague, giving the partners too much opportunity to fill in the project in their own way.

In table 6.8., we give an overview of the impact of differences in knowledge during ftf kick-off meeting on team task insight.

<table>
<thead>
<tr>
<th></th>
<th>Clear project proposal</th>
<th>Differences in knowledge</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>No</td>
<td>++</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
<td>No</td>
<td>++</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
<td>No</td>
<td>++</td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
<td>Yes</td>
<td>=</td>
</tr>
<tr>
<td>Dewey</td>
<td>No</td>
<td>Yes</td>
<td>=</td>
</tr>
<tr>
<td>Goa</td>
<td>No</td>
<td>No</td>
<td>=</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes</td>
<td>No</td>
<td>+</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Yes</td>
<td>No</td>
<td>++</td>
</tr>
</tbody>
</table>

Table 6.8. Impact of differences in knowledge during ftf kick-off meeting on team task insight

We can conclude that a great difference in knowledge (Print and Dewey) has a negative influence on team task insight and on the development of the β into the direction of +1. I.e. strategic momentum has a smaller effective component. On the other hand, when knowledge is more equally spread over the team members (Lisbon, Berlin, Paris, Jiaozuo and Groningen project), this can have a positive influence on team task insight and on the development of the β into the direction of +1. I.e. strategic momentum has a greater effective component. Combined with a vague project description, more equal spreading of knowledge over the partners does not lead to a great team task insight, as we could see in the Goa project.

So, there is an indication that the hypothesis that ‘a small difference in knowledge has a positive influence on the creation of team task insight’ can be verified.

Convergence of terminology/workshops

Impact of terminology/workshops during ftf kick-off meeting on team task insight

A convergence of terminology during the ftf kick-off meeting, like in the Berlin project (and too in the Jiaozuo project), has a positive impact on team task insight. This is a good basis for the technical discussions, eventually leading to conversion concerning team task insight, and a β that was close to +1 during the project. I.e. the activities were all in the (right) direction of the formulated goals of the project.

In table 6.9., we give an overview of the impact of terminology/workshops during ftf kick-off meeting on team task insight
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

<table>
<thead>
<tr>
<th></th>
<th>Convergence of terminology</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Paris</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Lisbon</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Print</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Dewey</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Goa</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Groningen</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Yes</td>
<td>++</td>
</tr>
</tbody>
</table>

Table 6.9. Impact of terminology/workshops during ftf kick-off meeting on team task insight

So, in only two projects empirical evidence could be found that gives an indication concerning the hypothesis that ‘Planning or training (during the ftf kick-off meeting; as a ‘convergence of terminology/workshops’ intervention) has a positive influence on the creation of team task insight’. On the basis of these two findings, there is an indication that the hypothesis can be verified, although it is a weak verification.

Although there are only two projects in which empirical evidence could be found that convergence of terminology during the ftf kick-off meeting, has a positive impact on team task insight, we will take this variable in consideration on the basis of its relationship also with the variable ‘difference in professional background’ (See also table 6.2).

Social events

Impact of organisation of social events during ftf kick-off meeting on team task insight

There is no empirical evidence showing some correlation between organisation of social events during ftf kick-off meeting and team task insight.

Analysis TTI with csQCA

To give an answer on the fourth central research question ‘what starting conditions and what management interventions can lead to the creation (and sustenance) of the variables team task insight, empowerment and/or collective commitment?’ at the start of the project, I conduct a csQCAAnalysis.

Starting conditions and management interventions leading to the creation of team task insight

What starting conditions and what management interventions can lead to the creation of the variable team task insight? To give an answer on this question, I start with analysing the data from table 6.1, 6.2, 6.6, 6.7, 6.8, 6.9 with crisp set Qualitative Comparative Analysis (csQCA). Where a condition appeared in more than one table – i.e. as part of a starting condition, or as (part of a) management interventions at the start of the project -, the data from the last table were used. The argument is that I am looking at the outcome (team task insight) at the start of the project, and not before the start of the project.

Step 1. Building a dichotomous input table

For the notation of data in this type of analysis, only a binary system can be used. So, all data have to be operationalised in [0], [1] or [-] when unknown (e.g., when it is unknown what the value of the variable in question was at that point in time) (table 6.10).
Because in the Dewey case it is unknown what the value of participative decision making is at the start of the project, I decided not to take this case into the analysis (Table 10).

Table 6.10. Dichotomous input table

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Natcult</th>
<th>Prof</th>
<th>Conv</th>
<th>Know</th>
<th>Partdec</th>
<th>Clearprop</th>
<th>Leadpar</th>
<th>TTI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paris case (PAR)</td>
<td>Yes [1]</td>
<td>Almost the same [0]</td>
<td>No [0]</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Lisbon case (LIS)</td>
<td>Yes [1]</td>
<td>Almost the same [0]</td>
<td>No [0]</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Goa case (GOA)</td>
<td>Yes [1]</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>No [0]</td>
<td>_ [0]</td>
</tr>
</tbody>
</table>

The numbers (6.1, 6.2, 6.9 etc) refer to the tables where the data are derived from.

Step 2. Constructing a ‘truth’ table (overview of configurations with output)

For this purpose, I used a software tool called ‘FSQCA’. It is freeware, downloaded from [www.compasss.org](http://www.compasss.org) on June 23rd, 2009. For both outcomes: [0] and [1], the ‘truth table’ must be conducted. For obtaining the ‘truth table’ I chose the ‘truth table algorithm’ (Table 6.11).
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

### Table 6.11. ‘Truth table’ (overview of configurations with output)

<table>
<thead>
<tr>
<th>Natcult</th>
<th>Prof</th>
<th>Conv</th>
<th>Know</th>
<th>Partdec</th>
<th>Clearprop</th>
<th>Leadpar</th>
<th>Number</th>
<th>TTI</th>
<th>Consist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
</tr>
</tbody>
</table>

**Legenda:**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Difference in (national) cultural background (6.1)</th>
<th>Difference in professional background (6.2)</th>
<th>Convergence of terminology (6.9)</th>
<th>Differences in knowledge (6.8)</th>
<th>Participative decision making style (6.7)</th>
<th>Clear proposal content (6.7)</th>
<th>Dominant leading partner (6.6)</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviation</td>
<td>Natcult</td>
<td>Prof</td>
<td>Conv</td>
<td>Know</td>
<td>Partdec</td>
<td>Clearprop</td>
<td>Leadpar</td>
<td>TTI</td>
</tr>
</tbody>
</table>

Table 6.11. ‘Truth table’ (overview of configurations with output)

**Step 3. Resolving contradictory configurations**

As we can see in table 6.11., there are no contradictory configurations, because the outcome ‘Consist’ is a 1 or a 0.

**Step 4. Boolean minimization (Determining the causal model)**

In this step, I am going to determine the causal model, by determining one or more configurations (or patterns), leading to the outcome (in this case: team task insight). The Quine Algorithm (QCA 3.0) was used for this crisp set analysis. (Except for the intermediate solution, where the Quin-McCluskey algorithm was used).

I will take a look at the configurations in three different forms, or solutions. These forms, or solutions, are:

g. the complex solution
h. the parsimonious solution
i. the intermediate solution

**a. The complex solution**

**The [1] Configurations**

First, for obtaining the most complex solution, I set the Positive cases to ‘True’ and all others to ‘False’ in the Specify panel. I obtained the following formula (formula 13).

\[
\text{NATCULT} \ast \text{prof} \ast \text{know} \ast \text{PARTDEC} \ast \text{CLEARPROP} \ast \text{leadpar} + \\
\text{natcult} \ast \text{PROF} \ast \text{know} \ast \text{PARTDEC} \ast \text{CLEARPROP} \ast \text{leadpar} \rightarrow \text{TTI} \\
(\text{BER, PAR, LIS}) + (\text{GRO, JIA})
\]
The ‘1’ outcome (creation of team task insight) is observed in virtual teams that combine differences in national cultural background AND small or no differences in professional background AND small or no differences in knowledge AND participative decision making style AND clear project proposal AND no dominant leading partner

OR

In virtual teams that combine small or no differences in national cultural background AND differences in professional background AND small or no differences in knowledge AND participative decision making style AND clear project proposal AND no dominant leading partner

[0] Configurations
First, for obtaining the most complex solution, I set the Negative cases to ‘True’ and all others to ‘False’ in the Specify panel. I obtained the following formula (formula 14):

\[ \text{NATCULT} \times \text{PROF} \times \text{conv} \times \text{know} \times \text{PARTDEC} \times \text{clearprop} \times \text{leadpar} + \]

\[ \text{NATCULT} \times \text{PROF} \times \text{KNOW} \times \text{partdec} \times \text{CLEARPROP} \times \text{LEADPAR} \rightarrow \text{tti} \]

\[ \text{GOA} + \text{PRI} \]

The ‘0’ outcome (non-creation of team task insight) is observed in virtual teams that combine differences in national cultural background AND differences in professional background AND small or no convergence of terminology AND small or no differences in knowledge AND participative decision making style AND small or no clear project proposal AND no dominant leading partner

OR

In virtual teams that combine differences in national cultural background AND differences in professional background AND small or no convergence of terminology AND knowledge differences AND small or no participative decision making style AND clear project proposal AND dominant leading partner

b. The parsimonious solution

[1] Configurations
For obtaining the most parsimonious solution, I set the Positive cases to ‘True’, remainders to ‘don’t care’ and all others to ‘False’ in the Specify panel. I obtained the following minimal formula (formula 15):

\[ \text{CLEARPROP} \times \text{leadpar} + \text{know} \times \text{CLEARPROP} \times \text{PARTDEC} \times \text{CLEARPROP} \rightarrow \text{TTI} \]

\[ (\text{BER}, \text{PAR}, \text{LIS}, \text{GRO}, \text{JIA}) + (\text{BER}, \text{PAR}, \text{LIS}, \text{GRO}, \text{JIA}) + (\text{BER}, \text{PAR}, \text{LIS}, \text{GRO}, \text{JIA}) \]

The ‘1’ outcome (creation of team task insight) is observed in virtual teams that combine a clear project proposal AND no dominant leading partner

OR
In virtual teams that combine small or no differences in knowledge AND a clear project proposal

OR

In virtual teams that combine participative decision making AND a clear project proposal

[0] Configurations
For obtaining the most parsimonious solution, I set the Negative cases to ‘True’, remainders to ‘don’t care’ and all others to ‘False’ in the Specify panel. I obtained the following minimal formula (formula 16)

\[
\text{NATCULT} \times \text{PROF} \rightarrow tti
\]

(PRI, GOA)

The ‘0’ outcome (non-creation of team task insight) is observed in virtual teams that combine differences in national cultural background AND differences in professional background.

c. The intermediate solution
For obtaining the intermediate solution, I used the Quin-McCluskey algorithm. The assumptions I made concerning ‘should contribute to the presence of team task insight when the single variable is present or absent’ for the single variables are as follows (Table 6.12).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Present or absent</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEADPAR</td>
<td>Absent</td>
<td>6</td>
</tr>
<tr>
<td>CLEARPROP</td>
<td>Present</td>
<td>7</td>
</tr>
<tr>
<td>PARTDEC</td>
<td>Present</td>
<td>7</td>
</tr>
<tr>
<td>KNOW</td>
<td>Absent</td>
<td>8</td>
</tr>
<tr>
<td>CONV</td>
<td>Present</td>
<td>9</td>
</tr>
<tr>
<td>PROF</td>
<td>Absent</td>
<td>2</td>
</tr>
<tr>
<td>NATCULT</td>
<td>Absent</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 6.12. Should contribute to the presence of team task insight when the single variable is present or absent

I obtained the following formula (formula 17)

\[
\text{leadpar} \times \text{CLEARPROP} \times \text{PARTDEC} \times \text{know} \times \text{natcult} + \text{leadpar} \times \text{CLEARPROP} \times \text{PARTDEC} \times \text{know} \times \text{prof} \rightarrow TTI
\]

(GRO, JIA) + (BER, PAR, LIS)

The intermediate outcome (creation of team task insight) is observed in virtual teams that combine no dominant leading partner AND a clear project proposal AND participative decision making style AND small or no differences in knowledge AND small or no differences in national cultural background

OR

In virtual teams that combine no dominant leading partner AND a clear project proposal AND participative decision making style AND small or no differences in knowledge AND small or no differences in professional background
**Step 5. Interpretation**

Looking at the intermediate solution, there are two configurations leading to the creation of team task insight. The first configuration is no dominant leading partner and a clear project proposal and participative decision making style and small or no differences in knowledge and small or no differences in national cultural background. This configuration was found in the Jiaozuo and Groningen cases. Both cases consisted of team members with the same (national) cultural background. There were also small or no differences in knowledge. The project proposal was written before the start of the Groningen project, and team members knew what to do. Also, at the kick-off meeting there were presentations held, increasing team task insight. In the Jiaozuo project, many discussions were held concerning the content of the project, with the aim of convergence of terminology and ideas, also increasing team task insight. In both projects there was a clear project proposal and enough room for participative decision making at the start of the project. There was no dominant leading partner in each of these projects.

The second configuration is no dominant leading partner and a clear project proposal and participative decision making style and small or no differences in knowledge and small or no differences in professional background. This configuration was found in the Berlin, Paris and Lisbon cases. The managers in these projects had a more facilitative style of management. So, there were no dominant leading partners. In all three projects, there was a clear project proposal, as an outcome of a participative decision making style (although before the start of the project only for a subgroup; during the ff kick-off meeting all partners could participate in the decision making, leading to small changes in the project proposal). In the Berlin project, although there were small differences in professional background, these differences could still lead to a ‘Babel of tongues’. Therefore the manager spend much attention to convergence (of terminology), having a positive effect on team task insight. In the Paris and Lisbon projects there were also small differences in professional background. In the Paris project, this had a positive effect on team task insight, whereas in the Lisbon project it had no effect.

From the parsimonious solution we learn that a combination of differences in national cultural background and differences in professional background, as was the case in the Print and Goa case, can lead to the non creation of team task insight. This will be true for the Goa case concerning the differences in professional background, but not for the Print case! Although there were differences in national cultural background in the Print case, this had no (negative) influence on team task insight. According to one team member the differences in his own country were greater than in the team. So, we have to be careful with this solution. The complex solution sheds a better light on the combination of conditions, leading to the non creation of team task insight in the Print project. Especially the differences in knowledge between the partners, the absence of participative decision making and the presence of a dominant leading partner (combined with differences in national cultural background, differences in professional background, small or no convergence of terminology and a clear project proposal) had their influence.

**6.2.2. Empowerment**

Empowerment can to some extent emerge spontaneously, but it can also emerge by management interventions and starting conditions.

The hypotheses concerning the management interventions and starting conditions and their impact on empowerment are as follows:

a. Participative decision making (starting condition: project proposal definition process; as a ‘management style’ intervention) positively contributes to the creation of empowerment
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

Below, the written outcome of the cross-case analysis will be presented concerning the management interventions and starting conditions. I will start with the analysis of the six starting conditions. Although they do not belong to the project process, they have their impact on the creation of E, and so on the creation (and in case of differences in cultural and professional background also on the sustenance) of strategic momentum. Then I will analyse the management interventions, which have their impact on E during the start of the project (which in all cases is the ftf kick-off meeting).

The six starting conditions
The six starting conditions are as follows:

Cultural background (national) of team members

Impact of difference in (national) cultural background of team members on empowerment
The difference in cultural background could also have a negative impact on empowerment. In countries were the power distance is greater, for example France, people were not empowered to take decisions in the Paris project. They first had to consult others in their organisation.

In table 6.13., we give an overview of the impact of difference in (national) cultural background of team members on empowerment.

<table>
<thead>
<tr>
<th>Cultural background</th>
<th>Difference in (national) cultural background</th>
<th>Empowerment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Dewey</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Groningen</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>No</td>
<td>/</td>
</tr>
</tbody>
</table>

Table 6.13. Impact of difference in (national) cultural background of team members on empowerment

Only in one case a (negative) effect is reported from difference in (national) cultural background on empowerment. This is too less to formulate a new hypothesis.

This starting condition will not be taken into consideration concerning its effect on empowerment, because there are too less cases in which there is a correlation between difference in (national) cultural background and empowerment.

Professional background of team members

Impact of difference in professional background of team members on empowerment
There is no empirical evidence showing some correlation between professional background of team members and empowerment.

Partner differences in knowledge

Impact of differences in knowledge on empowerment
There is no empirical evidence showing some correlation between differences in knowledge and empowerment.
Project proposal definition process

Impact of the process leading to the project description on empowerment
Participative decision making, as in the Berlin, Lisbon, Paris, Goa, Groningen and Jiaozuo project, can have a positive influence on empowerment, developing the $\alpha$ into the direction of 1.
Participative decision making was also the norm in the Dewey project concerning the development of the project description, but not every partner was involved in this process. So, only for the partners that were involved in this process it had a positive influence on empowerment, and a positive influence on the development of the $\alpha$. In the Print project, a directive decision making style led to the project description, and the other partners were not empowered to take part in this decision making process. This did not have a positive influence on the development of the empowerment, and the $\alpha$ could not develop.

In table 6.14., we give an overview of the impact of participative decision making on empowerment.

<table>
<thead>
<tr>
<th></th>
<th>Participative decision making style</th>
<th>Empowerment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Print</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Dewey</td>
<td>Partly (some partners) and – (other partners)</td>
<td>+</td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Yes</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 6.14. Impact of participative decision making on empowerment

So, there is an indication that the hypothesis ‘Participative decision making (starting condition: project proposal definition process) has a positive influence on the creation of empowerment’ is verified.

Project proposal content

Impact of proposal content on empowerment
There is no empirical evidence showing some correlation between proposal content and empowerment.

Dominant leading partners

Impact of dominant leading partners on empowerment
There is no empirical evidence showing some correlation between dominant leading partners and empowerment.

The management interventions, which have their impact on $E$ during the start of the project
All projects had an ftf kick-off meeting at the start of the project. Only one management intervention was found that had an impact on empowerment during the ftf kick-off meeting.
Management style

Impact of decision making style during ftf kick-off meeting on empowerment

In the Print project the tasks were prepared by one partner (initiator), and not by the whole team. Empowerment could not develop. So, a directive decision making style has a negative influence on empowerment.

In the Jiaozuo project, the project description was the outcome of participative decision making during the ftf kick-off meeting (and probably some ftf meetings afterwards), having a positive influence on the development of empowerment.

In the Groningen, Berlin, Paris and Goa project, the participative decision making style was continued during the ftf kick-off meeting, having a positive influence on the empowerment.

In the Dewey project, it is unknown what kind of decision making style was used during the ftf kick-off meeting. During the process after the ftf kick-off meeting, according to two informants, the Germans had clearly the lead in the project, using a more directive decision making style; they decided how partners had to work together. This only changed when a partner of Portugal joined the virtual R&D project team.

In the Lisbon project, project management spend a lot of attention concerning discussions about the planning, e.g. meetings and deadlines, of the work package and tasks during the ftf kick-off meeting. So, participative decision making has a positive influence on empowerment.

In table 6.15., we give an overview of the impact of participative decision making on empowerment.

<table>
<thead>
<tr>
<th>Project</th>
<th>Participative decision making style</th>
<th>Empowerment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Print</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Dewey</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Yes</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 6.15. Impact of participative decision making on empowerment

We can conclude that a directive decision making style, like in the Print project, has a negative influence on empowerment. A participative decision making style, like in the Jiaozuo, Groningen, Goa, Berlin, Paris and Lisbon project, has a positive influence.

So, there is an indication that the hypothesis ‘Participative decision making (as a ‘management style’ intervention) has a positive influence on the creation of empowerment’ can be verified.

Remark concerning empowerment at the start of the project (after the ftf kick-off meeting)

What we saw before is that only one management intervention concerning the ftf kick-off meeting had an impact on empowerment.

All projects consisted of team members from different organisations. Also, all projects were funded by (European or national) organisations, which did not take part as partners in the
projects. So, the project management had no real power to forbid the partners to use the resources at their own insights during the project period. They only had one very powerful tool, which they eventually could only use once: the power to write in a negative sense about a project partner at the half yearly or yearly project reports for the funding organisation. The project management had the possibility of dynamic reallocation of the tasks during the project, when necessary. The only problem concerning empowerment during the ftf kick-off meeting, which had definitely influence on the project in one way or the other, was that some partners in projects that were funded by national organisations (Lisbon, Berlin and Paris project) did not, or not in time, get their funding.

The empowerment of the Lisbon team was great from the beginning. In the first place, because the project leader (and the other project managers) did not have legitimate power over the team members. In the second place, because there were enough resources (especially in terms of manpower) in the project. This must be gradated, because one Italian partner did not know if they would receive funding from the national authority. Even when the project was ended they were not sure if they would receive funding. By not receiving the funding, the partner was not empowered to travel (much). A consequence was that at a certain point the partner had not enough money to join the meetings. Project management decided to intervene by organising meetings close to the Italian partner, organise meetings at places where the partner already went to a conference, and in some cases the results of the partner were presented on meetings by other partners. As a result, the Italian partner could participate fully in the project. In the third place, because team members were autonomous to work at the tasks at stake at their own insights and responsibility. All was leading to an \( \alpha \) close to 1.

