MASTER

Don't stick to your gun, bite the bullet
a field study to escalation of commitment in new product development teams

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Don’t stick to your gun, 
bite the bullet:

A field study to escalation of commitment in new 
product development teams

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In partial fulfillment of the requirements for the degree of

Master of Science
in Innovation Management

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Subject headings: escalation of commitment, entrapment, decision making, intra-group conflict, trust, shared leadership.
Abstract

Escalation of commitment is defined as the human trait to pursue the original course of action or even increase commitment towards an ongoing project, although new information suggest to cancel the project (Mahlendorf, 2013; Schmidt & Calantone, 2002). Field studies on escalation of commitment are rare (e.g. Mahlendorf, 2013; Turino & Soetjipto, 2012). Moreover, there is a lack of studies focusing on the decision making groups and their social factors in relation to escalation of commitment (Sleesman et al., 2012). This research aims to fill the methodological gap by conducting a field-study on group decision making and escalation of commitment in particular. 31 teams participated in this study by filling in a survey. Additionally, an electronic manufacturing company participated in a decision making task and allowed to conduct interviews with its employees. The results indicate that trust and information elaboration are negatively related to escalation of commitment, such that higher levels of intra-group trust and higher levels of information elaboration are related to less escalation of commitment. Contrary to expectations, task conflict is positively related to escalation of commitment, such that high levels of task conflict relate to more escalation of commitment. Furthermore the interviews reveal that expertise localization was negatively related to escalation of commitment. Depending on the level of shared leadership, participation in decision making was negatively (low shared leadership) or positively (high shared leadership) related to escalation of commitment.
Preface

This report presents my Master Thesis project for the Master program Innovation Management of the Eindhoven University of Technology. In all I can look back on a great couple of months as a graduation student, during which I received all sorts of support from many people who got themselves involved in this project one way or another.

After my graduation as a mechanical engineer I wanted to broaden my knowledge and skills. In order to fulfill these needs I assigned for the Innovation Management program. Two and a half years later at the start of this project, I still wanted to broaden my horizon. For that reason I asked Sonja Rispens to be my first and Josette Gevers as my second supervisor. With their expertise in the field of human performance management, I could not have chosen a field of study more unrelated to mechanical engineering. Still, my background as an engineer was of great help along the way. It helped me to understand how engineering teams operate, and enabled me to see connections between issues engineers faced during product development and social group factors.

Along the way Ms. Rispens was of invaluable help to me by pushing me in the right direction time after time, and by providing me detailed feedback on everything I handed in. With her help my rough idea of a study focused on social group processes, slowly evolved towards a research project focused on escalation of commitment. Combined with the feedback provided by Ms. Gevers this resulted in a research proposal for a study to escalation of commitment.

Based on this research proposal, John Wallaard offered me the chance to conduct my study at his department. During my time within this company I got a free hand in shaping this project. Furthermore, all the involved employees showed great honesty and openness, which made data collection such as conducting interviews not only very informative, but also entertaining.

To increase the sample size I contacted many of my former fellow mechanical engineering students. It was nice to experience that they were enthusiastically willing to participate. The same goes for all the other personal and professional contacts who contributed to this study along the way.

In all, I want to thank all contributors who I have mentioned above, but also those who remain anonymous. Without them, my graduation project would not have been possible.

Dirk van As
‘s-Hertogenbosch, September 2014
Management summary

This study addresses the concept ‘escalation of commitment’. Escalation of commitment occurs when a decision maker does not alter the course of action while information indicates the current course of action will turn out unsuccessful. Imagine a new product development team who came up with a new product concept. Some months in the development of the product, renewed sales projections indicate that the product will break even or might even incur losses. Still, since the team invested many hours in the development of their little diamond in the rough, they want to continue and finish the project. Formally stated, escalation of commitment is defined as the human trait to pursue the original course of action or even increase the commitment towards an ongoing project, although new information suggest to cancel the project (Mahlendorf, 2013; Schmidt & Calantone, 2002).

Although there are many factors at play in escalation of commitment situations, this study aims to identify the relation between the decision making process and escalation of commitment, and the role social factors play in this relationship. Since many decisions are made in teams, this study focuses on decision making teams rather than individuals. Furthermore, the goal of this study is to provide practical guidance to organizations by which escalation of commitment tendencies of teams can be reduced. The research questions this study addresses are:

RQ1: What intra-team social processes influence the link between the decision making process and escalation of commitment, and how can organizations influence these processes to reduce escalation tendencies?

RQ2: What are the strengths and weaknesses of the decision making process employed by the sponsoring company of this study and how can it be improved?

Research model

In this study, the relation between the decision making process and escalation was investigated by dividing the decision making process in three broad phases:

- Information elaboration; the problem is defined and/or discussed within the group, and in a later stage knowledge found in the information acquisition to solve the problem is shared, the group comes up with multiple solutions to the problem. In short this phase covers sharing information with other team members.

- Information acquisition; a phase in which a search for information on the problem and solutions is initiated. Thus, to what extend do teams look for information to be used in the decisions they make.

- Final decision; based on some decision scheme or heuristics the group makes a final decision out of the set of generated alternatives. In this study, the final decision is operationalized by looking at the extent team members have a say in making the final decision.

Teams need to share their knowledge in order to make decisions, a wide range of factors play a role in these social processes, from emotions to electronic facilities. In order to keep this study manageable only a set of factors related to social aspects of team work were selected. The factors under study here are: expertise localization, task conflict, intra-group trust and shared leadership.
Expertise localization is defined as “the extent to which team members know who on the team knows what” (Kanawattanachai & Yoo, 2007: pp785). As already provided in the definition, this factor relates to the extent team members can locate the various experts within their team. Task conflict was included in the study to obtain information on whether individuals are willing and daring to participate in group discussions. Task conflicts are defined as “disagreements among group members about the tasks being performed” (Jehn, 1995: pp 258) and indicate that individuals dare to challenge the current situation. Trust is defined as “the expectation that other people will behave in ways that are helpful and not harmful” (Rispens et al., 2007: pp 329; Gambetta, 1988). Shared leadership is the final moderator included in this study, it describes a collective team leadership by the team members and is characterized by shared responsibility for outcomes (Hoch & Dulebohn, 2013). The relations tested in this study are shown in figure 1 below. All direct relations were hypothesized to be negative. To clarify these relations with an example: a negative relation indicates that teams who share information extensively would be related to low escalation of commitment tendencies. For the moderators goes that it was expected that relationship between the decision making process variables and escalation of commitment of groups would be moderated such that for example the more expertise localization in a team, the more negative the relation between information acquisition and escalation of commitment. Building on the previous example in which teams sharing a lot of information were related to little escalation of commitment: teams in which leadership roles are shared show less escalation of commitment tendencies than teams with one leadership role.

Results
31 teams participated in this study by filling in a survey. Additionally, teams of an electronic manufacturing company participated in a decision making task and allowed to conduct interviews with its employees. Results of the survey data indicate that only knowledge exchange and trust are negatively related to escalation of commitment. Contrary to expectations was the result that task conflict is positively related to escalation of commitment, such that high levels of task conflict are related to escalating commitment. Participation in decision making is negatively related to escalation of commitment when shared leadership is low. And positively related to escalation of commitment when shared leadership is high. The interviews learned us that information acquisition and expertise localization also play a role in escalation of commitment situations.
Recommendations

For new product development teams in general, the following recommendations are provided: by means to curb escalation of commitment, information elaboration could serve an important role. Although causality could not be tested in this study, it is fairly safe to state that team members should be facilitated to share information with one another in order to reduce escalation tendencies. The role of task conflict remained ambiguous, making it hard and risky to provide guidance to managers. As a result, there is not enough ground to provide managers with recommendations on how to deal with task conflicts in light of escalation of commitment. Regarding the role of trust, organizations should create an environment that encourages team members trust one another. Finally, this study found a relationship between combined effects of participation in decision making and shared leadership in their relationship with escalation of commitment. In terms of escalation of commitment, teams who have a participative decision making process benefit from a centralized leader. On the other side, teams who have a centralized decision maker, benefit from shared leadership roles. Therefore, I recommend organizations to structure their new product development teams in such way that they always have a combination of one shared and one centralized aspect (e.g. shared leadership with centralized decision making or a one leadership role with participative decision making).