In the Berlin project, the management style of the project leader was empowering (political domain) the work package leaders and task leaders as much as possible, by trusting them and giving them much freedom (autonomy) and responsibilities (attributes of empowerment). This also had a positive influence on the \( \alpha \).

In the Paris project, the empowerment was probably great too, except for the partners in Portugal. Their contribution was small in the beginning, on the basis of the fact that it lasted a year before they heard that they would receive funding from the national authority. This had no effect on the project, because they had to test methods developed by other firms, what was minimal during the first year. The Portuguese partners, who received funding when the project already went into its second year, received funding for the first of three years (as was the duration of the project). When the project ended, they still received funding for a third year, so they had still the obligation to report for this third year. This was of course not synchronized with the project.

Concerning the political domain the partners in the Jiaozuo project were empowered to deploy the resources (time, finances etc.) to their own insight. In this way the \( \alpha \) could rise steadily into the direction of 1.

In table 6.16., we give an overview of the empowerment at the start of the project

<table>
<thead>
<tr>
<th></th>
<th>Empowerment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>++</td>
</tr>
<tr>
<td>Paris</td>
<td>++</td>
</tr>
<tr>
<td>Lisbon</td>
<td>++</td>
</tr>
<tr>
<td>Print</td>
<td>++</td>
</tr>
<tr>
<td>Dewey</td>
<td>++</td>
</tr>
<tr>
<td>Goa</td>
<td>++</td>
</tr>
<tr>
<td>Groningen</td>
<td>++</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>++</td>
</tr>
</tbody>
</table>

Table 6.16. Empowerment at the start of the project
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

So, I assume that the empowerment for most projects at the start of the project (after the ftf kick-off meeting) was great. There is one exception: the Print project. After the ftf kick-off meeting there were several ftf meetings. At the time of these ftf meetings the partners could present proposals how they wished to fill in the work packages. The initiator commented the proposals, in this way trying to establish an outcome in the technical domain. As a result, team task insight could develop, developing the $\beta$ into the direction of +1. But also in the political domain: if the initiator did not agree with the proposal of the partners, they had to adjust it. So, according to me the empowerment at the start (at the end of the ftf kick-off meeting) was low.

Analysis E with csQCA

Starting conditions and management interventions leading to the creation of empowerment

What starting conditions and what management interventions can lead to the creation of the variable empowerment? To give an answer on this question, I start with analysing the data from table 6.16 with crisp set Qualitative Comparative Analysis (csQCA). Where a condition appeared in more than one table – i.e. as part of a starting condition, or as (part of a) management interventions at the start of the project - , the data from the last table were used. The argument is that I am looking at the outcome (empowerment) at the start of the project, and not before the start of the project.

Step 1. Building a dichotomous input table

For the notation of data in this type of analysis, I used the same operationalisation as step 1 concerning team task insight (Table 6.17.).

<table>
<thead>
<tr>
<th>Condition</th>
<th>Participative decision making style (6.15)</th>
<th>Empowerment (Outcome)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Partdec</td>
<td>E</td>
</tr>
<tr>
<td>Berlin case (BER)</td>
<td>Yes [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Paris case (PAR)</td>
<td>Yes [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Lisbon case (LIS)</td>
<td>Yes [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Print case (PRI)</td>
<td>No [0]</td>
<td>[0]</td>
</tr>
<tr>
<td>Goa case (GOA)</td>
<td>Yes [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Groningen case (GRO)</td>
<td>Yes [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Jiaozuo case (JIA)</td>
<td>Yes [1]</td>
<td>++ [1]</td>
</tr>
</tbody>
</table>

The number (6.15) refers to the table where the data are derived from.

Because in the Dewey case it is unknown what the value of participative decision making is at the start of the project, I decided not to take this case into the analysis (Table 6.16.)

Table 6.17. Dichotomous input table

Step 2. Constructing a ‘truth’ table (overview of configurations with output)

A software tool called ‘FSQCA’ was used, as discussed in section 3.6.3. The ‘truth table’ must be conducted for both outcomes: [0] and [1]. For obtaining the ‘truth table’ I chose the ‘truth table algorithm’ (Table 6.18.).
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

<table>
<thead>
<tr>
<th>Partdec</th>
<th>Number</th>
<th>E</th>
<th>Consist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
</tr>
</tbody>
</table>

**Legenda:**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Participative decision making style (6.15)</th>
<th>Empowerment (Outcome)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partdec</td>
<td></td>
<td>E</td>
</tr>
</tbody>
</table>

Table 6.18. Truth table (overview of configurations with output)

**Step 3. Resolving contradictory configurations**

As we can see in table 6.18., there are no contradictory configurations, because the outcome ‘Consist’ is a 0 or 1.

**Step 4. Boolean minimization (Determining the causal model)**

As we saw under step 4 concerning team task insight, I am going to determine the causal model, by determining one or more configurations (or patterns), leading to the outcome (in this case: empowerment).

I will take a look at the configurations in three different forms, or solutions. These forms, or solutions, are:

a. the complex solution
b. the parsimonious solution
c. the intermediate solution

**a. The complex solution**

The [1] Configurations

First, for obtaining the most complex solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’. I obtained the following formula (formula 18)

\[
\text{PARTDEC} \rightarrow E \\
(BER, PAR, LIS, GOA, GRO, JIA)
\]

The ‘1’ outcome (creation of empowerment) is observed in virtual teams that have participative decision making.

**[0] Configurations**

First, for obtaining the most complex solution, I used the Quine-McCluskey algorithm with setting the Negative cases to ‘True’ and all others to ‘False’. I obtained the following formula (formula 19)

\[
\text{partdec} \rightarrow e \\
(PRI)
\]
The ‘0’ outcome (non creation of empowerment) is observed in virtual teams that have small or no participative decision making.

b. The parsimonious solution

[1] Configurations
For obtaining the parsimonious solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’, remainders to ‘Don’t cares’ and all others to ‘False’. Also here I obtained the following formula (formula 20)

\[
\text{PARTDEC} \rightarrow E
\]

(BER, PAR, LIS, GOA, GRO, JIA)

The ‘1’ outcome (creation of empowerment) is observed in virtual teams that have participative decision making.

[0] Configurations
For obtaining the parsimonious solution, I used the Quine-McCluskey algorithm with setting the Negative cases to ‘True’, remainders to ‘Don’t cares’ and all others to ‘False’. I obtained the following minimal formula (formula 21)

\[
\text{partdec} \rightarrow e
\]

(PRI)

The ‘0’ outcome (non creation of empowerment) is observed in virtual teams that have small or no participative decision making.

c. The intermediate solution
For obtaining the intermediate solution, I used the Quin-McCluskey algorithm. The assumption I made concerning ‘should contribute to the presence of empowerment when the single variable is present or absent’ for the single variable is as follows (Table 6.19.).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Present or absent</th>
<th>Table</th>
</tr>
</thead>
</table>

Table 6.19. Should contribute to the presence of team task insight when the single variable is present or absent

I obtained the following formula (formula 22)

\[
\text{PARTDEC} \rightarrow E
\]

(BER, PAR, LIS, GOA, GRO, JIA)

The ‘1’ outcome (creation of empowerment) is observed in virtual teams that have participative decision making.
Step 5. Interpretation
Looking at the intermediate solution, we see that participative decision making, as in the Berlin, Lisbon, Paris, Goa, Groningen and Jiaozuo project, can have a positive influence on the creation of empowerment, developing the \( \alpha \) into the direction of 1.
In the Print project, a directive decision making style was used, and the other partners were not empowered to take part in this decision making process. This did not have a positive influence on the creation of the empowerment, and the \( \alpha \) could not develop.

6.2.3. Collective commitment
Collective commitment can to some extent emerge spontaneously, but it can also emerge by management interventions and starting conditions.

The hypotheses concerning the management interventions and starting conditions and their impact on collective commitment are as follows:

a. Participative decision making (starting condition: project proposal definition process; as a ‘management style’ intervention) positively contributes to the creation of collective commitment

b. Different professional backgrounds of team members negatively contributes to the creation of collective commitment (This is a factor or a starting condition)

c. Different (National) cultural backgrounds of team members negatively contributes to the creation of collective commitment (This is a factor or a starting condition)

d. A clear project description (starting condition: project proposal content) positively contributes to the creation of collective commitment

e. Planning or training (during the ftf kick-off meeting; as a ‘convergence of terminology/workshops’ intervention) positively contributes to the creation of collective commitment

f. An ftf kick-off meeting (with socialising issues; as a ‘social events’ intervention) positively contributes to the creation of collective commitment

The hypotheses concerning the management interventions and their impact on collective commitment, which are the outcome of the cross-case analysis, are as follows:

f. Social activities positively contributes to the creation of collective commitment

g. A small difference in knowledge between the partners in the virtual R&D project team positively contributes to the creation of collective commitment

The written outcome of the cross-case analysis concerning the management interventions and starting conditions will be presented below. As mentioned before I will first start with the six starting conditions, which can have their impact on the creation of CC. Then the management interventions, which have impact on CC during the start of the project, will be presented.

The six starting conditions
The six starting conditions are as follows:
Cultural background (national) of team members

Impact of difference in (national) cultural background of team members on collective commitment

According to one informant in the Dewey project, the difference in cultural background was fruitful for the project ‘by combining the rational straight forward mentality of the Germans with the spontaneous enthusiasm of the southern European team members’, probably having a positive influence on the collective commitment.

The difference in power distance in some (national) cultures leads in the Goa project to a decrease of the collective commitment of a specific group of team members (PhD students).

In the Print project, the difference in cultural background had no influence on the project.

In Table 6.20., we give an overview of the impact of difference in (national) cultural background of team members on collective commitment.

<table>
<thead>
<tr>
<th></th>
<th>Difference in (national) cultural background</th>
<th>Collective commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
<td>/</td>
</tr>
<tr>
<td>Dewey</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
<td>_</td>
</tr>
<tr>
<td>Groningen</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>No</td>
<td>/</td>
</tr>
</tbody>
</table>

Table 6.20. Impact of difference in (national) cultural background of team members on collective commitment

So, there are no indications that the hypothesis that ‘Different (National) cultural backgrounds of team members have a negative influence on the creation of collective commitment’, can be falsified nor verified. The reason is that only in two cases effects are reported, which are also contradictory (negative or positive).

Anticipating on the analysis in section 6.3., there is no indication that the hypothesis that ‘Different (National) cultural backgrounds of team members have a negative influence on the sustenance of collective commitment’ can be neither falsified nor verified.

This starting condition will not be taken into consideration concerning its effect on collective commitment, because there are too less cases in which there is a correlation between difference in (national) cultural background and collective commitment, and the outcome is contradictory.

Professional background of team members

Impact of difference in professional background of team members on collective commitment

At the Goa project, differences in professional background of the team members also had a negative influence on the collective commitment.

In Table 6.21., we give an overview of the impact of difference in professional background of team members on collective commitment.
So, there is an indication that the hypothesis that ‘different professional backgrounds of team members have a negative influence on the creation of collective commitment’ can neither be falsified nor verified, because there is only an effect in one case.

Anticipating on the analysis in section 6.3., there is no indication that the hypothesis that ‘different professional backgrounds of team members have a negative influence on the sustenance of collective commitment’ can neither be falsified nor verified.

This starting condition will not be taken into consideration concerning its effect on collective commitment, because there are too less cases in which there is a correlation between difference in professional background and collective commitment.

### Partner differences in knowledge

**Impact of differences in knowledge on collective commitment**

There is no empirical evidence showing some correlation between differences in knowledge and collective commitment.

### Project proposal definition process

**Impact of the process leading to the project description on collective commitment**

The Berlin, Lisbon and Paris projects all were (European) follow-up projects and funded by the national authorities. The project description in all three projects was the result of participative decision making of a subgroup. This had a positive influence on collective commitment and the development of the $\alpha$, but only for this subgroup. The project plan for the Dewey project was in the first place the outcome of (directive) decision making by the two initiators. The work package leaders could fill in their part of the project, as a form of participative decision making style, but not all partners delivered a work package leader. But although most partners participated in the process of writing (some part of) the project plan, the project plan itself was vague, and the aims remained vague for a long time for the partners. Although participative decision making could lead to the development of the $\alpha$ into the direction of 1 for most of the partners, one can doubt about this, because - as will become clear at the ftf kick-off meeting - the informants disagreed concerning the collective commitment.

According to one informant there was a very low collective commitment in the beginning of the project, because the aims were vague and the partners wanted to invest less in this project. A possible reason for this conclusion can be that there were no real discussions concerning the project aims, and every work package leader filled in their part of the project plan according to their own interpretation (which was not shared with the others in the team).
According to another informant, one could talk of a great collective commitment, what became obvious from the clear will to come with an end product. This commitment was collective because everyone had his role in this and the commitment was alighted clearly above the individual interests of the partners. What we can conclude is that the collective commitment was not equally distributed over all partners. Some partners had a small collective commitment in the beginning. E.g. there was a German partner, which from the beginning resisted against the project and had a very small collective commitment. Others had a greater collective commitment.

The project description in the Goa project turned out to be vague too, but as we already saw the people thought to know what to do, but during the project it became clear that different parts of the project where developed into the wrong direction. Here, the first draft of the project proposal was written by a subgroup, but the eventual project description was the result of participative decision making by all partners. The project proposal, as the outcome of participative decision making, probably had a positive influence on the collective commitment, developing the $\alpha$ into the direction of 1.

In the Groningen project, the project description was written by all partners. As a consequence of this participative decision making, collective commitment could develop, developing the $\alpha$ into the direction of 1. This was also the case in the Jiaozuo project, but as a difference, the project description in the Groningen project was written some years before the official start of the project with the ftf kick-off meeting, while the project description in the Jiaozuo project was written during the ftf kick-off meeting and some follow-up meetings.

The initiator of the Print project, who saw a commercial advantage in this project, wrote a project proposal. So, the project proposal was not the outcome of a participative decision making process, but the outcome of a directive decision making style. This did not have a positive influence on the development of the collective commitment, and the $\alpha$ could not develop.

In table 6.22., we give an overview of the impact of the process leading to the project description on collective commitment.

<table>
<thead>
<tr>
<th></th>
<th>Participative decision making style</th>
<th>Clear project description</th>
<th>Collective commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>Yes</td>
<td>+ (for a subgroup)</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
<td>Yes</td>
<td>+ (for a subgroup)</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
<td>Yes</td>
<td>+ (for a subgroup)</td>
</tr>
<tr>
<td>Print</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Dewey</td>
<td>Partly</td>
<td>No</td>
<td>+ and – ((collective) commitment not equally spread over the participants)</td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
<td>No</td>
<td>+</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes</td>
<td>Yes</td>
<td>+</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Yes</td>
<td>Yes</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 6.22. Impact of the process leading to the project description on collective commitment

We can conclude that when the project description is the outcome of a participative decision making style, this has a positive influence on collective commitment (Berlin, Paris, Lisbon, Groningen and Jiaozuo project). When the project description is the outcome of a directive decision making style, collective commitment will not emerge (Print project). If the project description is the outcome of a partly participative decision making style, and the project description is vague, this will have a different influence on the (collective) commitment. At some partners the collective commitment will be medium, at others it will be small (Dewey project). On the other hand, when the project description is the outcome of a participative decision making style, and the project description turns out to be vague in a later stadium of
the project, the decision making style has a positive influence on the collective commitment (Goa project).

So, there is an indication that the hypothesis ‘Participative decision making (starting condition: project proposal definition process; as a ‘management style’ intervention) has a positive influence on the creation of collective commitment’ is verified.

Project proposal content

Impact of proposal content on collective commitment
There is no empirical evidence showing some correlation between proposal content and collective commitment.

Because no empirical evidence has been found showing some correlation between proposal content and collective commitment, I conclude that there is an indication that the hypothesis ‘A clear project description (starting condition: project proposal content) has a positive influence on the creation of collective commitment’ can be neither verified nor falsified.

Dominant leading partners

Impact of dominant leading partners on collective commitment
There is no empirical evidence showing some correlation between dominant leading partners and collective commitment.

The management interventions, which have their impact on CC during the start of the project
All projects had an ftf kick-off meeting at the start of the project. Management interventions concerning the ftf kick-off meeting are as follows:

Management style

Impact of decision making style during ftf kick-off meeting on collective commitment
The decision making style of the Print project was directive. As a result, during the ftf kick-off meeting no real attention was spend concerning (the content of) the project, and the influence of the decision making style on the development of the collective commitment was nil.

In the Dewey project, it is unknown what kind of decision making style was used during the ftf kick-off meeting. Therefore, it is unknown what the impact was on collective commitment. The decision making style of the Berlin project was participative. Also, the team members could choose what they wanted to do in the project. This had a positive influence on the collective commitment, and in this phase the α came close to 1 for the whole project team. The decision making style in the Groningen, Paris and Goa project was also participative, having a positive influence on the collective commitment.

The decision making style of the Jiaozuo project was participative too, and probably the most participative style of all projects, because all team members were involved in the process leading to the project description, having a positive influence on the collective commitment. On the other hand, beside the ftf kick-off meeting some ftf follow up meetings were held shortly after the ftf kick-off meeting to ‘get all noses into one direction’.

The decision making style in the Lisbon project was participative. Because the original project description was formulated six to twelve months before the start of the project, and because the national office had the power to make modifications in the project description, collective commitment was threatened. By using a participative decision making style,
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

management and partners changed the objectives and deliverables for some partners, and therefore changed the project description. This had a positive influence on the collective commitment, and therefore on the \( \alpha \).

In table 6.23., we give an overview of the impact of decision making style during ftf kick-off meeting on collective commitment.

<table>
<thead>
<tr>
<th>Participative decision making style</th>
<th>Collective commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>++</td>
</tr>
<tr>
<td>Paris</td>
<td>++</td>
</tr>
<tr>
<td>Lisbon</td>
<td>++</td>
</tr>
<tr>
<td>Print</td>
<td></td>
</tr>
<tr>
<td>Dewey</td>
<td>Unknown</td>
</tr>
<tr>
<td>Goa</td>
<td>++</td>
</tr>
<tr>
<td>Groningen</td>
<td>++</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>++</td>
</tr>
</tbody>
</table>

Table 6.23. Impact of decision making style during ftf kick-off meeting on collective commitment

We can conclude that when no or less attention is spend to the project description during the ftf kick-off meeting, no decisions have to be made and the effect on the collective commitment is nil (Print).

When the decision making style is participative (Goa, Berlin, Lisbon, Paris, Groningen and Jiaozuo project), the more team members are involved in the process of decision making, the more positive its influence on the collective commitment will be.

So, there is an indication that the hypothesis ‘Participative decision making (starting condition: project proposal definition process; as a ‘management style’ intervention) has a positive influence on the creation of collective commitment’ can be verified.

Content oriented interventions

Impact of differences in knowledge during ftf kick-off meeting on collective commitment

There is no empirical evidence showing some correlation between differences in knowledge and collective commitment.

Convergence of terminology/workshops

Impact of terminology/workshops during ftf kick-off meeting on collective commitment

There is no empirical evidence showing some correlation between terminology/workshops during ftf kick-off meeting and collective commitment.

So, there is no empirical evidence for the hypothesis that ‘Planning or training (during the ftf kick-off meeting; as a ‘convergence of terminology/workshops’ intervention) has a positive influence on the creation of collective commitment’.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

Social events

Impact of organisation of social events during ftf kick-off meeting on collective commitment

In the Print project, the team went to a restaurant to familiarise. In the Dewey project, before the content discussions, a conducted tour was organised and the team went dining at night. In the Goa project, the project management sustained a good balance between content discussions and socialising elements. In the Groningen project, by having a lunch and a drink in the end of the meeting, team members could meet each other in person.

Although no social activities were organised in the Jiaozuo project during the ftf kick-off meeting, collective commitment could develop in a natural way, because people could talk to each other ftf.

In the Lisbon project, collective commitment could develop in an artificial way, by organising ‘social’ events (i.e. a boat trip), and in a natural way, because people could talk with each other ftf. This was also the case in the Berlin project.

Concerning the ftf kick-off meeting in the Berlin and Paris project, social activities were organised, having a positive influence on the collective commitment.

In table 6.24., we give an overview of the Impact of organisation of social events during ftf kick-off meeting on collective commitment.

<table>
<thead>
<tr>
<th></th>
<th>Organisation of social events</th>
<th>Collective commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Dewey</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>No</td>
<td>++ (because people could talk to each other in a ‘natural’ way)</td>
</tr>
</tbody>
</table>

Table 6.24. Impact of organisation of social events during ftf kick-off meeting on collective commitment

We can conclude that socialising can have a positive influence on collective commitment in two ways. First, in a ‘natural way’, because people can talk to each other face-to-face during the ftf kick-off meetings (all projects). Second, in an ‘artificial way’, by organising social activities, building up a kind of ‘shared framework of reference’ (Print, Goa, Dewey, Lisbon, Berlin, Paris and Groningen project).

On the one hand, there is an indication that the hypothesis that ‘social activities have a positive influence on the creation of collective commitment’ can be verified. On the other hand we ask ourselves if collective commitment would not emerge during an ftf kick-off meeting pure in a ‘natural way’, because people can talk to each other face-to-face. There is some evidence for this, as we could see in the Jiaozuo project.

Analysis CC with csQCA

Starting conditions and management interventions leading to the creation of collective commitment

What starting conditions and what management interventions can lead to the creation of the variable collective commitment? To give an answer on this question, I start with analysing the data from table 6.25. with crisp set Qualitative Comparative Analysis (csQCA). Where a
condition appeared in more than one table – i.e. as part of a starting condition, or as (part of a) management interventions at the start of the project - , the data from the last table were used. The argument is that I am looking at the outcome (collective commitment) at the start of the project, and not before the start of the project.

**Step 1. Building a dichotomous input table**

In this type of analysis, for the notation of data I used the same operationalisation as step 1 at team task insight (table 6.25.).

<table>
<thead>
<tr>
<th>Condition</th>
<th>Clear project description (6.22)</th>
<th>Participative decision making style (6.23)</th>
<th>Organisation of social events (6.24)</th>
<th>Follow up project (6.24)</th>
<th>Collective commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviation</td>
<td>Clearprop</td>
<td>Partdec</td>
<td>Orgsoc</td>
<td>Fup</td>
<td>CC</td>
</tr>
<tr>
<td>Print case (PRI)</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Goa case (GOA)</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Jiaozuo case (JIA)</td>
<td>Yes [1] (but after ftf kick-off meeting and three follow up meetings)</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>No [0]</td>
<td>++ [1]</td>
</tr>
</tbody>
</table>

The numbers (6.22, 6.23 etc) refer to the tables where the data are derived from.

*Because in the Dewey case it is unknown what the value of participative decision making is at the start of the project, I decided not to take this case in the analysis (table 6.25.)*

Table 6.25. Dichotomous input table

**Step 2. Constructing a ‘truth’ table (overview of configurations with output)**

I used a software tool called ‘FSQCA’. It is freeware, downloaded from [www.compasss.org](http://www.compasss.org) on June, 23rd 2009, and further discussed in section 3.6.3. For obtaining the ‘truth table’ I chose the ‘truth table algorithm’ (Table 6.26.).

<table>
<thead>
<tr>
<th>Clearprop</th>
<th>Partdec</th>
<th>Orgsoc</th>
<th>Fup</th>
<th>Number</th>
<th>CC</th>
<th>Consist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1.000000</td>
</tr>
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<td>1</td>
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<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.000000</td>
</tr>
</tbody>
</table>
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

Legenda:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Clear project description (6.22)</th>
<th>Participative decision making style (6.23)</th>
<th>Organisation of social events (6.24)</th>
<th>Follow up project (6.24)</th>
<th>Collective commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviation</td>
<td>Clearprop</td>
<td>Partdec</td>
<td>Orgsoc</td>
<td>Fup</td>
<td>CC</td>
</tr>
</tbody>
</table>

Table 6.26. Truth table (overview of configurations with output)

Step 3. Resolving contradictory configurations

As we can see in table 6.26., there are no contradictory configurations, because the outcome ‘Consist’ is only a 1.

Step 4. Boolean minimization (Determining the causal model)

By determining one or more configurations (or patterns), leading to the outcome (in this case: the collective commitment), I am going to determine the causal model in this step.

I will take a look at the configurations in three different forms, or solutions. These forms, or solutions, are:

a. the complex solution
b. the parsimonious solution
c. the intermediate solution

a. the complex solution

The [1] Configurations

First, for obtaining the most complex solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’. I obtained the following formula (formula 23)

\[
\text{CLEARPROP} \cdot \text{PARTDEC} \cdot \text{fup} + \text{CLEARPROP} \cdot \text{ORGSOC} \cdot \text{fup} + \text{PARTDEC} \cdot \text{ORGSOC} \cdot \text{fup} + \text{CLEARPROP} \cdot \text{PARTDEC} \cdot \text{ORGSOC} \rightarrow \text{CC}
\]

\[(\text{JIA, GRO}) + (\text{PRI, GRO}) + (\text{GOA, GRO}) + (\text{BER, PAR, LIS, GRO})\]

The ‘1’ outcome (creation of collective commitment) is observed in virtual teams that combine a clear project proposal AND participative decision making AND no follow up project

OR

In virtual teams that combine a clear project proposal AND organisation of social events AND no follow up project

OR

In virtual teams that combine participative decision making AND organisation of social events AND no follow up project
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

OR

In virtual teams that combine a clear project proposal AND participative decision making AND organisation of social events

The [0] Configurations
There are no [0] configurations

b. The parsimonious solution

[1] Configurations
For obtaining the most parsimonious solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’, except the Remainders which I set to ‘Don’t Cares’ (which means: logical remainders included).

The message I received is ‘The 1 matrix contains all configurations’. So, I assume that the parsimonious solution is equal to the complex solution.

[0] Configurations
There are no [0] configurations.

c. The intermediate solution
For obtaining the intermediate solution, I used the Quin-McCluskey algorithm.

The message I received is ‘The 1 matrix contains all configurations’. So, I assume that the intermediate solution is equal to the complex solution.

Step 5. Interpretation
Because there are no cases with a low or very low collective commitment (no [0] configuration), there is no intermediate solution. Looking at the complex solution, we find four different configurations (formula 23).

In the Print case (and the Groningen case), the combination of a clear project proposal, the (spontaneous) organisation of social events and the absence of being a follow up project led to the creation of collective commitment. The organisation of social events, participative decision making and the absence of being a follow up project led to the creation of collective commitment in the Goa (and Groningen) case. The collective commitment at the start was high in the Goa case, although the project proposal was vague. But as we saw before, the perception of the project proposal at the start of the project was that it was clear; only after nine months it turned out to be vague, because partners were developing their part of the products into several directions. In the Berlin, Paris and Lisbon (and Groningen) cases, we see that the combination of a clear project proposal, participative decision making and the organisation of social events led to the creation of collective commitment.

In the Jiaozuo (and Groningen) cases we find the combination of a clear project proposal, participative decision making and the absence of being a follow up project. In Jiaozuo case, by participative decision making during the kick-off meeting and three follow up meetings, a clear project proposal was developed. There were no organised social events, but people learned to know each other better in a ‘natural’ way, also having a positive effect on the creation of the collective commitment.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

6.3. Sustenance of team task insight, empowerment and collective commitment

6.3.1. Team task insight
If after some time strategic momentum of the virtual R&D project team wears down - this is the issue of sustaining momentum - one may need again management interventions, aimed to produce the necessary outcomes in the technical domain (and political and cultural domains) to regain strategic momentum.

The hypotheses concerning the management interventions and starting conditions and their impact on team task insight are as follows:

a. Different professional backgrounds of team members negatively contribute to the sustenance of team task insight (This is a factor or a starting condition) (verified in section 6.2.)

b. Different (National) cultural backgrounds of team members negatively contribute to the sustenance of team task insight (This is a factor or a starting condition) (verified in section 6.2.)

c. Planning or training (during the ftf kick-off meeting; as a ‘convergence of terminology/workshops’ intervention) positively contributes to the sustenance of team task insight

d. Participative decision making (starting condition: project proposal definition process; as a ‘management style’ intervention) positively contributes to the sustenance of team task insight.

e. Positive and negative feedback (as a ‘content oriented’ intervention) positively contributes to the sustenance of team task insight

f. An ftf meeting (as a ‘content oriented’ intervention) positively contributes to the sustenance of team task insight

The hypotheses concerning the management interventions and their impact on team task insight, which are the outcome of the cross-case analysis, are as follows:

f. A small difference in knowledge between the partners in the virtual R&D project team positively contributes to the sustenance of team task insight (verified in section 6.2.)

g. Dominant leading partners have a negative influence on the sustenance of team task insight

The written outcome of the cross-case analysis concerning the management interventions and starting conditions will here be presented. I will focus on the management interventions, which have their impact on TTI during the continuation of the project process of the project. As we have seen in section 6.2., some hypothesis concerning the starting conditions which have their impact on the sustenance of TTI are already verified or falsified.

The management interventions, which have their impact on TTI during the sustenance of the project process
Management interventions, which have their impact on the sustenance of TTI during the project process, are as follows:

**Management style**

*Impact of decision making style on team task insight*

In the Lisbon project there was also discussion about the changes and the achievement of objectives in the workshops. As one informant said ‘Mostly the objectives were reached as originally formulated. In some cases the objectives had to be changed’. So, during the ftf-meetings there was room for participative decision making, having a positive influence on team task insight.

In the Dewey project, the objective remained unclear for a long time, so that one had to wait for clarity of other work package leaders before one could continue further, and team task insight could increase. This clarity was the result of discussions during ftf meetings. So, participative decision making can have a positive influence on team task insight.

In table 6.27., we give an overview of the impact of decision making style on team task insight

<table>
<thead>
<tr>
<th>Decision making style</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Participative</td>
</tr>
<tr>
<td>Paris</td>
<td>Participative</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Participative</td>
</tr>
<tr>
<td>Print</td>
<td>Less participative</td>
</tr>
<tr>
<td>Dewey</td>
<td>Participative</td>
</tr>
<tr>
<td>Goa</td>
<td>Directive</td>
</tr>
<tr>
<td>Groningen</td>
<td>Participative</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Participative</td>
</tr>
</tbody>
</table>

Table 6.27. Impact of decision making style on team task insight

We conclude that in two out of eight projects (Dewey and Lisbon) we could find evidence that participative decision making has a positive influence on team task insight.

So, there is an indication that the hypothesis that ‘participative decision making (as a ‘management style’ intervention) has a positive influence on the sustenance of team task insight’ can be verified.

This management intervention will not be taken into consideration concerning its effect on team task insight, because there are too less cases in which there is a correlation between difference in participative decision making and team task insight.

**Content oriented interventions**

*Impact of differences in knowledge during meetings on team task insight*

In all projects, the team members were empowered to use several media types for technical knowledge sharing: face-to-face (ftf) contacts, e-mail, and telephone (conferences). In the Berlin project, a shared repository was used, and in the Lisbon project there was also a website, which was not used much at this project, and portals. In the Jiaozuo project, also MSN messenger and Net meeting (more complex than MSN messenger) was used as an electronic tool for collaboration. In the Dewey project, also MSN messenger, a project
website and a collaboration tool was used. The latter did not function well. In the GOA project, also video conferences were used. The Print project also used MSN messenger. In Lisbon, Paris, Berlin, Jiaozuo, Dewey projects, ftf-meetings were (very) important for communication and technical knowledge sharing. All respondents in the Berlin project think an ftf-meeting is more efficient than other media types concerning content and technical discussions. As one respondent said 'The most important thing on workshops was the content discussions. Often, these discussions were very passionate. This does not work with other media. The discussion can be continued afterwards via e-mail. But just making ones point of view clear to the others and discuss about it goes much easier in an ftf-context'. Respondents from the Lisbon and Paris project agree with this. Concerning an informant in the Jiaozuo project, virtual communication (compared with ftf-meetings) is to some amount constrained. In the Dewey project, one informant even saw it as a 'drive for the process'. According to this informant, first team task insight must develop with the help of ftf meetings, before other communication forms become efficient. Especially in the design phase of an innovation project.

E-mail was the most important tool for the communication in the Berlin project. It was also used very often in the Lisbon project, and used in the Paris project. Two constrains were reported concerning the use of e-mail. In the first place when participants started to discuss, according to one respondent 'it is important to stop and wait for an ftf-meeting, where real discussions can take place. With e-mail, a discussion lasts too long. At one point it is even possible to lose the threat of the discussion'.

In the second place as one respondent said in the Paris project '(...) or the e-mail message is too short, so people do not get the message. Or it is too much text and people reply also with a lot of text, which can have as a disadvantage that the opinions diverge instead of converge'.

E-mail, MSN-messenger and Net meeting were used in the Jiaozuo project. The (concerning e-mail third) constrain was according to an informant that 'people can get confused concerning the meaning of written sentences. Therefore, when irritations occurred, one must telephone as soon as possible to solve the misunderstanding'.

These constraints can have a negative impact on team task insight and technical knowledge transfer or technical adjustment. One Benefit was reported concerning e-mail use. 'E-mail is a very good tool that helps us to save a lot of time and get the lowest to prepare efficiently of the real meetings we have had together. I think it is a very efficient and fantastic tool'.

In the Berlin project, teleconferences were not used much. In the Lisbon and Paris project, teleconferences were only used at the end of the project. Four constraints were reported for using teleconferences in the Lisbon project. In the first place they did not last longer than one hour, because it was too tiring on the basis of the fact that the partners did not see each other. In the second place, when more than five people joined a teleconference, it is more difficult to manage. 'You have one manager and the manager needs to give the authorization to speak. It is impossible to take it, because in that case you need to follow some rules. Because in that case you can imagine that when five or six people are speaking together in a conference call you are out, it is just noise. So you need to follow a rule. So these rules are not voluntary'.

In the third place, when more than five people joined a teleconference, communication disturbances can occur earlier, because it is more difficult to recognise the voice, and the people to whom the voice belongs. In the fourth place, when a team member joins a teleconference and he is too late, he is completely lost. These four constraints can have a negative impact on team task insight. A fifth constrain was reported in the Paris project '(...) because sometimes communication is not easy over the phone. For example, when you want to explain/describe a technical thing, it
is difficult to exchange by phone. If you want to explain a complex behaviour it is not easy, so you really need that face-to-face contact. I think we couldn’t have worked efficiently without seeing us’.

In this case also a teleconference can have a negative impact on knowledge transfer and a negative impact on team task insight.

A sixth constrain was reported for using teleconferences in the Dewey project ‘you know nothing about the emotional aspect of the other, or if he is writing things up or just ‘day dreaming’.

In the Goa project, according to one informant, video- and telephone conferences (its seventh constrain) led to communication disturbances, on the basis of too less conversation management.

One benefit was reported for using teleconferences in the Paris project, over e-mail use ‘Teleconferences have the advantage over e-mail that you can react directly on what is said by the other. And you hear the nuances much more’.

So, there are more social cues in a teleconference than in an e-mail conversation. This can have a positive impact on technical knowledge sharing and team task insight. Also in the Print project, one informant saw telephone conferences as efficient.

In the shared repository of the Berlin project, and partly in the electronic tool of the Jiaozuo project, which was most important for the technical work, one could find all project data (reports of gatherings, all presentations, and software under development with the last version). This can have a positive impact on knowledge transfer and team task insight, because a team member can always consult this backup tool.

Concerning technical knowledge sharing in the Groningen project, during the first phase the three organisations in the team talked with each other about the development of the three components of the tool to be sure that they all were developing into one direction. But one can ask if the β remained close to +1 during the first phase of the project, i.e. if all participating organisations were developing their component in the same direction. An indication for this is that a team member of H2 build a formation in this first phase which did not lead to results (RO/expected by the other participating organisations). Probably, this smaller team task insight is the result of not enough communication (and therefore technical knowledge sharing and technical adjustment) in the team. So, in all projects, different media types were used for technical knowledge sharing.

In the Berlin project, every two months there was a formal ftf-meeting on the consortium level; when there was too less progression, an extra ‘informal’ ftf-meeting was planned. The discussions in the workshops were very important for the technical domain; the team task insight increased during these meetings. So, knowledge transfer and feedback can have a positive influence on team task insight. There were two special ftf-meetings in the Berlin project, which lasted for one whole week. During this week the team members lived and worked together. There were workshops during these weeks, having a positive influence on team task insight (technical domain), on the basis of knowledge transfer and feedback.

In the Lisbon project, every half year there was an ftf project meeting. Between two project meetings, one or two work package meetings were organised. So there were ftf-meetings on work package level, never on task level. In these meetings, some amount of time was spend on a specific task. These ftf-meetings have a positive influence on (the sustenance of) team task insight, and the team continued working into the right direction.

Concerning the Paris project, on consortium level, there were two (to four) ftf-meetings each year, at which presentations were held. In these meetings there was exchange of information (knowledge transfer) and discussion (feedback). By using ftf-meetings as an intervention in the technical domain, team task insight increased.
As a follow-up of these meetings, some partners who worked on a specific objective, and who shared the same interests, had a more intense collaboration (on team task level). They had their own e-mail contact and sometimes ftf-meetings, and a more intensive exchange of knowledge, which lead to more team task insight (and according to one informant ‘more synergy’) in this specific subteam.

Concerning the Jiaozuo project, ftf-meetings were held once a month with the three team members. During these meetings the development of the project was conducted. Technical knowledge sharing during the development of the project in these meetings sustained the team task insight further.

Concerning the Dewey project, there were ftf meetings for the whole team twice or three times a year. Ftf meetings were used for discussions concerning the content of the project at workshops, leading to more conversion and therefore team task insight in the virtual team.

Beside ftf meetings for the whole team, there were also separate ftf meetings for the work packages.

There were also separate ftf meetings for the developers group, in which they worked very often throughout the whole night to develop the software tool, leading to a greater team task insight.

However, the objective of the project remained unclear for a long time, so that one had to wait for clarity of other work package leaders before one could continue further, and team task insight could increase. This clarity was the result of discussion on ftf meetings. So, participative decision making can have a positive influence on team task insight. However, in several ftf meetings this clarity was not realised much. About 12 months after the start of the project the team already had developed some team task insight (in the sense of WHAT had to happen there), but the operationalisation (in the sense of HOW (in the sense of to which it had to satisfy) stayed unclear; which requirements one had to formulate for the components) remained a chaos. Project management (Germany) intervened after twelve months, trying to establish an outcome in the technical domain, by cutting some knots on an ftf meeting to stop this divergence (directive management style). Although this was accepted by most partners, some protested, endangering their collective commitment.

However, the requirements remained unclear, whereupon the project did not ran well, and team task insight kept on changing. Much of the problems concerning the unclear requirements ‘were however smoothened’ in the development group (momentum effect), which had an important place in the project, in this way increasing team task insight and developing the β into the direction of +1.

Concerning the Goa project, there were for about six ftf meetings during the project for the whole project team. According to one informant, during these ftf meetings, there was a good balance between content discussions and the socialising activities. The content discussions during these ftf-meetings can have a positive influence on team task insight.

There were ftf-meetings in the Print project, but not as much as intended by the team members, on the basis of a shortage of money to pay for the travelling costs. This problem was solved by making use of teleconferences and e-mail. The end users participated in most meetings.

The media types were not used in a regular base (there was not enough communication) in the Groningen project. This led to a difference in knowledge between the partners, and to lesser team task insight.

In table 6.28., we give an overview of the impact of differences in knowledge during meetings on team task insight.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

<table>
<thead>
<tr>
<th>Differences in knowledge</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>No</td>
</tr>
<tr>
<td>Paris</td>
<td>No</td>
</tr>
<tr>
<td>Lisbon</td>
<td>No</td>
</tr>
<tr>
<td>Print</td>
<td>No</td>
</tr>
<tr>
<td>Dewey</td>
<td>Some</td>
</tr>
<tr>
<td>Goa</td>
<td>No</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 6.28. Impact of differences in knowledge during meetings on team task insight

So, there is an indication that the hypothesis that ‘A small difference in knowledge between the partners in the virtual R&D project team has a positive influence on the sustenance of team task insight’, can be verified.

Social events

Introduction
Here, the nature of the ftf-meeting is important, i.e. the social events. What it can or can not do concerning team task insight (empowerment, and collective commitment). Not concerning the number and level of the meetings.

Impact of organisation of social events during ftf meetings on team task insight
There is no empirical evidence showing some correlation between social events and team task insight.

Task reallocation

Impact of task reallocation on team task insight
There is no empirical evidence showing some correlation between task reallocation and team task insight.

Feedback

Introduction
Feedback is giving information to the team members (by other team members, the management or third parties) concerning tasks etc. they achieved so far. The difference with ‘technical knowledge sharing’ is that technical knowledge sharing is in my terminology neutral. Feedback in my terminology bears a value judgement in it. Feedback, like negative or positive remarks, given to others concerning the content of their tasks can lead to more team task insight. This is in line with Trompenaars and Hampden-Turner (1998, p. 159), who say that ‘The word ‘feedback’ is an interesting one in Western Management jargon. It recognizes the need to periodically correct an ongoing thrust or function. But rarely is feedback considered as important as the original direction. Indeed feedback is the means by which the original direction is maintained’.

Impact of feedback on team task insight
Feedback was given on different occasions and using different communication media. In the Berlin, Paris and Lisbon project feedback was given during the workshops at the formal ftf-meetings. Feedback was also given by the reviewers once-a-year on the reportage. Although this was only mentioned in the Paris project, it can also be assumed, on the basis of the same
funding structure, that the other two projects received also feedback in this way. A third source of feedback was the project reports which appeared every six months and in which all the work from the partners was reported. Although this was only mentioned in the Paris project, it can also be assumed, on the basis of the same funding structure, that the Lisbon and Berlin projects received also feedback in this way.

This feedback had a positive influence on (team) task insight, increasing the β. Especially concerning the feedback given during the workshops, this led to a conversion towards the objectives of the project (the project was steered in this way in the same direction as strategic momentum).

Concerning the Jiaozuo project, feedback was given when the team members delivered different parts of the project, and the others judged it. This feedback led to more team task insight.