The most important managerial recommendations for the sponsoring company are to create unambiguous shared leadership roles such that the responsibilities and division of labor is known to all stakeholders. Furthermore, not only the project manager, but also a lead engineer should feel the responsibility to regularly check in with the progress of individual team members. Thirdly, engineers have a tendency to escalate their own commitment due to hurdles preventing them from de-escalation. They should be rewarded with gratitude when they de-escalate their commitment rather than suffering consequences. With positive reinforcement they are more likely to de-escalate commitment on future occasions. Another important hurdle is formed by an absence of expertise localization, employees should be made aware of the various experts they can address when in need for help.
Chapter 1
Introduction
Although most of the time innocent, nearly every project needs a change of course sooner or later. Since no one is able to predict the future, these changes can only be initiated after a cue indicates a problem of some sort. However, what if these changes are not made? What if the decision maker does not identify the cue as a problem? Or what if he does, but is scared to make a change or to pull the plug and abandon the project altogether? If this is the case, a derailed train can rumble on by escalating this commitment to a point of no return, as was the case with for example the Fyra. The loss incurred to complete this project is estimated at €445 million, for a train-service that was operational for only 40 days after which it was terminated (Simmons-Boardman, 2013).

In this study, escalation of commitment is defined as the human trait to pursue the original course of action or even increase the commitment towards an ongoing project, although new information suggest to cancel the project (Mahlendorf, 2013; Schmidt & Calantone, 2002).

There are many examples of escalation of commitment (hereafter abbreviated as escalation), like major investments in oil transportation pipelines by governments who know fossil fuels are not around long enough to recoup their investments (Arbuthnott & Dolter, 2013) and the Channel Fixed Link railway tunnel connecting France and the United Kingdom (Winch, 2013). Escalation occurs in a wide variety of industries, some examples are research and development (R&D) projects (Schmidt & Calantone, 2002), new product development (Van Oorschot et al., 2011), management control systems (Chakravorty, 2009) and educational settings (Hollar et al., 2000). Also in software development projects, escalation is a common problem. In fact, software projects are more likely than other project types to be escalated (Liang et al., 2013; Pan et al., 2006). The intangible nature of software makes it difficult to obtain accurate estimates of the amount of progress, this may facilitate escalation by providing a false proximity of the project completion date (Pan et al., 2006). In new product development, the fuzzy front end of innovation (i.e. the start of the development process) is also characterized by its intangible nature. Until a product is commercialized, investment decisions must be based on forecasted information (Schmidt et al., 2001), and especially in the fuzzy front end this information is merely an estimate. The decision to pull the plug is a hard one to make in these situations, because it is not at all certain which way the project is heading.
In high risk areas such as R&D, the majority of projects are expected to fail (Mahlendorf, 2013). Continuing these failing projects for extended periods of time costs organizations serious amounts of resources and thus money. For example, Canadian consultants found that 87% of projects exceeded schedule, 56% overran budgets and 45% did not achieve planned benefits (KPMG, 1997). An American study found that 31% of software projects are canceled before completion, and more than half the projects exceed their budget with 89% (Whittaker, 1999). However, escalation of commitment is a double edged sword. To push an uncertain project through the pipeline to successful commercialization there is also a certain level of commitment required. With half of firm’s profits resulting from products commercialized within the past five years (Schmidt & Calantone, 2002), commitment to overcome hurdles is important. But only up until a certain point, too much commitment and the project is not terminated or adjusted when necessary. This can result in situations like the Fyra, Joint Strike Fighter and the North-South metro line of Amsterdam. Although these projects are not empirically proven to be subject to escalation of commitment, there are major resemblances: they ran heavily over budget, schedule and encountered problems that seem to have no solutions (ANP, 2008; Simmons-Boardman, 2013; US GAO, 2006). Still, these projects were pushed forward.

Staw and Ross (1987) identified four categories of antecedents that are at play in an escalation situation: social-, project-, psychological-, and structural antecedents. Since this categorization is widely applied throughout the escalation literature and to my knowledge never is put into question, it is applied in this study as well. In short, social antecedents reflect the influence of others on further committing to failing projects due to social pressures (Schmidt & Calantone, 2002; Sleesman et al., 2012). Project antecedents are the rational or economic components of the project such as financial performance measures (Schmidt & Calantone, 2002). Psychological antecedents recognizes that decision makers engage in cognitive and affective processing of information that often drives them to increase their commitment to failing projects, instead of de-escalating (Sleesman et al., 2012). Finally, Structural antecedents are organizational specific characteristics and organizational culture that can make it hard to change a course of action (Schmidt & Calantone, 2002).

Researchers from numerous backgrounds tried to unravel the mechanisms behind escalation and although many of them succeeded in adding pieces to the puzzle, there are still large gaps in the literature that deserve attention. Research on escalation has had a focus on the project and psychological antecedents at the expense of social and structural antecedents (Mahlendorf, 2013; Patzelt et al., 2011; Sleesman et al., 2012). The main methods applied to study escalation are case-studies (e.g. Arbuthnott & Dolter, 2013; Winch, 2013) and lab-experiments (e.g. Contractor et al., 2012; Schmidt & Calantone, 2002). Field studies on escalation of commitment are rare (e.g. Mahlendorf, 2013; Turino & Soetjipto, 2012) which causes some authors to urge the need to find new ways to study escalation with longitudinal or field-study designs (Sleesman et al., 2012).
This research aims to fill the methodological gap by conducting a field-study on group decision making. By focusing on group decision making, this study aims to complement the relatively small body of research focused on the social antecedents of escalation of commitment. A simplified research model is provided in figure 1.1. The focus of this study is on the relation between the decision making process of groups and escalation of commitment, under influence of social processes in groups as a moderator. In this study the decision making process relates to the extent that knowledge and information are generated and used in the decision making process.

The foundation of this study is formed by a survey amongst 31 teams operating in technical companies. This quantitative analysis is combined with practical insights obtained by conducting interviews and a structured decision making task. The reasoning for these practical additions is twofold. First this study is partly conducted within an Electronics Development Company (hereafter abbreviated as EMC) which provides a large number of teams and invests other resources, in return EMC wants practical guidance in their decision making performance. EMC offers a combination of services covering the entire product life cycle of high quality industrial electronic applications. These services range from co-development up to sustaining services. One of EMC’s key activities is developing and designing totally new products or further development of existing ones on customer order. Although there are no concrete problems at hand, this company wants to improve its new product development activities based on this study. Secondly, this practical approach is a great addition to the theoretical analysis since it offers an additional point of view that complements the quantitative findings.

The research questions this study addresses are:

**RQ1:** What intra-team social processes influence the link between the decision making process and escalation of commitment, and how can organizations influence these processes to reduce escalation tendencies?

**RQ2:** What are the strengths and weaknesses of the decision making process employed by EMC and how can it be improved?

This paper is structured as follows: following this chapter the theoretical framework is presented which introduces the decision making process and escalation of commitment theory. Chapter three presents the research model, and proposes the research hypotheses. Thereafter chapter four covers the method, chapter five covers the analyses and results. Chapter six covers the discussion, chapter seven presents the managerial recommendations and finally chapter eight presents the conclusion.
Chapter 2
Theoretical Framework

The more time, money or other resources one invests, the harder it is to change or abandon a project. This effect is called ‘sunk cost fallacy’ and is part of a phenomenon called ‘escalation of commitment’. Escalation of commitment is a well-known topic in business economics, psychology and various other fields of study, it refers to the human trait to pursue the original course of action or even increase the commitment towards an ongoing project, although new information suggest to cancel the project (Mahlendorf, 2013; Schmidt & Calantone, 2002). From the description of escalation of commitment provided thus far, it may seem as if decision makers -at some point in time- receive a clear message, objectively stating that the current course of action should be abandoned. In reality such clear cut messages are rare. More often than not the decision maker will receive (often subjective) pieces of information in dribs and drabs over a longer period of time.

“Put a frog into a container of hot water and it will feel the heat and jump out. Put a frog into cool water and then gently heat the water to boiling point and the frog will happily sit there unaware of the incremental, dangerous change occurring in its environment” (Richardson et al., 1994: pp. 9).