Feedback was given in the Groningen project, when team members presented their work and others commented, having a positive influence on team task insight. In the Print case, there was feedback given on a regular base by the end users on the products the core group of the Print team produced. This increased team task insight, and sustained the β. So, feedback has a positive influence on team task insight.

Feedback was also given in the Goa project, for example by giving feedback on each others work during ftf meetings or email. According to one informant this also increased team task insight. According to another one it did not increase team task insight, because the differences in professional background were too great.

In table 6.29., we give an overview of the impact of feedback on team task insight.

<table>
<thead>
<tr>
<th>Feedback</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>++</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>++</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>++</td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>++</td>
</tr>
<tr>
<td>Dewey</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td>/</td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>+ or _ (cause: difference in professional background)</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>++</td>
</tr>
</tbody>
</table>

Table 6.29. Impact of feedback on team task insight

We conclude that in seven out of eight projects, there is empirical evidence that feedback was given, in six projects having a positive influence on the sustenance of team task insight. Except in one case, where on the basis of a difference in professional background feedback only had minor impact on the sustenance of team task insight.

So, there is an indication that the hypothesis that ‘positive and negative feedback (as a ‘content oriented’ intervention) has a positive influence on the sustenance of team task insight’ can be verified.

**Analysis TTI with csQCA**

To give an answer on the fourth central research question ‘what starting conditions and what management interventions can lead to the (creation and) sustenance of the variables team task insight, empowerment and/or collective commitment?’ at approximately midterm of the project, I conduct a csQCA analysis.

223
Starting conditions and management interventions leading to the sustenance of team task insight

What starting conditions and what management interventions can lead to the sustenance of the variable team task insight? To give an answer on this question, I start with analysing the data from table 6.30. with crisp set Qualitative Comparative Analysis (csQCA).

Step 1. Building a dichotomous input table

For the notation of data, only a sort of binary system can be used. So, all data have to be operationalised in [0], [1], or [-] (table 6.30.).

I decided to put one starting condition, i.e. dominant leading partner, into the data table. The reason is, that during approximately midterm of the Goa project, a partner (the virtual team leader) cut some knots during a meeting in a directive way. In this way, team task insight increased from low to medium.

I decided not to put any other starting condition in the table, for which the reasons are as follows:

Difference in (national) cultural background: during the process, team members became more aware about the cultural differences, and in many cases learned how to deal with them.

Difference in professional background: during the process, and in some cases by paying explicit attention to this difference, in most cases these differences played a very minor or even no role concerning team task insight.

Clear project proposal: during the process, and certainly at midterm of the project, the team knew what to do and how to pursue it.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Dominant leading partner (6.6)</th>
<th>Differences in knowledge (6.28)</th>
<th>Feedback (6.29)</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin (BER)</td>
<td>No [0]</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Paris (PAR)</td>
<td>No [0]</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Lisbon (LIS)</td>
<td>No [0]</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Print (PRI)</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Groningen (GRO)</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>Yes [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Jiaozuo (JIA)</td>
<td>No [0]</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>++ [1]</td>
</tr>
</tbody>
</table>

The numbers (6.6, etc) refer to the tables where the data are derived from.

Because in the Dewey case it is unknown what the value of feedback is at approximately midterm of the project, I decided not to take this case into the analysis (Table 6.30.)

Table 6.30. Dichotomous input table

**Step 2. Constructing a ‘truth’ table (overview of configurations with output)**

The software tool ‘FSQCA’, which I used, is freeware, downloaded from [www.compasss.org](http://www.compasss.org) on June, 23rd 2009. It is further discussed in section 3.6.3. For obtaining the ‘truth table’ I chose the ‘truth table algorithm’ (Table 6.31.).

<table>
<thead>
<tr>
<th>Leadpar</th>
<th>Know</th>
<th>Feed</th>
<th>Number</th>
<th>TTI</th>
<th>Consist</th>
</tr>
</thead>
<tbody>
<tr>
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<td>4</td>
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<td>0</td>
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<td>2</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

Legenda:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Dominant leading partner (6.6)</th>
<th>Differences in knowledge (6.28)</th>
<th>Feedback (6.29)</th>
<th>Team task insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadpar</td>
<td>Know</td>
<td>Feed</td>
<td>TTI</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.31. Truth table (overview of configurations with output)
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

Step 3. Resolving contradictory configurations

As we can see in table 6.31, there are no contradictory configurations, because the outcome ‘Consist’ is only a 1.

Step 4. Boolean minimization (Determining the causal model)

In this step, I am going to determine the causal model, by determining one or more configurations (or patterns), leading to the outcome (in this case: team task insight).

I will take a look at the configurations in three different forms, or solutions. These forms, or solutions, are:

a. the complex solution
b. parsimonious solution
c. the intermediate solution

a. The complex solution

The [1] Configurations

For obtaining the most complex solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’. I obtained the following formula (Formula 24)

\[ \text{know*FEED + leadpar*FEED} \rightarrow \text{TTI} \]

\[ (BER, PAR, LIS, PRI, GOA, JIA) + (BER, PAR, LIS, GRO, JIA) \]

The ‘1’ outcome (sustenance of team task insight) is observed in virtual teams that combine a low or no difference in knowledge AND medium or high feedback

OR

In virtual teams that combine no dominant leading partner AND medium or high feedback

The [0] Configurations

No [0] configurations

b. The parsimonious solution

[1] Configurations

For obtaining the most parsimonious solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’, except the Remainders which I set to ‘Don’t Cares’ (which means: logical remainders included).

The outcome is the message that ‘the 1 matrix contains all configurations’. We can interpret this as that the complex solution is equal to the parsimonious solution.

The [0] Configurations

No [0] configurations
c. The intermediate solution
For obtaining the parsimonious solution, I used the Quine-McCluskey algorithm.

The outcome is the message that ‘the 1 matrix contains all configurations’. We can interpret this as that the complex solution is equal to the intermediate solution.

Step 5. Interpretation
Because there are no cases with a low or very low team task insight (no [0] configuration), there is no intermediate solution. Looking at the complex solution, we find two different configurations (formula 24).

In the Berlin, Paris, Lisbon, Print, Goa and Jiaozuo cases, the combination of no differences in knowledge and medium to high feedback have a positive influence on the sustenance of team task insight. In the Berlin, Paris, Lisbon, Groningen and Jiaozuo cases, the combination of no dominant leading partner and medium to high feedback have a positive influence on the sustenance of team task insight.
In the Goa case, approximately at midterm of the project there was a dominant leading partner, but by cutting some knots during an ftf meeting they only had a positive influence on team task insight.

6.3.2. Empowerment
A strategic momentum of a virtual R&D project can fluctuate in its intensity during a project lifetime. When strategic momentum is (too) low, management can intervene, aimed to produce the necessary outcomes in the political domain (and technical and cultural domains) to regain strategic momentum.

The hypotheses concerning the management interventions and starting conditions and their impact on empowerment are as follows:

a. Participative decision making (starting condition: project proposal definition process; as a ‘management style’ intervention) positively contributes to the sustenance of empowerment

b. Task reallocation positively contributes to the sustenance of empowerment

Here, I will present the written outcome of the cross-case analysis concerning the management interventions and starting conditions, mainly the management interventions, which have their impact on E during the continuation of the project process of the project.

The management interventions, which have their impact on E during the sustenance of the project process
Management interventions, which have their impact on the sustenance of E during the project process, are as follows:
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

Management style

Impact of decision making style on empowerment
In the Berlin project, meetings were held with workshops, where partners could present their progression. Then intensive and passionate discussions took place concerning the content. The discussions had a positive influence on empowerment.

In the Lisbon project there was also discussion about the changes and the achievement of objectives in the workshops. As one informant said ‘Mostly the objectives were reached as originally formulated. In some cases the objectives had to be changed’. So, during the ftf-meetings there was room for participative decision making, having a positive influence on empowerment.

In the Dewey project, decision making was not always based on a participation basis. E.g. after twelve months project management decided what was going to happen. Although partners accepted this, other partners disagreed, endangering their collective commitment. The directive decision making probably also decreased their empowerment. So, a directive (dictating) way of decision making can probably have a negative influence on empowerment.

In table 6.32., we give an overview of the impact of decision making style on empowerment

<table>
<thead>
<tr>
<th></th>
<th>Decision making style</th>
<th>Empowerment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Participative</td>
<td>++</td>
</tr>
<tr>
<td>Paris</td>
<td>Participative</td>
<td>/</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Participative</td>
<td>++</td>
</tr>
<tr>
<td>Print</td>
<td>Less participative</td>
<td>/</td>
</tr>
<tr>
<td>Dewey</td>
<td>Directive</td>
<td>/</td>
</tr>
<tr>
<td>Goa</td>
<td>Directive</td>
<td>/</td>
</tr>
<tr>
<td>Groningen</td>
<td>Participative</td>
<td>/</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Participative</td>
<td>/</td>
</tr>
</tbody>
</table>

Table 6.32. Impact of decision making style on empowerment

We can conclude that in two projects (Berlin and Lisbon), there was a participative decision making style used by the management, having a positive influence on empowerment. In the Dewey project the decision making style at some times was directive, having a negative influence on empowerment.

So, there is and indication that the hypothesis that ‘participative decision making (as a ‘management style’ intervention) has a positive influence on the sustenance of empowerment’ is verified, although it is not a very strong verification.

Content oriented interventions

Impact of content oriented interventions on empowerment
There is no empirical evidence showing some correlation between content oriented interventions and empowerment.

Social events

Impact of organisation of social events during ftf meetings on empowerment
There is no empirical evidence showing some correlation between social events and empowerment.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

Task reallocation

Impact of task reallocation on empowerment

When the Berlin project was conducted for about one year and four months, a partner had a reorganisation for some time. Meanwhile, their contribution to the project was very small. People were reallocated in the organisation, or left the organisation. In this way, resources were withdrawn from the Berlin project by the management, decreasing their momentum. But there were always some people who were involved in the project, although they almost never came to the ftf-meetings. Other partners in their country partly took over the tasks of this partner (task reallocation), who had an $\alpha > 1$. On the basis of this momentum effect, the momentum for the whole project remained normal. This intervention concerning task reallocation, not by the management but as a momentum effect, had a positive influence on empowerment.

After a year one of the partners (Portugal) in the Dewey project stepped for company-political reasons out of the project, what brought their strategic momentum to nil. Project management intervened, beside other things, by reallocating the tasks and budget. This was regulated in special (smaller) ftf meetings, because the partners had several conceptions concerning partitioning. The management intervention caused that strategic momentum in the rest of the group could be sustained on the same level. Here also, task reallocation had a positive influence on empowerment.

In the Goa project, after the project worked out for twelve months, a capacity reduction took place at one of the partners. The cause of this was that an employee left for the duration of one year, and was not replaced in the project. On the basis of e-mail communication, approximately five months later (then the project was in its 17th month) the management discovered the capacity reduction. The project management intervened with the intention to establish an outcome in the political domain. They reallocated the task from this partner to another. The former partner got less financial resources, and the latter partner more. Also in this case, task reallocation had a positive influence on empowerment.

In the beginning of the Jiaozuo project, a member of a partner was not able to fulfil the expectancies. As a consequence, agreements were not fulfilled and partners became a bit upset. The project leader intervened in two domains. By using conflict management, he intervened in the cultural domain. He allocated the tasks and capacities from one partner to another partner, as an intervention in the political domain. The latter partner was more successful in dealing with the task. On the basis of the interventions in the cultural and political domains, collective commitment and empowerment were restored again to a normal level, and $\alpha$ remained 1. In this way, strategic momentum sustained normal.

So, task reallocation can have a positive impact on empowerment.

In the Paris project, one (academic) partner had difficulties concerning the collaboration with another (industrial) partner. The goal was to share experience. A task was defined in the beginning of the project, but this task has never been reached jointly with the partner. Eventually, the academic partner reached the task, but by the work in their own lab. The problem was solved in the political domain by task reallocation, having a positive effect on empowerment.

In the beginning of the Print project, a partner wanted to see if the project could be used as a tool or a solution that could be proposed for their members. But on the basis of a lack of internal resources, it was too complex for them to implement and to disseminate it with the partners in their country. As a consequence, the partner became less committed to the project. The initiator intervened, intended to establish an outcome in the political domain, by taking over the activities of the partner, and made their only deliverable. This task reallocation from the partner to the initiator of the project had a positive influence on empowerment.

In table 6.33., we give an overview of the impact of task reallocation on empowerment.
Table 6.33. Impact of task reallocation on empowerment

We can conclude that in six projects (Print, Goa, Dewey, Berlin, Paris and Jiaozuo project), where task reallocation took place, this had a positive influence on empowerment.

So, there is an indication that the hypothesis that ‘task reallocation has a positive influence on the sustenance of empowerment’ can be verified.

Feedback

Impact of feedback on empowerment
There is no empirical evidence showing some correlation between feedback and empowerment.

Analysis E with csQCA

Starting conditions and management interventions leading to the sustenance of empowerment
What starting conditions and what management interventions can lead to the (creation and) sustenance of the variable empowerment? To give an answer on this question, I start with analysing the data from table 6.34. with crisp set Qualitative Comparative Analysis (csQCA).

Step 1. Building a dichotomous input table
In this type of analysis, I used the same operationalisation as step 1 at team task insight for the notation of data (table 6.34.).
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

### Table 6.34 Conditions and their influence on empowerment

<table>
<thead>
<tr>
<th>Abbreviations</th>
<th>(Participative) Decision making style (6.32)</th>
<th>Task reallocation (6.33)</th>
<th>Empowerment (at approx. midterm project)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes [1]</td>
<td>Yes [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes [1]</td>
<td>Yes [1]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>++ [1]</td>
</tr>
<tr>
<td>Print</td>
<td>Yes (Less) [1]</td>
<td>Yes [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Goa</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>++/+ [1]</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>++ [1]</td>
</tr>
</tbody>
</table>

The numbers (6.32, etc) refer to the tables where the data are derived from.

### Step 2. Constructing a ‘truth’ table (overview of configurations with output)

As discussed in section 3.6.3., I used a software tool called ‘FSQCA’. It is freeware, downloaded from [www.compasss.org](http://www.compasss.org) on June, 23rd 2009. For both outcomes: [0] and [1], the ‘truth table’ must be conducted. For obtaining the ‘truth table’ I chose the ‘truth table algorithm’ (Table 6.35.).

<table>
<thead>
<tr>
<th>Partdec</th>
<th>Tare</th>
<th>Number</th>
<th>E</th>
<th>Consist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
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</tr>
<tr>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

**Legenda:**

### Table 6.35. Truth table (overview of configurations with output)

### Step 3. Resolving contradictory configurations

As we can see in table 6.35., there are no contradictory configurations, because the outcome ‘Consist’ is a 1.

### Step 4. Boolean minimization (Determining the causal model)

In this step, I am going to determine the causal model, by determining one or more configurations (or patterns), leading to the outcome (in this case: empowerment).

I will take a look at the configurations in three different forms, or solutions. These forms, or solutions, are:
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

a. complex solution
b. parsimonious solution
c. the intermediate solution

a. the complex solution

The [1] Configurations
First, for obtaining the most complex solution, I used the Quine-McCluskey algorithm, with the setting Positive cases ‘true’ and all others ‘False’. I obtained the following formula (formula 25)

\[ \text{PARTDEC} + \text{TARE} \rightarrow \text{E} \]

\[(\text{BER, PAR, LIS, PRI, GRO, JIA}) + (\text{BER, PAR, PRI, DEW, GOA, JIA})\]

The ‘1’ outcome (sustenance of empowerment) is observed in virtual teams that have medium or high participative decision making

OR

In virtual teams that have medium or high task reallocation

The [0] Configurations

No [0] configurations

b. the parsimonious solution

[1] Configurations
For obtaining the parsimonious solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’, except the Remainders which I set to ‘Don’t Cares’ (which means: logical remainders included).

The outcome is the message that ‘the 1 matrix contains all configurations’. We can interpret this as that the complex solution is equal to the parsimonious solution.

The [0] Configurations

No [0] configurations

c. the intermediate solution
For obtaining the parsimonious solution, I used the Quine-McCluskey algorithm.

The outcome is the message that ‘the 1 matrix contains all configurations’. We can interpret this as that the complex solution is equal to the intermediate solution.

Step 5. Interpretation
Because there are no cases with a low or very low team task insight (no [0] configuration), there is no intermediate solution. Looking at the complex solution, we find two different configurations (formula 25).
In the Berlin, Paris, Lisbon, Print, Groningen and Jiaozuo projects a medium or high participative decision making has a positive influence on the sustenance of empowerment. In the Berlin, Paris, Print, Dewey, Goa and Jiaozuo projects a medium or high task reallocation has a positive influence on the sustenance of empowerment.

6.3.3. Collective commitment

For overcoming the difficulties of a decreasing strategic momentum the management has to intervene in the cultural domain (and political and technical domains) to produce the necessary outcomes to regain strategic momentum.

The hypotheses concerning the management interventions and starting conditions and their impact on collective commitment are as follows:

a. Participative decision making (starting condition: project proposal definition process; as a ‘management style’ intervention) positively contributes to the sustenance of collective commitment

b. Different professional backgrounds of team members negatively contributes to the sustenance of collective commitment (This is a factor or a starting condition)

c. Different (National) cultural backgrounds of team members negatively contributes to the sustenance of collective commitment (This is a factor or a starting condition)

d. Planning or training (during the ftf kick-off meeting; as a ‘convergence of terminology/workshops’ intervention) positively contributes to the sustenance of collective commitment

e. An ftf meeting (with socialising issues; as a ‘social events’ intervention) positively contributes to the sustenance of collective commitment

The hypotheses concerning the management interventions and their impact on collective commitment, which are the outcome of the cross-case analysis, are as follows:

f. Positive and negative feedback (as a ‘content oriented’ intervention) positively contributes to the sustenance of collective commitment

g. Social activities positively contributes to the sustenance of collective commitment

h. A small difference in knowledge between the partners in the virtual R&D project team positively contributes to the sustenance of collective commitment

Here, I will present the written outcome of the cross-case analysis concerning the management interventions and starting conditions, which have their impact on CC during the continuation of the project process of the project.

The management interventions, which have their impact on CC during the sustenance of the project process

Management interventions, which have their impact on the sustenance of CC during the project process are as follows:
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

Management style

**Impact of decision making style on collective commitment**

In the Berlin project, meetings were held with workshops, where partners could present their progression. Then intensive and passionate discussions took place concerning the content. The discussions had a positive influence on collective commitment.

In the Jiaozuo project, the management style of the project leader was facilitative. He was fixed on participation from the other team members. In this way, participating decision making probably has a positive influence on collective commitment.

In the Dewey project, decision making was not always based on a participation basis. E.g. after twelve months project management decided what was going to happen. Although partners accepted this, other partners disagreed, endangering their collective commitment. So, directive decision making can have a negative influence on the collective commitment.

In the Goa project, when there was a problem concerning the direction of the project, the project management intervened. On the basis of the directive decision making style the management used as an intervention, collective commitment at some partners was endangered, because they had to continue with their activities into another direction. This led to irritation and angeriness, i.e. less collective commitment.

In the Print project, the decision making process in this project was dominated by the initiators of the project. They wrote the project description, and determined the boundaries within which the other participants could operate. So, there was participative decision making only to a less extent, having a neutral or even negative influence on the collective commitment.

In the Groningen project, halfway the project, an evaluation took place that led to choices the team had to make concerning the different parts of the tool. The writing of the evaluation report by the team members led to more intensive collaboration, and to more collective commitment. So, participative decision making has a positive influence on collective commitment.

After two years the organisation H3 intended to make a radical change in their project contribution. The project management intervened in establishing an outcome in the technical domain and in the cultural domain, by making an update of the project description, reviewed and approved again by the project-funding organisation. Before, the updated proposal was discussed with and approved by the other two participating organisations. So, the updated project proposal was the outcome of participative decision making, probably having a positive effect on the collective commitment.

Most decision making in the Groningen project during the last year was on the basis of compromise or consensus. Although there were differences in perception concerning this decision making. For example the decision concerning which organisation would use the product from organisation H2 first was taken, according to informant H3, in a directive way. According to informant H6, the agreement was a compromise. Main reason also for this behaviour was that they have to go along with each other after the project. So, consensus is an attribute of (participative) decision making.

In table 6.36., we give an overview of the impact of decision making style on collective commitment.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

<table>
<thead>
<tr>
<th>Decision making style</th>
<th>Collective commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Participative</td>
</tr>
<tr>
<td>Paris</td>
<td>Participative</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Participative</td>
</tr>
<tr>
<td>Print</td>
<td>Less participative</td>
</tr>
<tr>
<td>Dewey</td>
<td>Directive</td>
</tr>
<tr>
<td>Goa</td>
<td>Directive</td>
</tr>
<tr>
<td>Groningen</td>
<td>Participative</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>Participative</td>
</tr>
</tbody>
</table>

Table 6.36. Impact of decision making style on collective commitment

We can conclude that in two projects (Goa and Dewey), at least during some times, there was a directive decision making style used by the management, having a negative influence on collective commitment. In the Print project the decision making style was less participative, having a neutral or even negative influence on collective commitment. In three projects (Berlin, Jiaozuo and Groningen) a participative decision making style was used by the management, having a positive influence on the collective commitment.

So, there is and indication that the hypothesis that ‘participative decision making (as a ‘management style’ intervention) has a positive influence on the sustenance of collective commitment’ is verified.

Content oriented interventions

Impact of content oriented interventions on collective commitment

In the Berlin project, meetings were held with workshops, where partners could present their progression. Then intensive and passionate discussions took place concerning the content. The discussions had a positive influence on collective commitment.

Concerning the Jiaozuo project, ftf-meetings were held once a month with the three team members. During these meetings the development of the project was conducted. These ftf meetings sustained the collective commitment. So, only in two projects (Berlin and Jiaozuo), there is some correlation between content interventions and collective commitment.

In table 6.37., we give an overview of the impact of differences in knowledge during meetings on collective commitment.

<table>
<thead>
<tr>
<th>Differences in knowledge</th>
<th>Collective commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>No</td>
</tr>
<tr>
<td>Paris</td>
<td>No</td>
</tr>
<tr>
<td>Lisbon</td>
<td>No</td>
</tr>
<tr>
<td>Print</td>
<td>No</td>
</tr>
<tr>
<td>Dewey</td>
<td>Some</td>
</tr>
<tr>
<td>Goa</td>
<td>No</td>
</tr>
<tr>
<td>Groningen</td>
<td>Yes</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 6.37. Impact of differences in knowledge during meetings on collective commitment

This management intervention will not be taken into consideration concerning its effect on collective commitment, because there are too less cases in which there is a correlation between differences in knowledge and collective commitment.
Social events

Impact of organisation of social events during ftf meetings on collective commitment

Concerning the social aspects, every organiser of a meeting (somewhere in Europe) organised an activity in the Berlin project. Mostly this was a diner, but visiting a museum etceteras also belonged to the possibilities. According to one respondent these social aspects lead to good relationships in the team, although there is ‘group forming’ on company or task level. Another respondent thought these activities added nothing more to the relationships, because people knew each other already from the former project. So, the social events could have a positive influence on the collective commitment.

There were two special ftf-meetings in the Berlin project, which lasted for one whole week. During this week the team members lived and worked together. The collective commitment increased by the social events during this week.

Social events were also organised at the Lisbon project, for example a visit to a castle. This had a positive impact on the collective commitment, because people learned to know each other much better. As one respondent said ‘They talked independent from technical things; they could learn to know each other. It is important that people know each other not only as anonymous names on e-mail, but as people. For this purpose social activities are very helpful’. According to this respondent, ftf-meetings were necessary because ‘only by these ftf meetings good co-operation was possible’.

In the Paris project, because people could meet during ftf-meetings, and could meet each other informally (at the diner and the excursions), collective commitment was sustained. So, collective commitment can be sustained in an artificial way, by organising social events, and in a natural way, because people could talk with each other ftf.

The meetings in the Dewey project were also important for learning to know each other better, also by social events, leading to a greater collective commitment. As one informant said ‘Friendship emerges when one has personal contact. You don’t need friendship, but you need some personal commitment with somebody’.

There were no social events planned during the Print project. Before and after ftf meetings, small groups or the whole group went something to eat and drink, but this was more in a spontaneous manner. This had a positive influence on collective commitment.

In the Groningen project, social events were not planned. They only went for a (spontaneous) drink after a meeting, which was not planned often. In the Jiaozuo project, social events were not planned either. It is unknown which influence this had on the collective commitment.

Examples of socialising activities during the Goa project ftf-meetings were bicycling, walking, and sauna. It always was a sportive activity, lasting for about four hours, and before the content discussions. Trust became stronger through these activities, as the collective commitment, sustaining the α into the direction of +1. So, social activities can have a positive influence on collective commitment.

In table 6.38., we give an overview of the impact of social events on collective commitment.
Table 6.38. Impact of social events on collective commitment

<table>
<thead>
<tr>
<th>City</th>
<th>Social events</th>
<th>Collective commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berlin</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Paris</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Lisbon</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Print</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Dewey</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
<td>++</td>
</tr>
<tr>
<td>Groningen</td>
<td>No</td>
<td>/</td>
</tr>
<tr>
<td>Jiaozuo</td>
<td>No</td>
<td>/</td>
</tr>
</tbody>
</table>

We conclude that at least in five out of eight projects (Goa, Lisbon, Berlin, Paris, and Dewey project), social activities were organised during the ftf-meetings, which had a positive influence on collective commitment.

So, there is an indication that the hypothesis that ‘Social activities positively contributes to the sustenance of collective commitment’ can be verified. We ask ourselves if collective commitment would not be sustained during an ftf meeting pure in a ‘natural way’, because people can talk to each other face-to-face.

Task reallocation

Impact of task reallocation on collective commitment

There is no empirical evidence showing some correlation between task reallocation and collective commitment.

Feedback

Impact of feedback on collective commitment

The Lisbon project made clear that giving feedback can also have a positive effect on collective commitment. Critique from the project management was that there were too less reviews from the national authorities, but project management had no influence concerning this review process. According to one informant: 'It would have helped the motivation. When people who produce something see, that it is seriously reviewed, and the bad and the good things are mentioned'.

When things were delivered, only the project leader gave positive or negative feedback. So, feedback has a positive influence on collective commitment.

In the Print project, after six months, at a meeting with externals where some partners in the virtual team presented a draft methodology, they got positive feedback and indicators for improvement on the product (the breakthrough meeting). As a consequence, this created much enthusiasm – as an indicator of momentum - at the virtual team partners, and these partners (three; the initiator, a partner from France and a partner from the Netherlands) 'found each other on this meeting in the United Kingdom. So, feedback can have a positive influence on collective commitment, and on strategic momentum. This meeting increased the momentum for these partners, increasing the $\alpha$, and was an indicator therefore that they were working into the right direction.

In table 6.39., we give an overview of the impact of feedback on collective commitment.
We conclude that in one project (Lisbon) an informant concludes that positive feedback would have had a positive influence on the collective commitment. In another project (Print) positive feedback had a positive influence on collective commitment.

This management intervention will not be taken into consideration concerning its effect on collective commitment, because there are too less cases in which there is a correlation between feedback and collective commitment.

Analysis CC with csQCA

Starting conditions and management interventions leading to the sustenance of collective commitment
What starting conditions and what management interventions can lead to the (creation and) sustenance of the variable collective commitment? To give an answer on this question, I start with analysing the data from table 6.40. with crisp set Qualitative Comparative Analysis (csQCA).

Step 1. Building a dichotomous input table
For the notation of data in this type of analysis, I used the same operationalisation as step 1 at team task insight (table 6.40.).
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

<table>
<thead>
<tr>
<th>Abbreviations</th>
<th>(Participative) Decision making style (6.36)</th>
<th>(Organisation of Social events (6.38)</th>
<th>Feedback (6.39)</th>
<th>Collective commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print case (PRI)</td>
<td>Yes (Less) [1]</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>+ [1]</td>
</tr>
<tr>
<td>Groningen case (GRO)</td>
<td>Yes [1]</td>
<td>No [0]</td>
<td>Yes [1]</td>
<td>+ [1]</td>
</tr>
</tbody>
</table>

The numbers (6.36., etc) refer to the tables where the data are derived from.

Because in the Dewey case it is unknown what the value of feedback is at approximately midterm of the project, I decided not to take this case into the analysis (table 6.40.)

Table 6.40. Dichotomous input table

Step 2. Constructing a ‘truth’ table (overview of configurations with output)
A software tool called ‘FSQCA’ was used, as discussed in section 3.6.3. The ‘truth table’ must be conducted for both outcomes: [0] and [1]. For obtaining the ‘truth table’ I chose the ‘truth table algorithm’ (Table 6.41.).

<table>
<thead>
<tr>
<th>Partdec</th>
<th>Orgsoc</th>
<th>Feed</th>
<th>Number</th>
<th>CC</th>
<th>Consist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1.000000</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

Legenda:

Table 6.41. Truth table (overview of configurations with output)

Step 3. Resolving contradictory configurations
As we can see in table 6.41., there are no contradictory configurations, because the outcome ‘Consist’ is a 1.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

**Step 4. Boolean minimization (Determining the causal model)**

In this step, I am going to determine the causal model, by determining one or more configurations (or patterns), leading to the outcome (in this case: collective commitment).

I will take a look at the configurations in three different forms, or solutions. These forms, or solutions, are:

- **d. the complex solution**
- **e. the parsimonious solution**
- **f. the intermediate solution**

**a. the complex solution**

**The [1] Configurations**

First, for obtaining the most complex solution, I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’. I obtained the following formula (Formula 26)

\[
\text{PARTDEC} \times \text{FEED} + \text{ORGSOC} \times \text{FEED} \rightarrow \text{CC}
\]

\[
(\text{BER, PAR, LIS, PRI, GRO, JIA}) + (\text{BER, PAR, LIS, GOA})
\]

The ‘1’ outcome (sustenance of collective commitment) is observed in virtual teams that combine medium or high participative decision making AND medium or high feedback

OR

In virtual teams that combine medium or high organisation of social events AND medium or high feedback

**The [0] Configurations**

No [0] configurations

**b. the parsimonious solution**

**[1] Configurations**

I used the Quine-McCluskey algorithm with setting the Positive cases to ‘True’ and all others to ‘False’, except the Remainders which I set to ‘Don’t Cares’.

The outcome is the message that ‘the 1 matrix contains all configurations’. We can interpret this as that the complex solution is equal to the parsimonious solution.

**The [0] Configurations**

No [0] configurations

**c. the intermediate solution**

For obtaining the parsimonious solution, I used the Quine-McCluskey algorithm.
The outcome is the message that ‘the 1 matrix contains all configurations’. We can interpret this as that the complex solution is equal to the intermediate solution.

Step 5. Interpretation
Because there are no cases with a low or very low team task insight (no [0] configuration), there is no intermediate solution. Looking at the complex solution, we find two different configurations (formula 24).

In the Berlin, Paris, Lisbon, Print, Groningen and Jiaozuo projects a combination of medium or high participative decision making and medium or high feedback have a positive influence on the sustenance of collective commitment. In the Groningen, Print and Jiaozuo projects, no social events were organised during approximately midterm of the project.
In the Berlin, Paris, Lisbon and Goa projects a combination of medium or high organisation of social events and medium or high feedback have a positive influence on the sustenance of collective commitment. In the Goa project, during approximately midterm of the project there was no participative decision making.

6.4. Conclusions concerning the research question in this chapter
In this chapter, I want to give an answer to the fourth central research questions of this research. The fourth central research question is as follows:
- What starting conditions and what management interventions can lead to the creation and sustenance of team task insight, empowerment and/or collective commitment?

I conducted several analyses to give an answer to this question. First, I conducted three analyses concerning the starting conditions and management interventions and their impact on the creation of respectively team task insight, empowerment and collective commitment at the start of the project. Second, three analyses concerning the starting conditions and management interventions and their impact on the sustenance of team task insight, empowerment and collective commitment at approximately midterm of the project were conducted.

As I stated in the intro to chapter 6, I am more interested in the configurations of starting conditions and management interventions that do or do not have a positive influence on the creation and sustenance of the TTI, E and CC. So, we will only look on the level of configurations (or patterns or combinations).

In section 6.2., I have looked at the configurations in three different forms, or solutions, at the start of the project. These are the complex, the parsimonious and the intermediate solution. While according to Ragin (2008) intermediate solutions are superior to the other two solutions, we will only look at the intermediate solutions concerning the conclusions.

What must we do when TTI does not emerge spontaneously? According to the analysis conducted in section 6.2.1. we can conclude from the intermediate solution that for the creation of team task insight no dominant leading partner, a clear project proposal, participative decision making style and small or no differences in knowledge are necessary conditions. But they are not sufficient conditions, because they have to be combined with each other and the condition small or no differences in national cultural background or small or no differences in professional background to lead to the outcome, which is team task insight.

As we saw in section 6.2.2., empowerment in the projects was already high from the beginning. Still, I could find a management intervention that has a positive influence on the creation of empowerment. From the intermediate solution it becomes clear that participative
decision making is a necessary condition leading to the outcome, which is empowerment. I can conclude that for the creation of empowerment participative decision making is a necessary condition. But I can be critical about the fact if it is a sufficient condition. All virtual teams had, for example, enough technical resources to communicate virtually.

In section 6.2.3., I analysed the management interventions and starting conditions that can have a positive influence on the creation of collective commitment, when this does not emerge spontaneously. Unfortunately, on the basis of the fact that there were no cases which had as an outcome a small or very small, or even absent, collective commitment (no \([0]\) configurations), there is no intermediate solution. From the complex solution we see that there are four different configurations, which are sufficient, but not necessary. There are no necessary conditions. These configurations are as follows:

1. The combination of a clear project proposal AND participative decision making AND no follow up project
2. The combination of a clear project proposal AND organisation of social events AND no follow up project
3. The combination of participative decision making AND organisation of social events AND no follow up project
4. The combination of a clear project proposal AND participative decision making AND organisation of social events

In all cases an ftf kick-off meeting was organised at the start of the project. This ftf kick-off meeting can be seen as a ‘platform’ during which a lot of other management interventions can take place and have their influence on the creation of TTI and CC.

In section 6.3., the configurations concerning the sustenance of the project (at approximately midterm of the project) have been analysed in three different forms, or solutions. These forms, or solutions, are the complex solution, the parsimonious solution, and the intermediate solution. Unfortunately there is no intermediate solution. There were no cases which had as an outcome a small or very small, or even absent, team task insight, empowerment or collective commitment (no \([0]\) configurations).

For sustaining TTI in a project, according to the analyses I conducted in section 6.3.1., we can conclude that feedback is a necessary condition. It is not a sufficient condition, because it must be combined with a low or no difference in knowledge or no dominant leading partner.

In section 6.3.2. the configurations leading to the sustenance of E were analysed. From the complex solution we can conclude that both participative decision making or task reallocation are sufficient, but not necessary, conditions concerning the outcome E.

Finally, in section 6.3.3. for sustaining CC in a project, according to the analyses I conducted we can conclude that medium or high feedback is a necessary condition, but not sufficient. It must be combined with medium or high participative decision making or medium or high organisation of social events.

In all cases ftf meetings were organised during the process of the project, which served as a ‘platform’ during which a lot of other management interventions can take place and have their influence on the sustenance of TTI and CC.

6.5. Design proposition
The fourth central question - What starting conditions and what management interventions can lead to the creation and sustenance of the variables team task insight, empowerment
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

and/or collective commitment? – was answered in this chapter. Below, I will present the solution concept according to the CIMO-logic, as introduced in section 5.7.

From the first design proposition, presented in section 5.7., we can derive other design propositions. First, we present the design propositions 5 till 10D (made visible in figure 6.1.), concerning the *creation* of team task insight, empowerment and collective commitment.

The model (figure 6.1.) concerning the *creation* of TTI, E and CC.

![Figure 6.1. Creation of team task insight, empowerment and collective commitment](image)

In all cases presented in chapter 5, I found that the project formally started with a face-to-face (ftf) kick-off meeting. This ftf kick-off meeting had influence on the creation of strategic momentum. During this ftf kick-off meeting, in a conscious and unconscious way team task insight, empowerment and collective commitment was developed. This brings us to design proposition 5.

Design proposition 5: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should conduct a face-to-face kick-off meeting (I) aimed at the creation of strategic momentum of the team (O) by developing team task insight, empowerment and collective commitment (M).

Team task insight was developed, eventually aimed at the creation of strategic momentum of the team, by using five out of six specific interventions, which are as follows: develop a clear project proposal, develop medium to high participative decision making, exclude a dominant...
leading partner, decrease differences in knowledge, decrease differences in national (cultural) background and decrease differences in professional background.

In the Groningen and Jiaozuo cases, and in the Berlin, Paris and Lisbon cases in chapter 6 it became clear, that a configuration of five specific interventions were used, aimed to emerge strategic momentum in a virtual R&D project team. By using this configuration of five specific interventions, team task insight was developed, leading to design proposition 6.

Design proposition 6: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should develop a clear project proposal (I1), develop medium to high participative decision making (I2), exclude a dominant leading partner (I3), decrease differences in knowledge (I4) aimed at the creation of strategic momentum of the team (O) by developing team task insight (M)

Starting conditions can decrease effectiveness (differences in national (cultural) background (the Groningen and Jiaozuo cases) or differences in professional background (the Berlin, Paris and Lisbon cases)). So, the fifth intervention can be decrease differences in national (cultural) background or decrease differences in professional background.

The design proposition 6 is a general design proposition, from which more specific design propositions (i.e. design proposition 7 and 8) can be derived.

To decrease the differences in knowledge, the team management and team members should share knowledge as much as possible. Knowledge sharing can take place, as we saw in all cases, by using the different communication media.

Design proposition 7: In order to decrease differences in knowledge (C), team management and team members should share knowledge (I), aimed to increase the effectiveness of the virtual R&D project team (O) by developing team task insight (M)

Decreasing differences in professional background can be established, as we saw in the Berlin case, by a training of team members and team management. In the Berlin case, the team had to learn a paper by heart in which the operationalisation was given for the most important professional words used in the project.

Design proposition 8: In order to decrease differences in professional background (C), team management and team members should follow a training (I), aimed to increase the effectiveness of the virtual R&D project team (O) by developing team task insight (M)

From the Berlin, Paris, Lisbon, Goa, Groningen and Jiaozuo cases it became clear that participative decision making is an important intervention aimed at the creation of strategic momentum, because it develops empowerment. This leads to design proposition 9.

Design proposition 9: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should develop medium to high participative decision making (I), aimed at the creation of strategic momentum of the team (O) by developing empowerment (M)

Collective commitment was developed, eventually aimed at the creation of strategic momentum of the team, by using three out of four specific interventions, which are as follows: develop a clear project proposal, develop medium to high participative decision making, avoid of being a follow up project and organise social events. Three different configurations became clear:
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

In the Jiaozuo and Groningen cases in chapter 6 we saw, that a configuration of three specific interventions were used, aimed to emerge strategic momentum in a virtual R&D project team. By using this configuration of three specific interventions, collective commitment was developed, leading to design proposition 10A.

Design proposition 10A: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should develop medium to high participative decision making (I1), aimed at the creation of strategic momentum of the team (O) by developing collective commitment (M)

Or:

Beside the configuration in design proposition 10A, there is also another configuration of three specific interventions that can be used, aimed to emerge strategic momentum in a virtual R&D project team, as we saw at the Print and Groningen cases in chapter 6. By using this configuration of three specific interventions, collective commitment was also developed. This brings us to design proposition 10B.

Design proposition 10B: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should organise social events (I1), aimed at the creation of strategic momentum of the team (O) by developing collective commitment (M)

The starting condition ‘a clear project proposal’ had a positive influence on developing collective commitment in the Jiaozuo and Groningen, and Print and Groningen cases. The starting condition ‘being a follow up project’ had a negative influence on developing collective commitment in the Jiaozuo and Groningen, and Print and Groningen cases.

Starting conditions can decrease effectiveness (being a follow up project) and increase effectiveness (a clear project proposal”). So, the second intervention can be ‘avoid being a follow up project’, and the third intervention can be ‘develop a clear project proposal’.

Or:

The Goa and Groningen cases, and the Berlin, Paris, Lisbon and Groningen cases in chapter 6 show a third configuration of three specific interventions, aimed to emerge strategic momentum, as presented in design proposition 10C.

Design proposition 10C: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should develop medium to high participative decision making (I1), and organise social events (I2), aimed at the creation of strategic momentum of the team (O) by developing collective commitment (M)

The starting condition ‘a clear project proposal” had a positive influence on developing collective commitment on the Berlin, Paris, Lisbon and Groningen cases. The starting condition ‘being a follow up project’ had a negative influence on the Goa and Groningen cases.

Starting conditions can decrease effectiveness (being a follow up project) or increase effectiveness (a clear project proposal”). So, the second intervention can be avoid being a follow up project, or develop a clear project proposal.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

Second, we present the design propositions 11 till 13 (made visible in figure 6.2.), concerning the sustenance of team task insight, empowerment and collective commitment. Also here, I take account of csQCA to find patterns or configurations that lead to a certain outcome. As a consequence, several design propositions only differ in one or two Mechanisms.

The model (Figure 6.2.) concerning the sustenance of TTI, E and CC.

![Diagram](image)

Figure 6.2. Sustenance of team task insight, empowerment and collective commitment

Team task insight was sustained, eventually aimed at the sustenance of strategic momentum of the team, by using two out of three specific interventions, which are as follows: sustain medium to high feedback, decrease the differences in knowledge and exclude a dominant leading partner. Two different configurations became clear:

In the Berlin, Paris, Lisbon, Print, Goa and Jiaozuo cases in chapter 6 we saw that a configuration of two specific interventions are aimed at the sustenance of strategic momentum, because they sustain team task insight. This can be seen in design proposition 11A.