The anecdote presented above relates to the point being made, the prospect of the course of action gradually moves from positive to negative, making it hard to judge when the project has crossed the line separating profitability from incurring a loss.

This chapter presents prior findings on the subjects of escalation of commitment. In essence, escalation of commitment can be seen as a badly executed decision making task since either the decision is wrong or no decision is made at all (Street & Street, 2006). Therefore, the chapter starts by outlining the general decision making process. After this description of the decision making theory, the chapter continues by explaining escalation of commitment in relation to general decision making. Thereafter the most important findings on escalation of commitment are discussed.

2.1 Decision making models

Over the years, a vast amount of decision making literature has emerged. However, these studies are conducted using different approaches within various frameworks and thereby produced a stockpile of incompatible ideas (Nutt, 2011). The majority of studies on decision making have been focused on the complete process, resulting in three fields of study: Rational and bounded rational choice models, political models, and the garbage can model (Patriotta & Spedale, 2011). Since a full discussion on these models is beyond the scope of this research they are only briefly discussed in the following section. This discussion starts with a brief summary of the paper of Eisenhardt & Zbaracki (1992), who described the three leading models of decision making in detail. Thereafter this summary is complemented with information from other sources.

“According to the rational decision making model, people enter decision situations with known objectives and make an optimal decision based on all available information. A major point of critique to this model is that people cannot possibly take all information into account due to cognitive limitations. In many cases they simplify the world surrounding them or work with standard operating procedures. Bounded rationality tries to incorporate inconsistencies of people by creating variations to rational decision making. For example by accounting for
standard operating procedures. There are three main assumptions in this model: decisions are made by agents with bounded rationality, decision quality is determined by the level of expertise of the decision maker, and cognitive processes play a crucial role in decision making (Campitelli & Gobet, 2010). In the political model, people are individually rational, but not collectively so. Organizations are coalitions of people with competing interests and choice reflects the preference of powerful people. People engage in politics to enhance their power to influence a decision. Therefore, conflict plays an important role in the political model. As a reaction to the rational and political models, the garbage can model tries to explain decision making in ambiguous settings by explaining decisions as random confluences of events.”

Over time, many variations of these models emerged which are incompatible with one another on their details. Campitelli & Gobet (2010) identified that information search, cognitive system, and decision heuristics lie at the heart of the decision process. McDevitt et al. (2007) proposed information acquisition, problem definition and a final decision. Nicolas (2004) identified the intelligence, conception, and selection phase. Finally Schwenk (1995) identifies an identification, development and selection phase. In this study, these models of rational and bounded rational decision making are combined and divided in three broad phases of the decision making process:

- Information elaboration; the problem is defined and/or discussed within the group, and in a later stage knowledge found in the information acquisition to solve the problem is shared, the group comes up with multiple solutions to the problem.
- Information acquisition; a phase in which a search for information on the problem and solutions is initiated.
- Final decision; based on some decision scheme or heuristics the group makes a final decision out of the set of generated alternatives.

These phases are not performed sequentially per se, most of the time in fact the process is highly non-linear. Depending on the decision problem at hand it might be an iterative process to come to a decision (Mintzberg et al., 1976).

2.1.1 The decision making process
Decision making often follows an iterative process. For example, let’s assume an engineering team has just finished the draft design of a new electric car. When the purchasing department starts negotiating with their suppliers to determine the prices of components, they find out that the batteries in the original design are priced higher than budgeted. Therefore the engineering team needs to go back in the process and start a second information search to find other batteries.

There are numerous factors that influence whether the process is fast and intuitive, long and deliberate, or anything in between (Campitelli & Gobet, 2010; Glöckner & Betsch, 2008). Besides external influences such as too expensive batteries, there are also causes emerging from within the group. For example, people have an adequacy criterion to decide whether an alternative is satisfactory such as a maximum price they are willing to pay. By the use of strategies people reduce the number of possibilities they need to explore. Our engineering team will ignore alkaline batteries since these are inadequate for electric cars, instead they narrow their focus on the more powerful li-ion batteries. Subsequently people generally choose the first option that meets their criterion (Campitelli & Gobet, 2010). This provides a favorable decision outcome while it meets an adequacy
criterion, but that is not optimal per se. The purchasing department buys the batteries from a preferred supplier if they can supply them within budget limitations. However, there might be other suppliers not on the shortlist, who can provide similar batteries for a better price, but are not asked to provide a quotation. This is not to say that routinely solving problems leads to bad decisions.

Experts can understand and decide quickly and come up with the correct decisions for routine problems (Campitelli & Gobet, 2010). Experts have acquired knowledge by practice and training, they are more selective, use better heuristics and apply evaluation criteria (Campitelli & Gobet, 2010). In our electric car example, the engineers take care of the design and the purchasing department arranges the supply of goods. Would the purchasers design the car, the design phase would probably take much longer and the outcome may be of relatively low quality.

Like using different decision heuristics, people use different cognitive abilities depending on the decision task. The human cognitive system possesses two subsystems: System 1 -intuition- operates automatically, causing people to work in routines, choose to take no action or maintain the status quo. System 2 -reasoning- requires effortful and controlled attention (Arbuthnott & Dolter, 2013; Campitelli & Gobet, 2010). In decision making this theory explains partly how decisions are made. System 1 can trigger an intuitive -fast- answer to a decision under time pressure, where System 2 engages in more systematic, reflective-deliberate thinking, leading to a more accurate solution at the cost of more time (Campitelli & Gobet, 2010; Glöckner & Betsch, 2008). One can trigger system 2 behavior with diffused responsibility or other factors that increases the need for discussions. These discussions trigger type 2 behavior with more deliberate decisions as a result (Winch, 2013). People change from system 2 to system 1 under severe time pressure. An alternative explanation for this change is that people change from system 2 to system 1 for complex decisions due to limitations of information integration capacity (Gigerenzer & Gaissmaier, 2011; Glöckner & Betsch, 2008), these cognitive limitations are part of the foundation of bounded rationality.

Besides that discussions can trigger reflective-deliberate thinking, discussions are also important while reaching consensus on an issue results in acceptance amongst decision makers (Nijstad, 2009). By using groups in the decision making process, the people involved can draw on more resources than they would on their own (Nijstad, 2009). However, the use of groups in the decision making process also has drawbacks. According to the group accentuation effect groups make more optimistic predictions (Beuhler et al., 2005). In line with this theory is the finding that groups make more extreme (escalation) decisions than do individuals (Greitemeyer et al., 2009).

The previous findings underline the complex nature of the decision making process. Since this study is mainly focused on escalation of commitment, the decision making process is not covered in a finely grained level of detail. Instead the three general phases of decision making will be covered: information elaboration, information acquisition, and making a final decision. A recent trend in the literature is to focus on micro-dynamics underlying the process (Patriotta & Spedale, 2011), such as communication style (e.g. Patriotta & Spedale, 2011), initial preference diversity (e.g. Nijstad & Kaps, 2008) and decision heuristics (e.g. Gigerenzer & Gaissmaier, 2011). These micro-dynamics are described in more detail after the short introduction of each phase, since these include the important social characteristics within the phases.
Information elaboration

The first phase of the decision making process in groups described here is the sharing of knowledge. Depending on the identified problem, this phase generally is the starting point of the decision making process while it encompasses the problem definition (Campitelli & Gobet, 2010; Mintzberg et al., 1976; Nicolas, 2004). Information elaboration is defined as “the exchange, discussion, and integration of task-relevant information and perspectives” (van Dick et al., 2008: pp 1464). A group cannot solve a jigsaw puzzle of which some pieces are in the hands of others who do not share them. The same goes for decision making, all team members should have access to complete information in order to come to good decisions.