Design proposition 11A: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should sustain medium to high feedback (I1), and decrease the differences in knowledge (I2), aimed at the sustenance of strategic momentum of the team (O) by sustaining team task insight (M)

Or:

The Berlin, Paris, Lisbon, Groningen and Jiaozuo cases in chapter 6 make clear that also another configuration of two specific interventions can be aimed at the sustenance of strategic momentum, because they sustain team task insight. Thus leading to design proposition 11B.
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

Design proposition 11B: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should sustain medium to high feedback (I1), and exclude a dominant leading partner (I2), aimed at the sustenance of strategic momentum of the team (O) by sustaining team task insight (M)

Empowerment was sustained, eventually aimed at the sustenance of strategic momentum of the team, by using one out of two specific interventions, which are as follows: sustain medium to high participative decision making and sustain task reallocation. Two different configurations became clear:

In chapter 6 we found two different configurations of interventions aimed at the sustenance of strategic momentum, because they sustain empowerment. The first one found in the Berlin, Paris, Lisbon, Print, Groningen and Jiaozuo cases is as follows:

Design proposition 12A: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should sustain medium to high participative decision making (I1), aimed at the sustenance of strategic momentum of the team (O) by sustaining empowerment (M)

Or:

The second configuration of interventions (actually, it is only one intervention) aimed at the sustenance of strategic momentum, because they sustain empowerment, was found in the Berlin, Paris, Print, Dewey, Goa and Jiaozuo cases and is as follows:

Design proposition 12B: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should sustain task reallocation (I1), aimed at the sustenance of strategic momentum of the team (O) by sustaining empowerment (M)

Collective commitment was sustained, eventually aimed at the sustenance of strategic momentum of the team, by using two out of three specific interventions, which are as follows: sustain medium to high feedback, sustain medium to high participative decision making and organise social events. Two different configurations became clear:

Concerning configurations of interventions aimed at the sustenance of strategic momentum, because they sustain collective commitment, also two configurations were found in the research. The first configuration of interventions found in the Berlin, Paris, Lisbon, Print, Groningen and Jiaozuo cases is as follows:

Design proposition 13A: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should sustain medium to high feedback (I1), and sustain medium to high participative decision making (I2), aimed at the sustenance of strategic momentum of the team (O) by sustaining collective commitment (M)

Or:

The second configuration of interventions found in the Berlin, Paris, Lisbon and Goa cases is as follows:

Design proposition 13B: In order to increase the effectiveness of the virtual R&D project team (C), team management and team members should sustain medium to high feedback (I1), and organise social events (I2), aimed at the sustenance of strategic momentum of the team (O) by sustaining collective commitment (M)
Chapter 6 Emergence and sustenance of team task insight, empowerment and collective commitment

In this chapter, we analysed with crisp set Qualitative Comparative Analysis (csQCA) the starting conditions and management interventions which probably have their influence on the creation and sustenance of the variables team task insight, empowerment and collective commitment. In the next chapter, we will present the conclusions and discussion.
Chapter 7 Conclusions and discussion

7.1 Conclusions

7.1.1. Research questions and answers
Since about fifteen years, there is a movement from face-to-face (or collocated) teams to virtual (or distributed) teams. With virtual teams we mean a team, characterised by geographical dispersion of the members, who rely only to a limited extent to face-to-face communication. In this research, I have concentrated on a specific group of virtual teams: virtual R&D project teams. The method I used was Design Science Research. Design Science Research starts with a ‘real-life problem’, for which a ‘solution concept’ can be developed and validated. So, what is the ‘real-life problem’ I dealt with? It is difficult for a manager to manage the team from a distance, because the manager has to deal with ‘invisible employees’ whom he only sees face-to-face to a limited extent, on the basis of the geographical distance. Moreover it is more difficult to mutually adjust the work-at-hand from a distance, when two or more people who are geographically dispersed are working together. An important consequence is decreased effectivity. It also decreases resilience of such a team. This field problem is the core management problem of virtual teams. The field problem, first formulated in chapter 1, and formulated in another way in chapter 3 and further is as follows:

How to create an effective virtual R&D project team, given the starting conditions of the team.

The starting conditions include issues like:
- team composition.
- team task.
- context.
- history.

The over-all aim of this research was to develop and test a solution concept for this field problem. So, in this research I looked how I can increase the effectivity of a virtual R&D project team. Therefore, I first had to know what effectivity is and how it can be measured. With effectivity is meant the ability to realise desired outcomes. Effectivity is not measured directly, but indirectly by measuring the output (performance).

A possibility to increase the effectivity of a virtual R&D team is a team that is ‘self-propelled’ and resilient. A team that knows exactly what the objectives of the project are and is committed (motivated) and empowered to such an extent that they don’t stop until they have reached these objectives successfully. On the level of the organisation, i.e. the literature concerning organisation science, we know the phenomenon of strategic momentum, which can be defined as ‘perseverance in goal-oriented behaviour’. In this research I looked if this strategic momentum is also applicable on team level. Ceteris paribus such a team also has a good performance. I propose that a team with strategic momentum is as much an effective team as the starting conditions permits (field-problem).

In order to be able to answer the main question, I formulated five central (or sub) questions in section 3.4. The first central question - How to define strategic momentum and how to measure it? – has been answered in section 3.2.4. and 3.2.5. For giving an answer to the next four questions, I conducted a developing serial single case study. The eight virtual teams I studied each consisted of members from several organisations, and all were virtual R&D project teams. From each team I interviewed three or four informants (except the Jiaozuo team, where I interviewed two informants), studied additional project information and (when available) the project website. In this way, triangulation was realised. Each interview was analysed on starting conditions and management interventions, and the variables team task
insight, empowerment and collective commitment. By analysing the explorative study and specific literature presented in chapter 2, these starting conditions and management interventions were gathered and put in a template. The template was then used for the analysis of the eight different cases with support of the software program Atlas TI. By analysing the eight cases several times, new starting conditions and management interventions could be added to the template, and others removed. This process of analysis was repeated until no new starting conditions and/or management interventions were found in the cases, i.e. when saturation occurred.

Then, within-case analyses were written for each case, as presented in chapter 4. In the end, cross-case analyses were conducted. First, in chapter 5, for the variables team task insight, empowerment and collective commitment and their causal relation with strategic momentum. Second, in chapter 6, for the starting conditions and management interventions and their causal relation with team task insight, empowerment and/or collective commitment. I used crisp set Qualitative Comparative Analysis (csQCA) for these cross-case analyses, to increase their quality and reliability, and to find causal combinations (patterns or configurations) which lead to a certain outcome.

With this process in mind, I can take a look at the next four central (or sub) questions. The second central question - Can strategic momentum be more or less a stable property of a virtual team? – has been answered in chapter 4. On the basis of the existence of momentum effects in several cases, which is the phenomenon that the self-propelling-force or perseverance of the momentum becomes manifest, it becomes clear that strategic momentum can be more or less a stable property of a virtual R&D project team.

The third research question - Does team task insight, empowerment and collective commitment lead to the emergence and sustenance of a strategic momentum? – has been answered in chapter 5. On the basis of the TPC-model of Tichy (1983) I hypothesized that strategic momentum in virtual teams can emerge and be sustained through three factors, or independent variables. In the TPC-model TPC stands for the technical (T), political (P) and cultural (C) domains, for virtual teams operationalised through respectively the factors team task insight, empowerment, and collective commitment. These hypotheses have been confirmed in chapter 5. So, developing and sustaining team task insight, empowerment and collective commitment lead to the development and sustenance of strategic momentum (for the cases I have studied). All three factors are needed as a combination, which I can explain with the metaphor of tomato plants. Tomato plants need nutrition, water and light to grow. On all three factors the amount must be sufficient. It makes no sense for example to increase the amount of one factor when there is insufficient available of the other factors.

The fourth research question - What starting conditions and what management interventions can lead to the creation and sustenance of the determinants team task insight, empowerment and/or collective commitment? – has been answered in chapter 6.

Team task insight was developed, eventually aimed at the creation of strategic momentum of the team, by using five out of six specific management interventions and starting conditions (two configurations), which are as follows: develop a clear project proposal, develop medium to high participative decision making, exclude a dominant leading partner, decrease differences in knowledge, decrease differences in national (cultural) background and decrease differences in professional background.

As we saw in section 6.2.2., empowerment in the projects was already high from the beginning. Still, I could find a management intervention that has a positive influence on the development of empowerment. I can conclude that for the development of empowerment participative decision making is a necessary condition. But I can be critical about the fact if it
Chapter 7 Conclusions and discussion

is a sufficient condition. All virtual teams had, for example, enough technical resources to communicate virtually.

Collective commitment was developed, eventually aimed at the creation of strategic momentum of the team, by using three out of four specific management interventions and starting conditions (four configurations), which are as follows: develop a clear project proposal, develop medium to high participative decision making, avoid of being a follow up project and organise social events.

The model (figure 7.1) concerning the creation of TTI, E and CC.

<table>
<thead>
<tr>
<th>T</th>
<th>Develop clear project proposal, medium to high participative decision making, exclude a dominant leading partner, decrease differences in knowledge, differences in national (cultural) background and differences in professional background</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Participative decision making</td>
</tr>
<tr>
<td>C</td>
<td>Develop a clear project proposal, develop medium to high participative decision making, avoid of being a follow up project and organise social events</td>
</tr>
<tr>
<td>TTI</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
</tr>
<tr>
<td>CC</td>
<td></td>
</tr>
</tbody>
</table>

Figure 7.1. Creation of team task insight (TTI), empowerment (E) and collective commitment (CC)

Team task insight was sustained, eventually aimed at the sustenance of strategic momentum of the team, by using two out of three specific management interventions (two configurations), which are as follows: sustain medium to high feedback, decrease the differences in knowledge and exclude a dominant leading partner.

Empowerment was sustained, eventually aimed at the sustenance of strategic momentum of the team, by using one out of two specific management interventions (two configurations), which are as follows: sustain medium to high participative decision making and sustain task reallocation.

Collective commitment was sustained, eventually aimed at the sustenance of strategic momentum of the team, by using two out of three specific management interventions (two configurations), which are as follows: sustain medium to high feedback, sustain medium to high participative decision making and organise social events.
Chapter 7 Conclusions and discussion

In all cases ftf meetings were organised during the process of the project, which served as a ‘platform’ during which a lot of other management interventions can take place and have their influence on the sustenance of TTI, E and CC.

The model (Figure 7.2) concerning the sustenance of TTI, E and CC.

<table>
<thead>
<tr>
<th>T</th>
<th>Sustain medium to high feedback, decrease the differences in knowledge and exclude a dominant leading partner.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Sustain medium to high participative decision making and sustain task reallocation</td>
</tr>
<tr>
<td>C</td>
<td>Sustain medium to high feedback, sustain medium to high participative decision making and organise social events</td>
</tr>
</tbody>
</table>

Figure 7.2. Sustenance of team task insight (TTI), empowerment (E) and collective commitment (CC)

7.1.2. Conclusions concerning strategic momentum

In chapter 5 I gave an answer to the third central question - Does team task insight, empowerment and collective commitment lead to the emergence and sustenance of a strategic momentum? -, which is yes. But on the basis of the cross-case analysis I also found some other interesting conclusions. In the first place, when you are not working into the right direction, it makes no sense to increase the empowerment and/or collective commitment of the virtual R&D project team, because the effective component of strategic momentum stays low (see also the formula of strategic momentum in section 3.2.5. Measuring strategic momentum). In the second place concerning the projects on which research was conducted in this research, management interventions that have an outcome in Tichy’s technical domain, i.e. interventions concerning team task insight, only have influence on the direction of strategic momentum. In other projects (which are not part of this research), for example less competent teams, team task insight has not only its influence on the direction, but probably also on the magnitude of strategic momentum.

7.1.3. Conclusions concerning strategic momentum and team objectives

The fifth central research question formulated in section 3.4. was: can the management of a virtual team use the emergence and sustenance of a strategic momentum to realize the objectives of the team? Concerning this fifth central research question, my conclusion is as follows. As we saw in section 5.5, I have tried to differentiate the projects with respect to their results. But in these cases the differences in results were small, with the exception of one case: the Groningen case. This was a case with a very small strategic momentum. Although two tools were
delivered in the end, it was not the product of the whole team. The project result on team level was rated with a 6. So, concerning the question if the management of a virtual team can use the emergence and sustenance of a strategic momentum to realize the objectives of the team, there is only supportive evidence: in the Groningen case we had a small momentum and a limited success and in the other seven we had medium to large momentum and quite satisfactory outcomes. We need more evidence on the relation between strategic momentum and eventual success.

7.2 Practical implications
Strategic momentum is a fantastic concept which can be used as a complement to management in virtual R&D project teams. When strategic momentum is created in such a team, the management only has to intervene once in a while, and the team – driven by the ‘force’ of the strategic momentum – continues to pursue the team objectives. This concept can be of great importance in the whole development of New Ways of Working, where the ‘command and control’ structure of management is replaced by other coordination mechanisms that give more autonomy to the employees.

In this research, I have developed several design propositions. Practitioners, i.e. the management, can use especially the design propositions by translating them to their specific context or situation. In this way, the design of context specific interventions is aimed to develop and sustain strategic momentum in one’s own virtual R&D project team.

Concerning the development of strategic momentum in a virtual team, and more specifically team task insight, empowerment and collective commitment, management can do as follows:

The virtual team could better consist of team members with the same national (cultural) and professional background (see design proposition 6), which has a positive influence on the development of team task insight. If this is not possible, i.e. the team consists of members with different national (cultural) and/or professional backgrounds, team members should follow a (intercultural) training to decrease these differences (design proposition 8). In this way, the development of team task insight is facilitated.

Before starting the project with a face-to-face (ff) kick-off meeting, it is recommended to develop a clear project proposal, by participative decision making in which all members of the virtual team are involved (which, besides team task insight, also facilitated the development of empowerment (design proposition 9)). In this way differences in knowledge are decreased beforehand (design proposition 7), and the development of team task insight is facilitated. Participative decision making excludes of course the participation of a dominant leading partner in the virtual team (design proposition 6).

But as already stated we saw in section 6.2.2., the empowerment in these projects did not play an important role as a consequence of the nature of these projects:
- All projects consisted of team members from different organisations.
- Also, all projects were funded by (European or national) organisations, which did not take part as partners in the projects.
- As a consequence, the project management had no real power to forbid the partners to use the resources at their own insights during the project period. They only had one very powerful tool, which they eventually could only use once: the power to write in a negative sense about a project partner at the half yearly or yearly project reports for the funding organisation.

A marginal note: for example the French had to consultate with their manager in France before they could agree with (new) proposals in meetings. This is of course a hindrance concerning the progress of the project.
Now we have seen how to develop team task insight and empowerment in a virtual team. Concerning the facilitation of the development of the collective commitment in a virtual team, looking at the design propositions there is not ‘one best way’ to achieve this goal, but there are four ways, i.e. configurations, which ‘lead to Rome’ (see design propositions 10A to 10C; see also section 3.6.3). This is the notion of equifinality (see also section 3.6.3).

These ‘paths’, all leading to the same outcome, i.e. collective commitment, are as follows:

1. Before starting the project with a ftf kick-off meeting, it is recommended to develop a clear project proposal, by participative decision making in which all members of the virtual team are involved. Be aware of the difficulties of a follow up project, because team members can continue pursuing the objectives of the former project.

or

2. Before starting the project with a ftf kick-off meeting, it is recommended to develop a clear project proposal. During the ftf kick-off meeting it is recommended to organise social events. Be aware of the difficulties of a follow up project, because team members can continue pursuing the objectives of the former project.

Or

3. Make use of participative decision making in which all members of the virtual team are involved. During the ftf kick-off meeting it is recommended to organize social events. Be aware of the difficulties of a follow up project, because team members can continue pursuing the objectives of the former project.

Or

4. Before starting the project with a ftf kick-off meeting, it is recommended to develop a clear project proposal, by participative decision making in which all members of the virtual team are involved. During the ftf kick-off meeting it is recommended to organise social events.

Each of the four configurations is sufficient to create collective commitment, but not necessary.

In practice, these paths do not exclude each other, so we can bring them together as ‘one best way’. Thus, before starting the project with a ftf kick-off meeting, it is recommended to develop a clear project proposal, by participative decision making in which all members of the virtual team are involved. Be aware that the project is not a follow up project. During the ftf kick-off meeting (which is recommended because a lot of interventions can be used here too by the management and/or the team members to consciously or unconsciously develop team task insight, empowerment and collective commitment (design proposition 5)), social events can be organised to develop the collective commitment.

Concerning the sustenance of strategic momentum in a virtual team, and more specifically team task insight, empowerment and collective commitment, management can do as follows:

Concerning sustaining team task insight, empowerment and collective commitment in a virtual team, looking at the design propositions there is (again) not ‘one best way’ to achieve this goal, but there are several ways.

The ‘paths’, all leading to the same outcome, i.e. team task insight, are as follows:
Chapter 7 Conclusions and discussion

1. It is recommended to continue feedback on the team task in the virtual team and decrease differences in knowledge (for example by encouraging all kinds of communication).

Or

2. It is recommended to continue feedback on the team task in the virtual team, and exclude the participation of a dominant leading partner in the virtual team.

Each of the two configurations is sufficient to sustain team task insight, but not necessary.

The ‘paths’, all leading to the same outcome, i.e. empowerment, are as follows:

1. It is recommended to encourage participative decision making.

Or

2. It is recommended, when necessary, to make use of task reallocation.

Each of the two configurations is sufficient to sustain empowerment, but not necessary.

The ‘paths’, all leading to the same outcome, i.e. collective commitment, are as follows:

1. It is recommended to encourage feedback on the team task in the virtual team and participative decision making.

Or

2. It is recommended to encourage feedback on the team task in the virtual team and the organisation of social events.

Each of the two configurations is sufficient to sustain collective commitment, but not necessary.

In practice, these paths do also not exclude each other, so we can bring them together to ‘one best way’. To sustain team task insight it is recommended to sustain feedback in the virtual team, decrease differences in knowledge (i.e. by encouraging all kinds of communication), and exclude the participation of a dominant leading partner in the virtual team (see design propositions 11A and 11B). By participative decision making or task reallocation, empowerment is sustained (see design propositions 12A and 12B). Collective commitment is sustained by feedback in the virtual team, participative decision making and the organisation of social events (see design propositions 13A and 13B).

Next to the recommendations given above it is also recommended that management monitors the strategic momentum of the virtual team by checking whether the agreed resources are deployed (alpha) and whether the virtual team still works into the right direction (beta). Most important point is to look if there are momentum effects at interferences. If there are no momentum effects at interferences than people can turn to the management or do nothing. In this case there is not enough strategic momentum, which is a wake up call for the management and the virtual team members to sustain the strategic momentum. In the second place the management can use the strategic momentum concept at the post mortem of the project. With this post mortem analysis management can learn for future projects. After a project has ended (ex-post), by interviewing respondents and studying documentation of the
virtual R&D project team, a within-case analyses of the project can be accomplished. Central topic in this within-case analyses are the interventions aimed at the creation and sustenance of strategic momentum. The insights derived from the within-case analyses can be used in future virtual R&D project teams. In this way, a 'post mortem' of the project is written. Several within-case analyses can be compared with each other, on the basis of which a cross-case analysis can be accomplished. This also delivers insights that can be used to improve virtual R&D project teams in the future.

Also other practical uses can be found for strategic momentum as ‘perseverance of strategic behaviour’. For example a manager in a huge organisation also deals with the problem of less effective and less resilient employees, on the basis of lesser face-to-face contacts, because his employees are distributed over several plants, and/or the manager has a great span-of-control. The research I conducted shows that strategic momentum is a very effective tool for managing people. So, also in these cases it can be used to increase effectivity.

7.3 Discussion
As I already mentioned in the former section, strategic momentum is a fantastic concept which can be used as a complement to management in virtual R&D project teams. By creating such a strategic momentum in a team, the team pursues the team objectives, and the management only has to intervene once in a while.

There are three limitations concerning the analysis conducted in this research. Concerning team task insight and collective commitment and their causal relation with strategic momentum, enough evidence could be found in this research. However, because empowerment was in almost all projects interwoven with the project structure (virtual teams consisting of team members from different organisations and a funding structure for which empowerment was almost a necessity) the causal relation between empowerment and strategic momentum is more difficult to find. The second limitation is that I have not found a virtual team in which no strategic momentum emerged, or broke up at some point in the process, before reaching the end. On the other hand, there are more and less successful virtual R&D project teams I conducted research on, as we saw in section 5.5.

The third limitation is that no attention has been given explicitly to ‘efficiency’, whereas ‘efficiency’ can be defined as ‘the degree to which a set of goals is achieved while using up a minimum of resources, leading to technical and economic efficiency’ (Keuning, 2010, p. 53). But the cases I studied were a special type of subsidized projects in different organisations. All the projects succeeded in obtaining their goals. The only difference is that some succeeded well and others less well (see also section 5.5). The resources are already paid for by the subsidizing organisation. When partners in the projects would use less resources, they would have been paid less money. As a result, efficiency is less important.

On the other hand, efficiency has been a topic in this research concerning ‘efficiency losses’, when (a part of) the team is not working into the right direction. These efficiency losses became overt in two case studies: the Dewey case (see section 4.2.) and the Goa case (see section 4.3.).

Beside these limitations, an interesting question is if SM can always be created. The answer to this question is not given in this research, because there was always SM. But we can give possibilities or conditions under which SM does not occur. This is the case, when one deals with insufficient:
- Team task insight. This is for example the case when the tasks are too difficult.
- Empowerment. This is for example the case when people are sending off empty-handed, or they have too less resources.
- Collective commitment. This is for example the case when there are differences of interests between the partners).
There are limitations, as mentioned above, as we have studied strategic momentum at specific projects. Looking at the positive effects on the effectivity of a team, we have reason to believe that the concept of strategic momentum is not only limited to virtual teams. This research on SM can also be conducted to develop knowledge that strategy practitioners can use to design and manage more effective strategy processes in other contexts than virtual teams. Because too often strategy processes resemble Ackoff’s rain dance, impressive to see, but with limited impact on the subsequent behaviour of the on looking members of the organization. Design science or solution-oriented research on the basis of these ideas on strategic momentum may produce knowledge for the design and management of more effective strategy processes.

Concerning developing knowledge that strategy practitioners can use to design and manage more effective strategy processes, several lines of research can be conducted. The implications of the ideas on strategic momentum for research include a focus in strategy process research on the creation of the right streams of actions and the attitudes, intentions and behaviour of the recipients of change, next to the more common focus on the design of a smart plan and the intentions and behaviour of top management. There is already good research on the recipients of change, but that tends to focus on resistance to (strategic) change and the (miss)interpretation of the plans of top management. The suggested research would focus more on the other side of the medal, developing support for change and the right actions.

A next line of research could be the testing of a first key proposition: in order to produce desired long term business outcomes, strategy processes have to be designed and managed with a focus on the creation of the right strategic momentum. This testing could be conducted by assessing the effectivity of strategy processes (or of organizational decision making processes in general) with strategic momentum as outcome variable rather than the more usual long term business outcomes. More precisely, one would analyse the relation between the characteristics of the design and management of the strategy process and the resulting “collective perseverance in pursuing given long-term business objectives while following certain strategies, even in the face of changing or adverse circumstances”. Especially interesting would be the relation between the characteristics of the strategy formation process and possible “momentum effects” during strategy realization: how do the recipients of change react to set backs and new opportunities; do they wait for management interventions or do they adapt, but still within the broad scope of agreed strategies?

Another line of research could be the testing of a second proposition in another context: to what extent do the combination of collective insight, empowerment and collective commitment of the recipients of change indeed result in ‘collective perseverance in pursuing given long-term business objectives while following certain strategies, even in the face of changing or adverse circumstances’.

Also a line of research could be the creation and sustenance of strategic momentum in a large organisation, because here the manager also deals with the problem of less effective and less resilient employees, on the basis of lesser face-to-face contacts, because his employees are spread over several plants, and/or the manager has a great span-of-control.

The nature of the research, suggested above, does not differ very much from explanatory approaches in strategy research. However, it would produce knowledge on possible solutions for the problem of less than desired effectiveness of strategy processes. That would be very relevant knowledge for strategy professionals, the ultimate target group of strategy research.

A final line of research can be the dependence of the development of SM in the style and structure of the management. For example it will be difficult to create SM when the manager has a ‘command and control ‘style of management. And it is unclear how the development of
SM is dependent on the structure of management. For instance distributed management, or line management outside the team.

7.4 Final remark
In 1991, my interest started in working virtually, because I saw it as a way to reduce the impact of management and increase the autonomy of professionals in organisations. Nowadays, terms like telework and working virtually in teams fall under the umbrella of ‘new ways of working’. In these ‘new ways of working’, the ‘command and control’ structure is reduced in organisations by giving more responsibilities and autonomy to professionals. Strategic momentum, as researched and explained in this dissertation, can encourage this development of reducing the ‘command and control’ structure in organisations, and is a valuable addition to the body of knowledge concerning ‘new ways of working’.
Appendices

Appendices

Appendix 1 Interviewprotocol 1

Version of the interview list used after April 2005.

Interviewscheme

Name of the interviewer: Raymond Opdenakker
Number respondent:
Interview date:
Place:

Introduction

- This is an investigation into "the organizational momentum in virtual R & D teams". This research takes place within the framework of a PhD program at the TUE, conducted by Raymond Opdenakker
- The purpose of the interview is to collect information regarding the causes of (or contribution to) the creation and sustenance of the organizational momentum in virtual R & D teams
- Definitions: 'Virtual teams are goal oriented collaborations, characterised by geographical dispersion of the members, who communicate mainly by other means than face-to-face'
  Momentum: 'the combination of team task insight into the aims of the team with the empowerment and collective commitment to achieve these aims’
- Do you mind when I record this interview on tape? This simplifies the process for me. The tape will only be listened to by me. After the research, the tape will be destructed.
- This is an interview with open questions. The interview will last for about one hour.
- Following on this interview, I will make a report. This report I will first explain to you, before I process the data. Your data will be processed anonymously.
- Do you have any questions beforehand?

Vragen

1. What types of teams do you have in your organisation?
   (face-to-face teams versus virtual teams, project teams versus permanent teams (for example management team) etcetera)

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Appendices

2. Remember a particular virtual team in which you participated. What was your position on that team (team leader or team member)?

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3. Can you tell me more about the project for which this virtual team was formed?

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4. Can you say what you think all went well in this team?
(When for lack of response, ask about the factors related to momentum)

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5. Can you recall a period in which the team worked extremely well? What contributed to such an exciting time? Describe this period as well as possible.
(Pay extra attention to: when a problem occurred during this period, how did the team deal with this?)

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6. Can you say what you believe was less (or wrong) good in this team? (or: Could you say what you would do differently next time / would like to see on this team)

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7. You undertook (as a team manager or a member) special actions when things went less well to bring things back on track? And if so, which ones and what was the effect?

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8. Is / are the original objective (s) of this virtual team achieved? If not, why not?

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9. This project is representative of your experience with virtual teams, or do you have completely different experiences? If so, what?

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Appendices

10. General vision: Finally, you prefer to work with co-located teams or work with distributed (virtual) teams? Why do you prefer?
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- Closing

- Words of thank

- Are there still remarks?

Factors momentum:
- *Empowerment (commitment)*

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- *Face-to-face kick-off meeting*

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- The virtual team project is a continuation of a former project

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- *Participative decision making*

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- *Coaching management style*

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- *Knowledge transfer*

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- Professional background of team members

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- Team cohesiveness

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- *Use of different media types (communication)*

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- Cultural background of team members

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- Organisational background of team members

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Appendices

- Project description

- Task differences (Mc Grath)

- Communication patterns (combination of leadership and media use)

- Trust

- (Planning or) training

- Feedback

- Process losses (mainly based on research in collocated teams)
Appendices

Appendix 2 Interview protocol 2

Version of the interview list used after September 2005.

Interview scheme

Name of the interviewer: Raymond Opdenakker
Number respondent:
Interview date:
Place:

Research questions (only for the interviewer)
Using this semi-structured interview should contribute to answer the following questions:

Central question 1: What is the relationship between strategic momentum and performance of virtual teams?

Central question 2: What causes a strategic momentum in virtual teams?

Central question 3: What causes the emergence of a strategic momentum in virtual teams?
- which factors and interventions lead to the emergence of insight in the functioning of the virtual teams
- which factors and interventions lead to the emergence of empowerment in the functioning of the virtual teams
- which factors and interventions lead to the emergence of a collective commitment in the virtual teams
- which factors and interventions lead to the emergence of F¹, by F²….Fª in the virtual team.

Central question 4: What causes the maintenance of a strategic momentum in virtual teams?
- which factors and interventions lead to the maintenance of insight in the functioning of the virtual teams
- which factors and interventions lead to the maintenance of empowerment in the functioning of the virtual teams
- which factors and interventions lead to the maintenance of a collective commitment in the virtual teams
- which factors and interventions lead to the maintenance of F¹, by F²….Fª in the virtual team.

Central question 5: What disturbed strategic momentum?

Based on the interview, an assessment will be made regarding the creation and sustenance of strategic momentum in the virtual team. This assessment is then sent to a team member (member-check).

Introduction for the informant
- It is a study of "strategic momentum in virtual teams. This research takes place within the framework of a PhD program at TU / e, conducted by Raymond Opdenakker.
Appendices

- The purpose of the interview to collect information about the perseverance of the objectives of the team, the agreed method and responsibilities for the virtual team, and what affects this perseverance. Especially with regard to matters that create and/or sustain this perseverance. The perseverance is particularly noticeable when so-called "critical incidents" occur in the virtual team, such as when a team member is sick, a team drops out or not working properly, or when conflicts arise. "Critical incidents" are thus events when the functioning of the team, and even its survival is at risk. I also want to gather information about the influence of strategic momentum on the performance of the virtual team.

- Definitions: 'Virtual teams are goal oriented collaborations, characterised by geographical dispersion of the members, who communicate mainly by other means than face-to-face'
  Strategic momentum: 'the perseverance to the objectives, the ways of working and the division of tasks'.

- Do you mind when I record this interview on tape? This simplifies the process for me. The tape will only be listened to by me. After the research, the tape will be destructed.

- This is an interview with open questions. The interview will last for about one and a half hour.

- Following on this interview, I will make a report. This report I will first present to you, before I process the data. Your data will be processed anonymously. The report will only be used in the study, consisting of me, Prof. Dr. Joan van Aken and Prof. Dr. John Rijsman.

- Do you have any questions beforehand?

**Questions**

1. You have participated in a virtual team in the X project. What was your position on that team (team leader or team member)?

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   1. Can you tell me more about project X for which this virtual team was established?

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   2. What was your motivation to participate in this project?

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   3. How was the team started?

   (Was there a kick-off meeting? Explain, who did what, when and way, and what did this do with the team members. How were the different participant chosen? Explain)

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Appendices

4. How the team was formed (teambuilding)? Can you describe this formation process?
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5. How were the objectives, the tasks etceteras agreed on (by the initiator of the project, discussion in a part of the project etceteras?). Can you describe this process?
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6. To what amount could you speak about 'Empowerment'
(With Empowerment is mend the degree to which tasks, responsibilities, and capabilities are delegated from the management to a team)
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7. To what amount could you speak about 'team task insight'? If yes, how did this develop in time?
(The degree in which virtual team members felt they acquired new insights regarding the objectives and tasks of their virtual teams)
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8. To what amount could you speak about 'collective commitment'? If yes, how did this develop in time?
(The degree in which team members feel determined to translate the insights into formal actions; emphasize the collectivity, dis this appear?)
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9. Concerning what things you were satisfied in the team?
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10. Concerning what things you were dissatisfied in the team?
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11. Can you give examples of things that went less well in the team? (or: can you say what you would do different when participating again in a virtual team)
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12. What influence did this have on the perseverance of the objectives, division of tasks etceteras?
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13. When things went less well in the team, what influence did this have on your motivation?
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Appendices

14. You undertook (as a team manager or a member) special actions when it went less well off to bring things back on track? And if so, which ones and what was the effect?
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15. How was the project terminated?
(What were the reaction/emotions of the team members?)
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16. Is this project representative for your experiences with virtual teams or do you have other experiences? If yes, which? ………………………………………………………………………………………………………………………………………………………………………………………………………
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17. General vision: Finally, you prefer to work with co-located teams or work with distributed (virtual) teams? Why do you prefer?
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- Closing
- Words of thank
- Are there still remarks?

Factors momentum:
- The virtual team project is a continuation of a former project
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- Participative decision making
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- Coaching management style
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- Knowledge transfer
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- Professional background of team members
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- Team cohesiveness
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- Use of different media types (communication)
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- Cultural background of team members
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- Organisational background of team members
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Appendices

- Project description

- Task differences (Mc Grath)

- Communication patterns (combination of leadership and media use)

- Trust

- (Planning or) training
Appendices

Appendix 3

November 6th 2005

Strategic momentum in virtual teams

   Second supervisor: Prof dr. J.B. Rijsman, University of Tilburg, Faculty of social sciences: psychology and society.

   Supervisor and second supervisor also form the supervision team.

Project objective

The subject field of this research project is virtual teams in a technological setting. On the basis of factors as the need to decrease travelling costs, faster product development, and more use of expertise world-wide, projects take place more and more in virtual teams. With this distribution of project activities, new questions rise. One of these questions is the continuation of functioning of a virtual team (the perseverance), although they experience interferences. In virtual teams, interferences of all kinds can occur. With interferences is meant: a wrong interpretation concerning an e-mail message by the receiver, a different perception of the product qualifications by two or three parties who deliver team members for the virtual teams, a team leader who has to be replaced, or when there is no team leader for a while, or when a team member can't do his task on the basis of illness, etceteras. These interferences can frustrate the continuity of a project, which is under construction of a virtual team. In the most terrible case these interferences can lead to a cancelling of the virtual team, before the project has ended successfully. This problem (or endangerment) is probably higher for a virtual team than for a collocated team, on the basis of a lack of face-to-face interactions between virtual team members and the team manager. A way of managing interferences that in the worst case can lead to a disbandment of the virtual team, before the project has ended successfully, is developing and maintaining a strategic momentum. Strategic momentum is ‘the perseverance in virtual team strategy’. When strategic momentum has been created, the team members have learned a great deal about the tasks and objectives at stake and feel empowered and committed to translate these insights into actions whenever the time is right for doing so.

The objective of this research is to analyse the impact of strategic momentum on the performance of virtual teams, to analyse the mechanisms developing and maintaining strategic momentum in such teams and to develop solution concepts for management interventions and systems for managing virtual teams, based on these analyses.

Therefore, by interviewing virtual (project) team members and studying documents, we want to know:
- What is the relationship between strategic momentum and performance of virtual teams?
- What happens when there is an interference in the virtual team and why does that happen?
- What causes the development of the perseverance of behaviour in virtual teams?
- What causes the maintenance of the perseverance of behaviour in virtual teams?
Appendices

Definitions

Virtual teams
Virtual teams are goal oriented collaborations characterised by geographical dispersion of the members, who rely only on a limited extend to face-to-face communication, but on other forms of communication.

Additional characteristics are:
- possible use of IT for communication
- possible organisational and cultural heterogeneity
- possible distributed ownership
- They may be set up as temporary structures, existing only to accomplish a specific task, or may be more permanent structures, used to address ongoing issues, such as strategic planning
- membership is often fluid, evolving according to changing task requirements

Strategic momentum
Strategic momentum is 'perseverance of behaviour'. In this research the definition of a strategic momentum in virtual teams is 'the perseverance in virtual team strategy'.

Strategy
Strategy is a certain course of action, undertaken by a certain entity (i.e. virtual team), using certain resources, in order to realise certain outcomes

Team task insight
The degree in which virtual team members felt they acquired new insights regarding the objectives and tasks of their virtual teams (Akkermans and van Aken (2005))

Empowerment
With Empowerment is mend the degree to which tasks, responsibilities, and capabilities are delegated from the management to a team.

Collective commitment
The degree in which team members feel determined to translate the insights into formal actions (Akkermans and van Aken (2005))
Appendices

Appendix 4 Member check

Dear informant,

I would like to thank you very much for your participation in my research. Enclosed, you will find the outcome of my analysis of the Jiaozuo case, and additional information concerning (the measurement of) strategic momentum. This is a member check, which is necessary to conduct scientifically good research. In a member check, the analysis is feed back to the informants. Two questions are of major importance to me, and if you would answer them, it would be of great help for my research:

- The within-case analysis (enclosed) is based on the interviews I have held with you and some colleagues. Can you agree with this analysis?
- If not, why?

As you probably will know, it is necessary for research to collect data to answer research questions. For doing this, I would kindly like to ask you to answer the following specific question.

- At the end of the project it was agreed that partner (F1) would conduct the evaluation of the project. This partner did not succeed. As a result, another partner (F2) conducted the evaluation. Question: did the project leader reallocate this task from organisation F1 to F2, or was the task spontaneously taken over by organisation F2?

You can send this member-check by email by using the return button.

Or to: Raymond Opdenakker [adress]

Thank you very much for your help,

With kind regards,

Raymond Opdenakker
Appendices

Appendix 5 The explanation of the concept of strategic momentum as used in the member check

Dear reader,

When you read my analysis of your project, you will find a lot of information concerning strategic momentum. Maybe, some information will not be clear to you immediately. Therefore, in this small paper I will try to explain the concept of strategic momentum I use, and its formula.

Strategic momentum is derived from the concept of momentum in physics. In physics, momentum is mass times velocity. Velocity is a vector quantity; therefore momentum is a vector quantity too. So, momentum has a magnitude (mass times velocity) and a direction (the direction of velocity). Strategic momentum, which is defined as ‘the perseverance in virtual team strategy’, also has a magnitude and a direction. Strategic momentum can emerge spontaneously, but can also emerge or deliberately be developed by three determinants: In the first place team task insight, which is the degree to which virtual team members felt they acquired new insights regarding the objectives and tasks of their virtual team. In the second place empowerment, which is the degree to which a person can deploy the resources put at his disposal according to his own insights. And in the third place collective commitment, which is the degree to which team members are determined to translate the insights into formal actions.

Based on the conceptualization of strategic momentum as a vector given above, we link strategic momentum with the resources, allocated to the project to realize its objectives, and to the objectives-in-use during the work, the ‘direction’ of the work. When the people, allocated to the project, are working according to plan (or according to expectations if there is no formal plan), using the agreed or expected amount of resources in the agreed direction, we say that strategic momentum is equal to these resources. In formula \( SM = R \).

However, in reality this often is not the case. Actual strategic momentum may be described by \( SM = \alpha \times \beta \times R \), with \( \alpha \) and \( \beta \) as dimensionless correction factors. The first one reflects the possible deployment of less or more resources for the venture in question than planned. The nature of these discrepancies may vary. Middle managers may withdraw some resources from the team, for instance to address an urgent issue elsewhere, or, alternatively, they may allocate more resources to the team (drawn from outside the team), for instance because the objectives prove to be more difficult to realize than foreseen. This correction factor \( \alpha \) is non-negative and can, as discussed, be both greater and smaller than 1. The \( \alpha \) may also reflect the productivity of the resources deployed, larger or smaller than planned, for instance because of a technical expertise of the team members larger or smaller than planned. Another ground for this correction may be a demotivation of team members (\( \alpha < 1 \)), or exactly the opposite, if a highly motivated team shows an extraordinary drive.

The second correction factor reflects the degree in which one operates in the right direction. The correction factor \( \beta \) is equal to \( \cos \gamma \), with \( \gamma \) the angle between the actual and the desired direction of working. With \( \gamma \) between 0 and 180 degrees, \( \beta \) lies between +1 and -1. Negative values for momentum mean that one is actually working against agreed objectives. These two correction factors are related with the two factors determining the vector strategic momentum, i.e. respectively its magnitude and its direction.

We did not use the formula to get a quantitative value for strategic momentum, but discussed the impact on strategic momentum of deploying more or less resources than agreed (the \( \alpha \)) or of deploying them not (fully) in the direction of the agreed objectives (the \( \beta \)), and the interventions used to deal with problems in strategic momentum.

Raymond Opdenakker

Maastricht, The Netherlands [date]
Appendices
References

References

References

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Samenvatting (in Dutch)

De laatste decennia is er een toenemende belangstelling voor het werken in multidisciplinaire teams. Een belangrijke reden is dat ‘problemen’ waarvoor een organisatie zich gesteld ziet makkelijker zijn op te lossen door gebruik te maken van verschillende expertises. Sinds vijftien jaar verschuift deze belangstelling steeds meer in de richting van het werken in virtuele teams. Onder een virtueel team wordt in dit onderzoek verstaan een team dat gekarakteriseerd wordt door geografische verspreiding van de leden, en die slechts in beperkte mate gebruik maken van face-to-face communicatie. Volgens deskundigen zal de populariteit van virtuele teams in de toekomst toenemen.

Veldprobleem
In dit onderzoek staat een specifieke groep van virtuele teams centraal, namelijk virtuele Research & Development (R&D) project teams. In onze kapitalistische maatschappijvorm geldt het adagium ‘stilstand is achteruitgang’. Om constant vooruitgang te kunnen boeken en de concurrentie de loef af te kunnen steken, is innovatie onontbeerlijk. Deze innovatie kan tot stand gebracht worden door het werken in virtuele R&D project teams. Maar er doemen ook problemen op bij het werken in virtuele R&D project teams. Zo is een virtueel R&D project team moeilijker te managen dan een reëel team (c.q. een team waarbij de leden bij wijze van spreken ‘bij elkaar op de schoot zitten’), omdat de manager niet voortdurend als het ware over de schouder van de medewerkers kan kijken wat deze aan het doen zijn. Daarnaast is het moeilijker voor teamleden om het werk op elkaar af te stemmen, wanneer ze op afstand met elkaar samenwerken. Deze problemen brengen met zich mee dat een virtueel R&D project team minder effectief en minder veerkrachtig is. Het veldprobleem, dat tevens een kernprobleem voor het management vormt, dat in dit onderzoek dan ook centraal staat is:

Hoe kan een virtueel R&D project team effectiever worden, gegeven de startcondities van het virtuele R&D project team?