Situations in which pieces of knowledge are in the hands of different individuals, and should be shared with the group are known in the literature as (amongst other terms) hidden profiles, transactive memory, and collaborative mental modeling. These theories all imply that new information held by individuals should be shared amongst the team to clarify the problem at hand (Mojzisch & Schulz-Hardt, 2011, Nijstad, 2009, Jeffery et al., 2005). For example hidden profiles are defined as “group decision tasks, in which one best choice alternative exists, but it cannot be identified by the group members individually, prior to the discussion, because they each have only a subset of the information, supporting the superior alternative” (Mojzisch & Schulz-Hardt, 2011: pp236). Those teams that communicate effectively benefit from improved performance (Jeffery et al., 2005; Mohammed et al., 2000). Groups have a tendency to discuss the shared information (i.e. information that is available to all members) at the cost of unshared information (i.e. information that is only available to a small fraction of the group) (Nijstad, 2009) simply because the former can be mentioned by more persons than the latter (Mojzisch & Schulz-Hardt, 2011). Secondly, even if unshared information is discussed, the weight assigned to the information tends to be lower in the final decision than the weight for shared information because people focus on their initial preferences during negotiation (Mojzisch & Schulz-Hardt, 2011). This leads to the common knowledge effect, shared information has a larger impact on the decision than unshared information (Nijstad, 2009). Even though these effects have a great impact on decision quality, groups outperform individual decision-makers (Mojzisch & Schulz-Hardt, 2011).

Information acquisition

The second phase identified here is the search for information and most often the development of solutions to the problem at hand, this can encompass anything like the design of a component or a new quality control mechanism. Information acquisition is defined as “the ability of employees to seek and acquire new knowledge or create new knowledge out of existing knowledge within or outside of the organization” (Kim & Lee, 2010: pp134). Most of the time this phase is an intermediate step which can be conducted multiple times if the developed set of alternatives is inadequate (Mintzberg et al., 1976). Information is important in the decision making process since without it,
there is no way to rationally choose between alternatives. The decision making task would be nothing more than a game of chance.

Information provided to group members should be unambiguous and readily available in order to make good decisions (Winch, 2013). Also important in this phase is whether team members know who holds expertise on what information. Since if they do, unshared information is shared more often and the credibility of the information is higher (Nijstad, 2009) with as a result that the group can improve their decision making quality (Mojzisch & Schulz-Hardt, 2011; Nijstad, 2009). When the demand for information is not present or identified among the group members they need to expand their search. Search rules specify in what direction the search extends and stopping rules specify when the search is stopped (Gigerenzer & Todd, 1999).

E.g.: “One-clever cue heuristics” are based on the premises that one indicator is sufficient to make the right judgment (Gigerenzer & Gaissmaier, 2011). A product portfolio manager who needs to make a choice to abandon one of two products might for instance merely choose to abandon one of two products might for instance merely decide on the projected profits. Information acquisition is therefore focused on retrieving profit projections and stopped when these projections are gathered.

An important mechanism in information acquisition is confirmation bias: people prefer information that supports their favored decision alternative over information that opposes it (Schulz-Hardt et al., 2000). In teams with preference diversity, the individual group members search for information in favor of their personal preference. Since these preferences are different of other group members the full body of information is less biased and thereby a better decision is made. Homogenous teams on the other hand only search for a narrow set of information, leading to biased information search and more commitment to the group’s decision (Nijstad & Kaps, 2008; Schulz-Hardt et al., 2000).

Making the final decision – decision schemes and decision heuristics

The third phase of the decision making process is making a decision. To come to a decision, groups use a social decision scheme, e.g. majority wins or consensus (Nijstad, 2009). Over time, a large number of rules has been invented, ranging from easily applied rules such as the majority rule, to cumbersome computations that use a great number of variables to come to a decision and can only be executed by using computers. In a study to the performance of those rules, Hastie and Kameda (2005) found that the majority rule approaches the performance of the most complicated rules, justifying its popularity in practice.

Furthermore, due to time pressure and resource constraints it seems reasonable to suggest that organizations use short-cuts in their decision making by the use of heuristics. Heuristics are defined as “a strategy that ignores part of the information, with the goal of making decisions more quickly, frugally, and/or accurately than more complex methods” (Gigerenzer & Gaissmaier, 2011: pp454). Findings from the field show a less-is-more effect in which decision heuristics with a subset of information outperformed complex models with all the information (Gigerenzer & Gaissmaier, 2011), these effects are larger in group than in individual decisions (Reimer & Katsikopoulos, 2004). Since people apply these short-cuts, organizations can enhance decision making by expressing importance of the right strategy/heuristic. Langerak et al. (2010) studied trade-offs between different heuristics and concluded that teams were better off by choosing a sales maximization strategy over a development cost minimization strategy, and that teams in practice were not aware what heuristic works best. The rationale to use heuristics is often explained by the trade-off between accuracy and
effort, for less important decisions people take shortcuts to save effort (Gigerenzer & Gaissmaier, 2011). A second explanation is provided in the previous section, namely due to cognitive limitations of the actor (Gigerenzer & Gaissmaier, 2011; Glöckner & Betsch, 2008).

Regarding the social intra-group processes, other studies investigated the effects of preference homogeneity in teams on decision quality. In the case of preference homogeneity, group members become more convinced about the correctness of their choice (Nijstad & Kaps, 2008; Schulz-Hardt et al., 2000). Preference diversity on the other hand is important in the decision making process, since it is found to be related to enhanced decision making (Nijstad & Kaps, 2008; Schulz-Hardt et al., 2000).

2.1.2 The place of escalation of commitment in the decision making process

Now we know the basics on how decisions are made, it is time to explain how escalation of commitment is related to normal decision making. An escalation of commitment situations starts like any other decision making process.

E.g. Roughly one year ago a Chinese new product development team came up with an idea for a new product that would fulfill the needs of millions of consumers in Europe. Their product would be priced at half the sales price of their competitors since the Chinese are able to manufacture and develop their product in China at very low costs. On all other specifications, like quality, their product is similar to the products of the competitors.

Now, one year after the start of the project, a final review meeting is scheduled in which the product is presented to upper management. This meeting forms the final hurdle to assess whether or not the product should be launched to the market. When preparing for this meeting, the development team calculates the products’ costs and benefits in full detail. Their findings astonish them: the costs of their products are tripled by unexpected high shipment costs and import fees. At this point, they thus have a product under development in which all team members invested close to a year of their time, with a product that is equal to that of their competitors but is more expensive.

The scenario presented above can form the starting point of a regular decision making process as well as an escalation of commitment scenario. For a regular decision making scenario resulting in high decision making quality the team could take numerous decisions. They could re-design the product or production process to make an even cheaper product. Or they could explore the possibility to upgrade their product to one with better specifications than their competitors and investigate whether consumers are willing to pay a premium for those higher specifications. Another choice is to abandon the project altogether. On the other hand, the team can escalate their commitment to the product. For example, they can refute, ignore, cover-up or bias the negative financial information in order to push their product thorough the review meeting. Or upper management could decide to continue the project in an attempt to earn back the investment. Finally, the people involved could not notice the negative prospects since they focus on the positive information. Either way, the decision is to escalate commitment by continuing the project while the people involved know -or at least could know- the project will fail in its current form.

To summarize, escalation of commitment can be described as a failure in the decision making process (Street & Street, 2006). Some factors in the process cause the decision makers to come to a decision to continue a failing course of action instead of changing the course. This naturally raises the
question why one would make such a decision. Since Barry Staw (1976) introduced the concept of escalating commitment, a great body of research tried to unravel this process of irrationality. And not without its successes, some important factors in play have been identified over the years, such as the fear for loss of face that occurs when one needs to admit that one’s initial decision does not result in the expected profits (Greitemeyer et al., 2009). The following section covers the escalation model, thereafter detailed findings and underlying principles are presented.

2.2 The four categories of escalation antecedents

As previously introduced, escalation of commitment is defined as the human trait to pursue the original course of action or even increase the commitment towards an ongoing project, although new information suggest to cancel the project (Mahlendorf, 2013; Schmidt & Calantone, 2002). The majority of prior studies to escalation of commitment focused on individual decision makers, escalation in group contexts has received little attention (Sleesman et al., 2012). However, many important decisions in organizations are made by groups (Greitemeyer et al., 2009). Since this study’s focus is on escalation tendencies of product development teams, the theory presented below discusses how the effects found in prior studies could influence escalation of commitment in groups.

In explaining escalation of commitment, Staw & Ross (1987) identified four categories of antecedents that are at play in an escalation situation: structural-, project-, social-, and psychological antecedents. Together they are referred to as “the four main categories of antecedents” throughout this study. Structural antecedents are organizational specific characteristics and organizational culture that can make it hard to change a course of action (Schmidt & Calantone, 2002). Among others these include administrative inertia and reward systems (Schmidt & Calantone, 2002; Sleesman et al., 2012). The second set of antecedents labeled project antecedents are the rational or economic components of the project including market share and other financial performance measures (Schmidt & Calantone, 2002). Thirdly, social antecedents reflect the influence of others on further committing to failing projects due to social pressures such as face-saving and public identification with a project (Schmidt & Calantone, 2002; Sleesman et al., 2012). Finally, psychological antecedents, recognizes that decision makers escalate commitment due to cognitive and affective processing of information (Sleesman et al., 2012). Amongst other reasons, self-justification and information-processing biases can drive decision makers to make irrational decisions (Schmidt & Calantone, 2002). Figure 2.1 shows the model as initially proposed by Staw & Ross (1989).

![Figure 2.1: Escalation model as proposed by Staw and Ross (1989)](image-url)
Many authors have conducted research or made claims about the direction and structure of the four main categories of antecedents in relation to escalation, with contradictory findings (Hollar et al. 2000; Keil & Robey, 1999; Pan et al., 2006). In their meta-analysis Sleesman et al. (2012) found that the effects of the four main categories of antecedents differ within these categories and a more finely grained level of detail is necessary to describe the effects. Thus, although the four main categories of antecedents of figure 2.1 are widely applied in the literature, it is not enough to merely investigate them at this level of abstraction. For example ego threat and anticipated regret both belong to the psychological antecedents and are among the most powerful drivers of escalation, but ego threat is positively and anticipated regret negatively associated with escalation (Sleesman et al., 2012). Furthermore, many antecedents belonging to other factors than the psychological factor have been brought in direct relation to escalation of commitment (Sleesman et al., 2012). To clarify these separate antecedents and their relation with escalation of commitment, the following section covers the four main categories of antecedents on more finely-grained level of detail.

2.3 Escalation antecedents

The fairly abstract level of the four main categories of antecedents results in an incomplete picture. Much of the real-world situation gets lost by effects cancelling each other out. For example, a meta-analysis found that half of the antecedents belonging to project factors are negatively, and half positively related to escalation (Sleesman et al., 2012). These results urge the need to assess the direction of individual antecedents independently from the four proposed categories. This section describes prior findings on escalation divided over these four categories in more detail.

2.3.1 Social antecedents

Social antecedents reflect the influence of others on further committing to failing projects due to social pressures such as norms for consistency, face-saving and public identification with a project (Schmidt & Calantone, 2002; Sleesman et al., 2012). These effects can be so strong that people refute negative information and only take positive information in support of their choice into account (Schulz-Hardt et al., 2010). These factors are discussed in the oncoming section.

Numerous case studies to escalating commitment consistently found three factors to be at play: the need for external justification (Keil, 1995; Ross & Staw, 1986; Ross & Staw, 1993), norms for consistency (Keil, 1995; Ross & Staw, 1986; Ross & Staw, 1993) and behavioral models (Ross & Staw, 1986; Ross & Staw, 1993). External justification is defined as the need decision makers feel to rationalize their actions to other parties (Ross & Staw, 1993). Norms for consistency relate to the special praise and admiration of society for leaders who exhibit consistent commitment (Keil, 1995). Both these factors raise the tendency to escalate commitment while decision makers want to save face to their environment (Keil, 1995; Ross & Staw, 1986; Ross & Staw, 1993). Finally, comparison to other related projects\(^1\) can prevent or increase escalation. For example, prior research describes a case in which the Long Island Lightning Company (LILC) escalated commitment while building a nuclear power plant. Competitors built similar plants and succeeded, this raised the commitment of LILC while they felt they should also be able to succeed as well (Ross & Staw, 1993). When decision makers are aware of failed projects that are related to theirs, they are more likely to de-escalate. For example, turning back to LILC and their nuclear power plant, would the competition have failed to

\(^1\) Known as “behavioral models” in the literature.
build nuclear power plants, LILC would have been likely to de-escalate their commitment early on in the project by abandoning their construction as well (Ross & Staw, 1986).

When ‘stop or go’ decisions are made by teams rather than individuals, results indicate reduced escalation tendencies (Little & Little, 2009). One of the advantages groups have is the ability to critically assess each others’ arguments and choice preference. For example, groups can assign a member to play the role of the devil’s advocate. This means that one of the group members has to critically question the prevailing plan and its assumptions. Escalation is considerably reduced by using a devil’s advocate in groups (Greitemeyer et al., 2009). An explanation could lie in the dual process model of human reasoning as discussed earlier. A devil’s advocate can activate system 2 type of reasoning (Arbuthnott & Dolter, 2013), opening up possibilities to change the course of action. Preference diversity amongst team members can have similar effects. Preference diversity is also referred to as opinion-split groups. Kameda and Sugimori (1993) studied the effects of such opinion-split groups on group entrapment. Their findings are in accordance with Greitemeyer et al. (2009) and indicate that the more initial consensus exists within the group, the greater the tendency to escalate. However, this is not the full picture. When taking decision rules into account, opinion-split teams using majority-rules showed the least entrapment. Opinion-split teams applying a consensus-rule escalated significantly more, the same goes for teams with preference homogeneity (Kameda & Sugimori, 1993). Thus, opinion split teams, especially those using the majority-rules decision rule seem to be able to curb escalation of commitment relative to preference homogeneous groups.

Related to devil’s advocacy and preference heterogeneity are the effects of intra-group conflicts on decision making, task conflict in particular. Jehn & Bendersky (2003) qualified conflicts in three distinct types: relationship-, task- and process conflicts. Relationship conflicts are defined as incompatibilities among group members such as personality differences as well as differences of opinion and preferences regarding nontask issues. Task conflicts are defined as disagreements among group members about the tasks being performed. Finally, process conflicts are about the means to accomplish the specific tasks, not about the content or substance of the task itself, but about strategies for approaching the task (Jehn & Bendersky, 2003). Process conflicts are predominantly negatively associated with group outcomes (e.g. De Wit et al., 2012; Greer et al., 2011). The effects of relationship, and task conflicts are more complicated. Without task conflict, people are not very likely to change an incorrect initial opinion. This likelihood increases with raised task conflict. However, when relationship conflict comes into play on top of task conflicts, group members are found to be less motivated to process information, less likely to use information provided by other group members, and rigidly hold on to initial preferences during decision making (Bradley et al., 2012; De Wit et al., 2012). The resulting situation, a combination of high relationship and task conflict, is related to bad performance and lowered team member motivation (e.g. De Dreu & Weingart, 2003; De Wit et al., 2012; Shaw et al., 2011).

2.3.2 Psychological antecedents
Psychological antecedents induce errors in decision making or commit decision makers to courses of action due to self-justification, information-processing biases and other cognitive limitations (Schmidt & Calantone, 2002). In the past years, psychological researchers explained important antecedents of escalation.
The dual process model of human reasoning can be applied to explain the difference in thought processes between escalation and de-escalation of commitment. According to the theory, two thought processes are involved in human reasoning. System 1 -intuition- operates automatically, causing people to work in routines and choose to take no action or maintain the status quo. On the other hand system 2 -reasoning- requires effortful and controlled attention (Arbuthnott & Dolter, 2013). Various authors found this mechanism during escalation (Little & Little, 2009; Pan et al., 2006, Zeng et al., 2013). Zeng et al. (2013) proved that this distinction plays a role in escalation by producing MRI-scans of 27 participants. They concluded that no overlapping brain areas were found to respond to both sunk cost and incremental cost. The higher the incremental cost (i.e. the higher the need to de-escalate) the more the subjects started to reason (Zeng et al., 2013). In another study, researchers adopted Lewin’s change model of unfreezing-changing-refreezing and applied it to escalation (Pan et al., 2006). Although the nature of the study is completely different, they came to similar findings. People have a basic need to remain the status quo. In order to de-escalate, their state of mind needs to be altered from acting intuitively, to a state in which they are open for discussion and willing to change the course of action - system 2. When the change has occurred and thus the course of action is altered, they can go back to acting intuitively in their new course of action - refreezing (Pan et al., 2006).