Tot de startcondities behoren:
- teamsamenstelling
- team taak
- context
- geschiedenis

Solution concept
Dit onderzoek wordt gekenmerkt door een ontwerp karakter, waarbij voor het voornoemde veldprobleem een ‘solution concept’ wordt ontwikkeld. De onderzoekstrategie die hierbij gekozen is, is ontwerpgericht onderzoek (Design Science Research (DSR)). De vraag die nu voorligt, is welk ‘solution concept’ voor dit veldprobleem kan worden aangedragen. Een mogelijk ‘solution concept’ dient er dus een bijdrage aan te leveren dat de effectiviteit in het team wordt vergroot. Dit kan, door ervoor te zorgen dat er een ‘vliegwieleffect’ ontstaat in het virtuele R&D project team. Uit de organisatieliteratuur ken ik het fenomeen van het strategisch momentum, dat kan worden gedefinieerd als het ‘vasthouden aan doel georiënteerd gedrag’. In dit onderzoek is nagegaan of dit strategisch momentum, dat ook gezien kan worden als een substituut voor management, ook van toepassing kan zijn op teamniveau.

Hiertoe zijn vier initiële proposities geformuleerd:

Initiële propositie 1:
Het ontstaan en onderhouden van het strategisch momentum in een virtueel R&D project team is een effectieve manier om tegemoet te komen aan het kernprobleem van het management.
Het ontstaan en onderhouden van een strategisch momentum kan spontaan gebeuren, maar er kunnen ook interventies toegepast worden om dit strategisch momentum ‘kunstmatig’ te creëren en te onderhouden. Het hoofddoel van dit onderzoek is dan ook om interventies te ontwerpen en te testen met als doel het creëren en onderhouden van het strategisch momentum. Hiertoe wordt gebruik gemaakt van het TPC-model van Tichy (1983), op grond waarvan ik de hypothese poneer dat het strategisch momentum in virtuele R&D project teams gecreëerd en onderhouden kan worden door drie factoren, of onafhankelijk variabelen. In het TPC model staat TPC voor het technische (T), politieke (P) en culturele (C) domein, voor virtuele R&D project teams geoperationaliseerd als respectievelijk de factoren team taak inzicht, empowerment, en collectieve gecommiteerdheid. Dit leidt tot de drie volgende initiële proposities:

Initiële propositie 2: Het strategisch momentum kan ontstaan en worden onderhouden door team taak inzicht (van Aken & Opdenakker, 2005).

Initiële propositie 3: Het strategisch momentum kan ontstaan en worden onderhouden door empowerment (van Aken & Opdenakker, 2005).

Initiële propositie 4: Het strategisch momentum kan ontstaan en worden onderhouden door collectieve gecommiteerdheid (van Aken & Opdenakker, 2005).

Daarnaast is het creëren en onderhouden van team taak inzicht, empowerment en collectieve gecommiteerdheid ook afhankelijk van diverse onafhankelijke variabelen. Dit zijn startcondities en management interventies, waarnaar eveneens in dit onderzoek gekeken is.

Onderzoeksvragen
Om enig inzicht te krijgen in startcondities en management interventies werden de resultaten van vijf interviews als onderdeel van een exploratieve studie geanalyseerd, evenals uitgebreid literatuuronderzoek verricht. Dit resulteerde in een overzicht van mogelijke startcondities en management interventies die geplaatst werden in een template. Gaande het onderzoek werden startcondities en management interventies op grond van de analyses toegevoegd en soms weggestreept. Voor het onderzoek werd gebruik gemaakt van case-studies. Hiertoe werden acht virtuele R&D project teams bestudeerd. Drie multi-organisationele en internationale virtuele R&D project teams die gesubsidieerd werden door de EU, drie multi-organisationele en internationale virtuele R&D project teams waarvan de deelnemende organisaties gesubsidieerd werden door de verschillende nationale overheden en drie Nederlandse multi-organisationele virtuele R&D project teams. Het onderzoek naar zeven teams was ex-post, naar één team longitudinaal.

Op basis van dit onderzoek kan een antwoord gegeven worden op de verschillende onderzoeksvragen, geformuleerd in paragraaf 3.4. van dit onderzoek.

In hoofdstuk 3 wordt een antwoord gegeven op de vraag hoe het strategisch momentum gedefinieerd en gemeten kan worden. De definitie van het strategisch momentum heb ik hierboven al gegeven. Het strategisch momentum kan verder gemeten worden aan de hand van de hoeveelheid resources die ingezet worden. Wanneer de resources die het management aan het virtuele R&D project team heeft toegekend gelijk is aan de resources die voordien in het projectplan overeen zijn gekomen (SM=R(resources)), dan is er sprake van een strategisch momentum van 1. Nu zullen er in de praktijk vaak meer en minder resources aan het virtuele R&D project team worden toegekend. Daarom wordt er voor het strategisch momentum de formule SM= α * β * R gekozen, waarbij α en β dimensieloze correctiefactoren zijn.

De vraag of het strategische momentum min of meer een stabiele eigenschap van een virtueel R&D project team kan zijn wordt beantwoord in hoofdstuk 4. Strategisch momentum is een ‘hypothetische constructie’. We kunnen het niet direct zien, maar alleen indirect wanneer er
momentum effecten optreden. Een momentum effect is het fenomeen dat het ‘vliegwiel effect’ van het momentum manifest wordt. Dit wordt bijvoorbeeld zichtbaar wanneer de teamleden zelf het initiatief nemen om een probleem in het team op te lossen, zonder dat het management daarbij betrokken hoeft te worden. Momentum effecten treffen we in alle cases aan.

Hoofdstuk 5 geeft een antwoord op de vraag of team taak inzicht, empowerment en collectieve gecommiteerdheid leiden tot het ontstaan en onderhouden van het strategisch momentum. Hoewel deze vraag bevestigd is, worden conform de DSR gedachten in dit onderzoek de bevindingen uit de analyses in hoofdstuk 5 en hoofdstuk 6 gepresenteerd als ontwerpproposities, gebaseerd op de CIMO-logica. Dit betekent probleem-in-context (C), interventie (I), mechanisme (M) en uitkomst (Outcome: O) (Denjer, Tranfield and van Aken, 2008). Een ontwerppropositie is toepasbaar in een bepaald applicatie-domein, een klasse van problemen, en in dit geval virtuele R&D project teams.

De laatste onderzoeksvraag is of het management van een virtueel R&D project team het ontstaan en het onderhouden van een strategisch momentum kan benutten om de doelen van het team te bereiken. In hoofdstuk 5 is gebleken dat we meer bewijs nodig hebben voor wat de relatie betreft tussen strategisch momentum en eventueel succes.

Praktische bijdrage
In dit onderzoek heb ik verschillende ontwerpproposities ontwikkeld. Praktijkmensen, waaronder het management, kunnen deze ontwerpproposities gebruiken door ze te vertalen naar hun specifieke context of situatie. Op deze manier is het ontwerp van context specifieke interventies erop gericht om het strategisch momentum te ontwikkelen en onderhouden in het eigen virtuele R&D project team.

Met betrekking tot de ontwikkeling van strategisch momentum in een virtueel team, en meer specifiek team taak inzicht, empowerment en collectieve gecommiteerdheid, kan het management het volgende doen:

Het virtuele team kan het beste worden samengesteld uit teamleden met dezelfde nationale (culturele) en professionele achtergrond (zie ontwerppropositie 6), wat een positieve invloed heeft op de ontwikkeling van team taak inzicht. Wanneer dit niet mogelijk is, bijvoorbeeld omdat het team bestaat uit teamleden met een verschillende nationale (culturele) achtergrond en/of professionele achtergrond, dan kunnen teamleden een (interculturele) training volgen om deze verschillen te verminderen (ontwerppropositie 8). Op deze manier wordt de ontwikkeling van team taak inzicht ondersteund.

Voordat het project wordt gestart met een face-to-face (ftf) bijeenkomst, is het aan te bevelen om een duidelijk projectvoorstel te ontwikkelen, door participatieve besluitvorming waarbij alle teamleden zijn betrokken (wat, naast de ontwikkeling van team taak inzicht, ook de ontwikkeling van empowerment (ontwerppropositie 9) ondersteund). Op deze manier worden verschillen in kennis op voorhand verminderd (ontwerppropositie 7), en de ontwikkeling van team taak inzicht ondersteund. Participatieve besluitvorming sluit natuurlijk de aanwezigheid van een dominante leidende partij in het virtuele team uit (ontwerppropositie 6).

Empowerment speelde in deze projecten geen belangrijke rol op basis van de aard van deze projecten:
- alle projecten bestonden onder de aard van deze projecten;
- ook werden alle projecten gesubsidieerd door (Europese of nationale) organisaties, die niet deelnemen als partners in het project;
- het gevolg was dat het projectmanagement geen werkelijke macht had om de partners te verbieden de resources naar eigen inzicht in te zetten gedurende de projectperiode. Het projectmanagement had slechts een machtsmiddel ter beschikking, die ze eventueel slechts enenmaal kon gebruiken: de macht om een negatief rapport op te stellen over een
Samenvatting (in Dutch)

project partner voor de halfjaarlijkse of jaarlijkse rapportering aan de subsidiërende instantie.

Een marginale opmerking: de fransen dienden bijvoorbeeld hun manager in Frankrijk te consulteren voordat ze koonden instemmen met (nieuwe) voorstellen op bijeenkomsten. Dit is natuurlijk een nadeel voor wat betreft de voortgang van het project.

Nu hebben we gezien hoe team taak inzicht en empowerment ontwikkeld kunnen worden in een team. Voor wat betreft de facilitering van de ontwikkeling van de collectieve gecommiteerdheid in een virtueel team, wordt uit de ontwerpproposities duidelijk dat er niet een weg is om dit doel te bereiken, maar dat er vier wegen of configuraties ‘leiden naar Rome’ (zie ontwerpproposities 10A tot en met 10C). Dit is het concept van equifinaliteit.

Deze wegen, die allen tot dezelfde uitkomst leiden namelijk collectieve gecommiteerdheid, zijn als volgt:

1. Voordat het project gestart wordt met een ftf kick-off bijeenkomst is het aan te bevelen om een helder projectvoorstel te ontwikkelen, door participatieve besluitvorming waarbij alle teamleden van het virtuele team betrokken zijn. Let wel op de moeilijkheden van een vervolgproject, omdat teamleden kunnen doorgaan met het nastreven van de doelen van het voorgaande project.

Of

2. Voordat het project gestart wordt met een ftf kick-off bijeenkomst is het aan te bevelen om een helder projectvoorstel te ontwikkelen. Gedurende de ftf kick-off bijeenkomst is het aan te bevelen om sociale activiteiten te organiseren. Let wel op de moeilijkheden van een vervolgproject, omdat teamleden kunnen doorgaan met het nastreven van de doelen van het voorgaande project.

Of

3. Maak gebruik van participatieve besluitvorming waarbij alle teamleden van het virtuele team betrokken zijn. Gedurende de ftf kick-off bijeenkomst is het aan te bevelen om sociale activiteiten te organiseren. Let wel op de moeilijkheden van een vervolgproject, omdat teamleden kunnen doorgaan met het nastreven van de doelen van het voorgaande project.

Of

4. Voordat het project gestart wordt met een ftf kick-off bijeenkomst is het aan te bevelen om een helder projectvoorstel te ontwikkelen, door participatieve besluitvorming waarbij alle teamleden van het virtuele team betrokken zijn. Gedurende de ftf kick-off bijeenkomst is het aan te bevelen om sociale activiteiten te organiseren.

Elk van de vier configuraties is voldoende om collectieve gecommiteerdheid te ontwikkelen, maar niet noodzakelijk.

In de praktijk sluiten deze wegen elkaar niet uit, dus kunnen we ze samenvoegen tot ‘een beste weg’. Dus, voordat het project gestart wordt met een ftf kick-off bijeenkomst is het aan te bevelen om een helder projectvoorstel te ontwikkelen, door participatieve besluitvorming waarbij alle teamleden van het virtuele team betrokken zijn. Let er wel op dat het project geen vervolgproject is. Gedurende de ftf kick-off bijeenkomst (die aanbevolen wordt omdat veel interventies hier kunnen worden benut door het management en/of de teamleden om bewust
Samenvatting (in Dutch)

of onbewust team taak inzicht, empowerment en collectieve gecommiteerdheid te ontwikkelen (ontwerppropositie 5)), kunnen sociale activiteiten georganiseerd worden om collectieve gecommiteerdheid te ontwikkelen.

Met betrekking tot het onderhouden van strategisch momentum in een virtueel team, en meer specifiek team taak inzicht, empowerment en collectieve gecommiteerdheid, kan het management het volgende doen:

Met betrekking tot het onderhouden van team taak inzicht, empowerment en collectieve gecommiteerdheid in een virtueel team is er, kijkend naar de ontwerpproposities (opnieuw) niet een beste manier om dit doel te bereiken, maar zijn er verschillende wegen mogelijk.

Deze wegen, die allen tot dezelfde uitkomst leiden namelijk team taak inzicht, zijn als volgt:

1. Het is aan te bevelen om vaker feedback te geven met betrekking tot de taak van het team in het virtuele team en verschillen in kennis af te laten nemen (bijvoorbeeld door het aanmoedigen van het gebruik van diverse communicatiemedia en -mogelijkheden).

Of

2. Het is aan te bevelen om vaker feedback te geven met betrekking tot de taak van het team in het virtuele team, en de deelname van een dominante leidende partner in het virtuele team uit te sluiten.

Elk van de twee configuraties is voldoende om team taak inzicht te onderhouden, maar niet noodzakelijk.

De wegen, die allen tot dezelfde uitkomst leiden namelijk empowerment, zijn als volgt:

1. Het is aan te bevelen om participatieve besluitvorming aan te moedigen.

Of

2. Het is aan te bevelen, wanneer noodzakelijk, om gebruik te maken van taak reallocatie.

Elk van de twee configuraties is voldoende om empowerment te onderhouden, maar niet noodzakelijk.

De wegen, die allen tot dezelfde uitkomst leiden namelijk collectieve gecommiteerdheid, zijn als volgt:

1. Het is aan te bevelen om vaker feedback te geven met betrekking tot de taak van het team in het virtuele team, evenals participatieve besluitvorming.

Of

2. Het is aan te bevelen om vaker feedback te geven met betrekking tot de taak van het team in het virtuele team, evenals de organisatie van sociale activiteiten.

Elk van de twee configuraties is voldoende om collectieve gecommiteerdheid te onderhouden, maar niet noodzakelijk.
In de praktijk sluiten ook deze wegen elkaar niet uit, dus kunnen we ze samenvoegen tot ‘een beste weg’. Om team taak inzicht te onderhouden is het aan te bevelen om vaker feedback te geven met betrekking tot de taak van het team in het virtuele team, verschillen in kennis te verminderen (bijvoorbeeld door het aanmoedigen van het gebruik van diverse communicatiemedia en -mogelijkheden), en de deelname van een dominante leidende partner in het virtuele team uit te sluiten (zie ontwerpproposities 11A en 11B). Door participatieve besluitvorming of taak allocatie wordt empowerment onderhouden (zie ontwerpproposities 12A en 12B).

Collectieve gecommiteerdheid wordt onderhouden door vaker feedback te geven met betrekking tot de taak van het team in het virtuele team, participatieve besluitvorming en de organisatie van sociale activiteiten (zie ontwerpproposities 13A en 13B).

Naast de hierboven gegeven aanbevelingen is het ook aan te bevelen dat het management strategisch moment van het virtuele team monitored door na te gaan of de afgesproken resources worden in gezet (alfa) en of het virtuele team nog in de goede richting werkt (beta). Het belangrijkste is om na te gaan of er momentum effecten optreden ten tijden van verstoringen in het team. Wanneer er geen momentum effecten zijn gedurende verstoringen dan kunnen de teamleden zich wenden tot het management of niets doen. In dit geval is er niet genoeg strategisch momentum, wat een ‘wake up call’ is voor het management en de virtuele teamleden om het strategisch momentum te onderhouden. In de tweede plaats kan het management het concept van strategisch momentum gebruiken bij de ‘post mortem’ van een project. Uit deze ‘post mortem’ analyse kan het management lering trekken voor toekomstige projecten. Nadat een project is beeindigd (ex-post) kan er een ‘within-case analysis’ van het project plaatsvinden door het interviewen respondenten en het bestuderen van documentatie van het virtuele R&D project team. Centraal aandachtspunt in deze ‘within-case analysis’ zijn de interventie die worden benut voor de ontwikkeling en het onderhouden van strategisch momentum. De inzichten die worden afgeleid van de ‘within-case analysis’ kunnen worden gebruikt in toekomstige virtuele R&R project teams. Op deze manier wordt een ‘post-mortem’ van het project geschreven. Verschillende ‘within-case analyses’ kunnen met elkaar worden vergeleken, op grond waarvan een ‘cross-case analysis’ kan worden geschreven. Dit levert eveneens inzichten op die kunnen worden gebruikt om toekomstige virtuele R&D project teams te verbeteren.

Ook kunnen andere praktische toepassingen worden gevonden voor strategisch momentum als ‘het vasthouden aan strategisch gedrag’. Bijvoorbeeld kampt een manager in een grote organisatie ook met het probleem van minder efficiënte en minder veerkrachtige medewerkers, op basis van minder face-to-face contacten, omdat deze medewerkers verspreid zijn over verschillende organisatieonderdelen, en/of doordat de manager een grote ‘span of control’ heeft. Het onderzoek dat ik heb uitgevoerd toont aan dat strategisch momentum een erg effectieve manier is voor het managen van mensen. Dus kan het ook in deze gevallen worden gebruikt om de effectiviteit te vergroten.
Summary

In recent decades there is a growing interest in working in multidisciplinary teams. A main reason for this is that often solving problems in organisations needs the use of various different expertises. As these expertises often are not to be found concentrated in one place, this interest is increasingly shifted towards working in virtual teams. A virtual team is a team characterised by geographical dispersion of the members, who rely only on a limited extent to face-to-face communication.

In this research I focus on a specific type of virtual teams, namely virtual Research & Development (R&D) project teams, an increasingly important mode of operation in innovation. However, managing virtual teams faces significant problems. A main cause is that managers can not constantly look over the shoulder of the dispersed professionals to see what they are doing. It is also difficult for the team members themselves to adjust their work to one another when they are cooperating without much face-to-face contacts. Such problems threaten the effectiveness of the virtual R&D project team. Thus the field problem driving this research is:

How to create an effective virtual R&D project team, given the starting conditions of the virtual R&D project team.

The research strategy chosen here is design-oriented research (Design Science Research). In this approach one aims at the development of generic solution concepts for a type of field problem, to be used in designing specific solutions for specific cases of this field problem. I have based my solution concepts on the theory of 'strategic momentum'. Strategic momentum is a kind of flywheel effect. An organization or group of people has strategic momentum if it is able to pursue its objectives, in spite of disturbances and without (much) management interventions. A key indicator of the existence of strategic momentum is a 'momentum effect': an interference in work is solved without management intervention.

The objective of my research is to investigate whether strategic momentum can be a sustainable feature of a team and, if so, to develop ways in which one can develop strategic momentum in virtual teams. I studied eight cases of virtual R&D-teams, analysing the emergence of their strategic momentum and the interventions used to increase it. I developed a way to measure strategic momentum in terms of the resources deployed in the right direction.

More specifically: in chapter 3 an answer is given to the question of how strategic momentum can be defined and measured. Whether strategic momentum can be more or less a stable feature of a virtual R & D project team is answered in Chapter 4, in which I present the eight case studies. One cannot see strategic momentum directly, but only indirectly, for example when momentum effects occur: momentum becomes manifest e.g. when team members take the initiative to solve a problem in the direction of the team's objectives without consulting management. Momentum effects were found in all cases.

Chapter 5 provides answers to the questions on how to create strategic momentum. The theory suggests that the development of team task insight, empowerment and collective commitment leads to the creation and sustenance of strategic momentum. My research supports this hypothesis. In chapter 6 I investigate through cross-case analyses (using crisp set Qualitative Comparative Analysis) how one can develop team task insight, empowerment and collective commitment. The results are presented in the form of design propositions, using the CIMO-logic. This logic runs like: for this problem-in-context (C), it is useful to use this intervention (I), which will produce through these mechanisms (M) the desired outcome (O).
Summary
Author’s Curriculum Vitae

Raymond Opdenakker studied Human Resource Management at the Hogeschool Zuyd (diploma in 1990) and Work and Organisation psychology at the Open Universiteit Nederland (diploma in 1995). After working as a Human Resource Manager at several organisations, he worked as an assistant professor at the Open Universiteit Nederland for four years. In 2000 he started Bureau Lara (www.bureaulara.nl), together with his wife. Key activities are in the first place the development of bachelor, post-bachelor and master courses for several institutes in the field of distance learning. He was already involved in the development of more than twenty courses, under which a HRM course for an International MBA. In the second place training and advice in the field of Human Resource Management, and in the third place translating services from English or German into the Dutch language. In the scientific field he presented papers at the 9th International Workshop On Teamwork, the 10th International Workshop On Teamwork, the International Federation of Scholarly Associations in Management (with Joan van Aken), the EURAM, the 2007 International congres of management science and engineering, the 2008 International congress of management science and engineering, the International Congress in Innovation Management, the 2010 Congress of Management Science and Artificial Intelligence and the 2011 Congress of Management Science and Artificial Intelligence.