Although these studies provide convincing evidence, there are some contradictory conclusions. Zeng et al. (2013) discussed that their MRI-scans rule out self-justification theory as an explanation for escalation. However, a meta-analysis revealed that the most powerful drivers of escalation are two psychological antecedents both based on self-justification theory. Furthermore, of the nine psychological drivers included, five are based on self-justification theory and provide significant results in relation to escalation (Sleesman et al., 2012). Self-justification theory is probably the most widely applied theory in the escalation-literature. According to the self-justification theory people will pursue a failing course of action because they do not want to admit to themselves that initiating the action was a mistake (Greitemeyer et al., 2009). Besides self-justification, many other psychological factors are previously studied. In the meta-analysis conducted by Sleesman et al. (2012), positive relations were found on previous resource expenditures in terms of sunk costs, time investment, experience/expertise with the decision context, personal responsibility for initial decision, self-efficacy, and ego threat. A negative relation was found between anticipated regret and escalation (Sleesman et al., 2012).

The remainder of psychological antecedents in the Sleesman et al. (2012) study is grounded by prospect theory and goal substitution effect. According to the prospect theory, people are risk-averse or risk-seeking depending on the framing of a message. People tend to be risk-averse with respect to gains and risk-acceptant with respect to losses (Levy, 1997). A change in frame can result in a change in preferences even if the values and probabilities associated with outcomes remain the same (Levy, 1997). When objectively negative information is positively framed, people are less likely to escalate (Arbuthnott & Dolter, 2013; Liang et al., 2013; Sleesman et al., 2012).

E.g. A situation can be described as (1) having a 20% chance of making a profit or (2) as having a 80% chance to incur a loss. Although the scenarios describe the same situation with the same expected outcome, people more easily escalate commitment if they face situation 2 (negatively framed) than they would if facing situation 1 (positively framed).
The last psychological antecedent identified by Sleesman et al. (2012) is the goal substitution effect, similar to Lewin’s notion of task tension. The reasoning of both theories is that the closer projects approach their deadline, the more the completion goals overrule the initial project success goals. In other words, people are motivated to finish what they started and this effect grows stronger when approaching the completion date (Greitemeyer et al., 2009; Sleesman et al., 2012).

Although the meta-analysis of Sleesman et al. (2012) provides a solid foundation for certain drivers, others are not included due to sample size restrictions or other theoretical reasons. For example, people make decisions in favor of their egocentric position (Chakravorty, 2009). If continuing a failing course of action is favorable for the decision maker in any way, he/she is more likely to escalate commitment. Illusion of control can also aid escalation for people with a history of success. Successful outcomes are ascribed to personal skill and failures are blamed to factors beyond personal control (Chakravorty, 2009). Finally, competence, self-esteem and helplessness of the decision maker are identified as antecedents (Hollar et al., 2000). To conclude, many factors are identified as psychological antecedents of escalation, in which self-justification theory on its own is applied the most to provide a theoretical explanation for the psychological antecedents of escalation (Sleesman et al., 2012).

### 2.3.3 Project antecedents

Project antecedents are the rational or economic components of projects including market share, estimated sales volumes, profits, and financial performance measures (e.g. internal rate of return and return on investment) (Schmidt & Calantone, 2002). These antecedents are widely studied in the field of economics and management (Sleesman et al., 2012). This section discusses the main findings regarding the impact of project antecedents on escalation of commitment.

Many researchers who studied project antecedents recommend companies to provide better information to managers in order to decrease the likelihood of escalation (e.g. Chakravorty, 2009; Mahlendorf, 2013; Winch, 2013). For example, decision makers should have access to clear financial information so that they can withdraw from a losing course of action when necessary (Chakravorty, 2009). When information is uncertain escalation tendencies are higher (Sleesman et al., 2012). It is argued that the more uncertainty surrounding negative information, the easier it becomes to justify the use of other information and to neglect the negative information (Sleesman et al., 2012).

Besides the certainty of information, the type of information provided is also relevant. Little and Little (2009) identified that escalation and de-escalation rationales are based on a different set of criteria. Where de-escalation was always based on cost, specifications, and time, escalation was based on a combination of two or three of the following criteria: alternatives, cost, impact, specifications, and sunk cost. Related to these findings, Van Oorschot et al. (2011) concluded that the best intervention in new product development decision making combines a trade-off across time, cost, and performance. These interventions can be conducted early on (before 2/3 of the project is finished) or late in the project (after 2/3 of the project is finished). Both early and late in the project, it is effective to decrease development time by bringing more team members to the project. Product performance can be increased effectively early on in the project to maximize sales. However, in the later project phase it is better to apply a cost trade-off instead, in which product performance is decreased to reduce workload and development costs. Mahlendorf (2013) proposed that amongst others, predetermined stopping rules, progress reports, and information about future benefits from
additional expenditures mitigate escalation behavior. These factors provide possibilities to prematurely terminate projects by clarifying the decision making process and lowering the perceived threat of the decision (Mahlendorf, 2013). When combining these lines of reasoning one can argue for the need to determine stopping rules and provide clarity on the progress for the de-escalation factors (costs, specification and time). This is underpinned with findings from the field, e.g. having a budget in combination with multiple formal stages in which a (dis)continuation decision is made, is negatively associated with escalation (Tan & Yates, 2002).

2.3.4 Structural antecedents

Structural antecedents include such characteristics of organizations such as culture and rules (Schmidt & Calantone, 2002).

Strategic project orientation researchers studied the relation between product launch strategy and escalation. It is found that pioneering products rather than product improvements, are more likely to be escalated (Little & Little, 2009; Pan et al., 2006; Schmidt & Calantone, 2002). An explanation for this finding can be found in the time invested in the different types of projects. Pioneering projects often follow a long path from idea to product launch, during this process the attachment of people to the project grows. On the other hand follower products and especially product improvements, are relatively easy to develop and therefore project duration is shorter and people do not get that attached (Schmidt & Calantone, 2002).

Another structural antecedent is perceived threat experienced by decision makers when making a bad decision. Mahlendorf (2013) finds that decision makers who feel more threat are more hesitant to cancel a failing project and continue investing for too long. According to self-justification theory decision makers with high decision responsibility and negative decision consequence escalate commitment to a losing course of action. However, neither high decision responsibility nor negative decision consequence are necessary conditions for escalation of commitment to occur (Akinbobola & Ehigie, 2012). Arbuthnott and Dolter (2013) opt to hold managers responsible for the decision process rather than outcomes alone. This is in line with the argument that escalation depends on the presence and type of reward system in the organization. First, a distinction between two types of reward systems is necessary: “Outcome-based rewards are those where managers are rewarded only when a successful outcome of the project is reached,(...) process-based rewards are those where managers are rewarded for meeting prescribed behavior or following guidelines as the project proceeds” (Contractor et al., 2012: pp2). Managers who self-initiate a project tend to de-escalate with the presence of either outcome-based or process-based rewards. On the other hand, managers who are assigned to their projects escalate with outcome-based rewards, while process-based rewards tend to de-escalate (Contractor et al., 2012). Thus, outcome-based rewards have the potential to drive both escalation as well as de-escalation of commitment, depending on whether the manager was assigned to the project or self-initiated it. An explanation can be that process-based rewards can reduce the perceived threat of de-escalation and also make the decision making process more clear. Also, innovative management and accounting practices that contribute to the concept of allowance for failure and sharing responsibility can enhance de-escalation (Mahlendorf, 2013).
Chapter 3
Theory and hypotheses

As previously explained, important phases in group decision making are information acquisition, information elaboration and making a final decision. The foundation of this model is laid with these three factors as independent variables to measure their relation with escalation of commitment, also see figure 3.1. This foundation is complemented with escalation antecedents included as moderators, which allows to study whether escalation tendencies change by the presence or absence of escalation antecedents during decision making.

For clarification purposes I would like to note that high levels of escalation represent the unwanted situation, low levels on the other hand represent the desirable situation. Thus, to provide an example with a hypothetical relation between trust and escalation, in which high levels of trust indicates that team members highly trust one another:

- A positive relation between trust and escalation indicates that high levels of trust are related to high -unwanted- levels of escalation.
- A negative relation indicates that high levels of trust are related to low -desirable- levels of escalation.

![Research model](Diagram)

**Figure 3.1: Research model**

### 3.1 Moderating factors

Teams need to share their knowledge in order to make rational decisions. A wide range of factors play a role in these social processes, from emotions to electronic facilities. In order to keep this study manageable only a set of factors related to social aspects of team work are selected. The factors under study here are: expertise localization, task conflict, intra-group trust and shared leadership.

Expertise localization is included because team members are expected to share more relevant information and information of higher quality if they are aware of who holds expertise on what information (Nijstad, 2009). Recall the jigsaw puzzle in which individual team members all hold some pieces of a puzzle, when they know who holds what piece they more easily solve the puzzle. Or more formally stated, if team members know who holds what information, they are better able to come to a good decision (Mojzisch & Schulz-Hardt, 2011).
Secondly, task conflict is included because higher levels of task conflicts are related to an increased likelihood that an initial (incorrect) opinion is changed. If one team member favors the right decision beforehand, this one member can convert the whole group to believe in that decision (Nijstad, 2009). Although teams without task conflict search for and share information, they are expected to benefit less from this information than teams with task conflicts. Furthermore, although it covers a broader area, dissent is related to task conflicts. And groups with dissent make higher quality decisions, even if none of the group members prefers the correct decision prior to the discussion (Mojzisch & Schulz-Hardt, 2011). In all, task conflict can cause individuals to break with their prior beliefs, in which the project was heading for success. By bursting this bubble, commitment could be de-escalated.

Since intra-group trust plays an important role in discussions and conflict situations (De Wit et al., 2013; Jehn & Bendersky, 2003), it is included in this study. It is not uncommon for employees to take task conflicts personally and misinterpret it for a relationship conflict (De Wit et al., 2013; Jehn & Bendersky, 2003). This misinterpretation is proven to be lower in groups with higher levels of intragroup trust, thus companies are able to reap the benefits of task conflict with an appropriate basis of intragroup trust (Simons & Peterson, 2000). Furthermore, in the relation between task conflict on the one side and decision quality and decision commitment on the other, cognition-based trust positively moderates the relationships (Parayitam & Dooley, 2009). Related to this is the finding that the benefits of task conflicts manifest themselves in a psychological safe communication climate (Bradley et al., 2012). Trust, thus it seems, is an important beneficial factor in decision making situations where conflicts occur.

Finally, shared leadership's inclusion is based on practical and partly on theoretical considerations. From a practical point of view, EMC is interested in the extent to which their project teams contain informal leaders at the times when the hierarchical leader is absent. The project teams of EMC are largely guided by a project manager who prescribes important deadlines and deliverables. The team members themselves determine how to accomplish these goals. This is similar to the description of self-managed teams as described by Wageman (2001) and later adopted by e.g. Carte et al. (2006): “Typical conceptualizations of [self-managed] teams include an external leader (i.e. not a direct participant in the team) who is responsible for initiating structure and goal setting, while the team members themselves are responsible for executing and monitoring the work” (Carte et al., 2006: pp330). Shared leadership exists in self-managed project teams and decision-making teams (Bergman et al., 2012). Carte et al. (2006) found that in those self-managed teams, high-performing teams are characterized by higher incidence of shared leadership. For this reason it is expected that shared leadership in the teams of EMC would also be beneficial for their performance.

### 3.2 Hypotheses development

The model in Figure 3.1 shows the social escalation of commitment factors and their position in this research. The following section explains the model and proposes hypotheses on the relations.

#### 3.2.1 Information, finding and distributing it

Although decision making is not necessarily a sequential process, the process often starts with sharing information by defining the problem with the group, or with information acquisition to understand a problem. In today's organizations, success depends on effectively integrating the knowledge of skilled professionals (Bergman et al., 2012). I argue that escalation of commitment situations benefits from information and sharing this information amongst team members.
Without information there is nothing to rationally choose between alternatives, resulting in decision making as a game of chance. With more and more relevant information, one is better able to make proper decisions. Information acquisition is defined as “the ability of employees to seek and acquire new knowledge or create new knowledge out of existing knowledge within or outside of the organization” (Kim & Lee, 2010: pp134). I argue that more information acquisition is related to better decision making quality and less escalation of commitment.

Imagine a case in which a new product development team needs to choose one product to develop, out of two products. Without any additional information the chance they choose product A is equal to that of choosing product B. Now assume that the team found that product B is expected to be highly more profitable than product A. This would flip the odds completely in favor of product B. However, even more information could indicate that product B is nearly impossible to develop while product A is a sure thing, raising the expected value of product A over that of product B.

We can continue making such assumptions indefinitely. The point I want to make is that every piece of information can be highly valuable when making a decision. Although expected profit per product might look like a strong argument to choose one product over the other, it is worthless if the most profitable product is nearly impossible to develop, produce, sell, etcetera. To make a good and rational decision, information provided to group members should be unambiguous and readily available (Winch, 2013). Many researchers recommend companies to provide better information to managers in order to decrease the likelihood of escalation (e.g. Chakravorty, 2009; Mahlendorf, 2013; Winch, 2013). Decision makers should have access to clear financial information so that they can withdraw from a losing course of action when necessary (Chakravorty, 2009).

Individual group members search and process information, and integrate this through communication at the group level. In this study, sharing of information is operationalized by using information elaboration, which is defined as “the exchange, discussion, and integration of task-relevant information and perspectives” (van Dick et al., 2008: pp 1464). Those teams that communicate effectively benefit from improved performance (Jeffery et al., 2005; Mohammed et al., 2000). There are situations in which knowledge exchange is particularly important, such as hidden profiles. Hidden profiles are defined as “group decision tasks, in which one best choice alternative exists, but it cannot be identified by the group members individually, prior to the discussion, because they each have only a subset of the information, supporting the superior alternative” (Mojzisch & Schulz-Hardt, 2011). Teams that include members who keep information to themselves might not be able to solve the hidden profile (Greer et al., 2011). As a result their decision is far from optimal.

Prior studies found that teams who communicate, efficiently identify and combine unshared information improve their decision quality (Schulz-Hardt et al., 2000). In an experiment where team members were free to choose the amount of information to be used in a decision task, it was found that it was critical to collect and distribute as much information as possible to obtain high decision making performance (Hollenbeck et al., 1995). Thus, if collecting information and sharing it amongst the team has a positive effect on decision making quality, it is expected to be negatively related to escalation of commitment. Formally stated:

Hypothesis 1: Information elaboration is negatively related to escalation of commitment.
Hypothesis 2: Information acquisition is negatively related to escalation of commitment.
3.2.2 Final decision making

The third and most often last factor of the decision making model, is the final decision rule. To come to a decision, groups use a social decision scheme, e.g. majority wins or consensus (Nijstad, 2009). Over time, a large number of rules has been invented, ranging from easily applied rules such as the majority rule, to cumbersome computations that use a great number of variables combined with advanced mathematics and statistics to come to a decision. In a study to the performance of those rules, Hastie and Kameda (2005) found that the majority rule approaches the performance of the most complicated rules.

In this study the focus is on intra-group processes and factors. Partly for that reason, making the final decision is not operationalized as a categorical variable to study what rule works best. In making the final decision, one might say there are two extremes. Firstly there are self-managed teams in which the members are expected to fully contribute to the decision making task (e.g. consensus rule or to lesser extent majority rules). On the other extreme the hierarchical leader plays a dictator-like role, in which team members do not get the opportunity to participate in the decision making at all (e.g. leader decides rule). Decision making teams fall somewhere in between, depending on their decision rule, but also on social and structural team aspects. Since we are interested in these social aspects, making the final decision is operationalized by measuring the team members’ participation in decision making. Participation in decision making, is in this study defined as the extent to which team members (are allowed to) participate in the decision making process.

The teams under study in this research consist mainly of specialist engineers, who dedicate their time to the development of complex products. They are guided by a project leader who is responsible for keeping the project on schedule and within budget. Due to the complex nature of these products, the project leader does not have detailed knowledge on all aspects involved. Therefore, in order to make grounded, high quality decisions, the project leader needs aid from its team members since they are familiar with the details. Prior research on the overall decision making performance of groups indicate that groups outperform individual decision-makers (Mojzisch & Schulz-Hardt, 2011). The advantage of groups is that their pool of available information is expanded, raising the decision making quality higher than could be reached by any one individual (Mesmer-Magnus & DeChurch, 2009). Furthermore, people can have an incorrect opinion. If an individual makes a decision and this decision is based on such an incorrect opinion, the decision outcome is automatically incorrect as well. However, when a team as a whole is included in the process for the same decision scenario, one team member that favors the right decision beforehand has the potential to convert the whole group to believe in that decision (Nijstad, 2009). Following this line of reasoning, it is expected that participation in decision making is negatively related to escalation of commitment.

Hypothesis 3: Participation in decision making is negatively related to escalation of commitment.
3.2.3 Expertise localization

The first moderator to be introduced in this study is expertise localization, defined as “the extent to which team members know who on the team knows what” (Kanawattanachai & Yoo, 2007: pp785). Recall the hidden profiles situation in which some group members hold pieces of the puzzle the group as a whole is trying to solve. If you can identify who those individuals are, you can more easily ask for their piece of the puzzle and apply their unique knowledge. To clarify, when expertise localization is low one asks for a piece of the puzzle and receives it. However, it could be the wrong piece and therefore does not add anything to the puzzle. When expertise localization is high, that same question for a piece of the puzzle yields the right piece, coming one step closer to completion. In this way, group discussions and decision making benefit from expertise localization, because it raises the awareness for the expertise various group members bring to the table (Mojzisch & Schulz-Hardt, 2011). Furthermore, expertise localization raises the importance group members assign to information, and the credibility they give the expert (Nijstad, 2009). Credibility of the source in its turn, makes it more difficult for team members to bias the information (Schmidt & Calantone, 2002). Outside meetings a similar situation might occur, in which one needs expertise information on a certain topic. By being aware of the experts within the organization, better information is more easily found. By addressing the right expert, information quality enhances and information uncertainty decreases (Mojzisch & Schulz-Hardt, 2011; Nijstad, 2009).

It is expected that locating expertise knowledge does not influence the amount of information shared, but the relevance and quality of information since group members more easily identify knowledgeable sources of information (Mojzisch & Schulz-Hardt, 2011; Nijstad, 2009). Being able to identify knowledgeable sources could be beneficial during both information acquisition and information elaboration. Thus, high levels of expertise localization are expected to strengthen the information elaboration-escalation and the information acquisition-escalation relationships.

Hypothesis 4: Expertise localization plays a moderating role such that:

a) Expertise localization moderates the relationship between information elaboration and escalation of commitment of groups such that the more expertise localization in a team, the more negative the relation between information elaboration and escalation of commitment, and

b) Expertise localization moderates the relationship between information acquisition and escalation of commitment of groups such that the more expertise localization in a team, the more negative the relation between information acquisition and escalation of commitment.

3.2.4 Task conflict

Task conflict is included in the study to obtain information on whether individuals are willing and daring to participate in group discussions and/or to challenge the current situation. Task conflicts are defined as “disagreements among group members about the tasks being performed” (Jehn, 1995: pp 258) and indicate that individuals dare to challenge the current situation.

New information acquired by individuals should be shared amongst the team to clarify the problem at hand (Jeffery et al., 2005; Mojzisch & Schulz-Hardt, 2011; Nijstad, 2009). According to collaborative mental modeling, team performance relies on shared mental models. Teams need to alter their models if they receive new information or if other changes in their environment occur.
Those teams that communicate effectively and are efficient in collaborative modeling experience improved performance (Jeffery et al., 2005; Mohammed et al., 2000), just like teams who communicate, efficiently identify and combine unshared information. Moreover, teams with preference diversity discussed more information in longer discussions than groups with preference homogeneity (Schulz-Hardt et al., 2000). With this we come back to the dual process model of human reasoning, from which one could argue that an important mechanism with which escalation could be prevented is by switching from acting intuitively to activating human reasoning. When a group would consist of “Yes Men”, the group can fall prey to groupthink, which “is a process of rationalization that sets in when members of a team or group begin to think alike” (Sims & Sauser, 2013: pp79). However, when team members speak up, a discussion starts and the reasoning between group members can cause a de-escalation (Arbuthnott & Dolter, 2013). Scholars tried to enhance decision making by introducing devil’s advocacy (Schwenk, 1995), the findings of these studies indicate that escalation is considerably reduced by using a devil’s advocate (Greitemeyer et al., 2009) and by initial preference diversity within the group (Kameda & Sugimori, 1993).

These group compositions all trigger task conflict (Greitemeyer et al., 2009). The likelihood of people to change an incorrect initial opinion increases with raised task conflict (Bradley et al., 2012; De Wit et al., 2012). E.g. the amount of information shared within a team experiencing task conflicts might be equal to a team not experiencing task conflict. But the team experiencing task conflict shares or searches for information that challenges the status quo where teams low on task conflict do not challenge the status quo. Similarly, teams participating in decision making who experience task conflict, participate by challenging the status quo. When in conflict, interactions take place like confronting issues, in the absence of conflict teams might not realize inefficiencies exist (De Dreu & Weingart, 2003). The positive effects of task conflicts are found to be most beneficial in studies measuring decision making performance and financial performance (De Wit et al., 2012). Since escalation is a form of decision making in which the team follows the wrong track or does not make a decision at all, the effects of task conflict on escalation are expected to be the same.

Since task conflict influences the way group members perform tasks as well as group discussions, task conflicts are expected to improve the relations that are hypothesized between the three phases of decision making and escalation.

Hypothesis 5: Task conflict plays a moderating role such that:

a) Task conflict moderates the relationship between information elaboration and escalation of commitment of groups such that the more task conflict in a team, the more negative the relation between information elaboration and escalation of commitment, and

b) Task conflict moderates the relationship between information acquisition and escalation of commitment of groups such that the more task conflict in a team, the more negative the relation between information acquisition and escalation of commitment, and

c) Task conflict moderates the relationship between participation in decision making and escalation of commitment of groups such that the more task conflict in a team, the more negative the relation between participation in decision making and escalation of commitment.
3.2.5  Intra-group trust

Trust is defined as “the expectation that other people will behave in ways that are helpful and not harmful” (Rispens et al., 2007: pp 329; Gambetta, 1988). Trust can be expressed in many ways, in a business setting it can encompass thinks like expecting the truth from each other, and respecting each other (Simons & Peterson, 2000). By turning to these two aspects of trust, and relating them to the decision process, I argue that trust is an important aspect of decision making.

Firstly, expecting the truth from each other contains two aspects: in small part it implicates that (1) things are expected to be told and thus not withholding information, and (2) the thing being said is not intentionally misleading. The first part indicates that more trust is related to more information elaboration since more information is shared with the group. The second and main part in this argument indicates that the information brought to the table does not need to be put into question. When people think highly of their group members in terms of their expertise it is expectable that they perceive a decision to be more valid and thus express more commitment (Parayitam & Dooley, 2009). Thus, shared information of a trustworthy person is of higher quality than information coming from of an untrustworthy person, while the latter more often provides information that is falsified, biased, or by some other reason cannot be trusted. Secondly, respecting someone is defined by the oxford dictionary as: “A feeling of deep admiration for someone or something elicited by their abilities, qualities, or achievements” (Oxford, 2014). In other words, one has confidence that one’s co-workers are good in doing what they do. The same reasoning as above applies: respect indicates that that the information brought to the table does not need to be put into question, it comes from someone who is admired by his/her abilities, qualities, or achievements. Thus, shared information of a respected person is believed to be of higher quality than information coming from a disrespected person, while the latter is believed to provide bad information.

Trust so it seems, is positively related to putting high quality, reliable information on the table. This is not only of importance during information elaboration, but also during the final decision making step. If the members who participate in the decision making are trustworthy, they contribute to the decision making with high quality, reliable arguments. Employees who trust their manager are more likely to voice their opinions and suggestions, furthermore they may challenge the status quo and established beliefs (Gao et al., 2011). To break with escalation of commitment one needs to break with the status quo. These results indicate that a trusting subordinate who is engaged in the decision making process, might be more likely to step up and challenge the established beliefs, thereby possibly de-escalating commitment. In all, trust strengthens the relationships between information elaboration and participation in decision making with escalation of commitment by enhancing the quality of information available to the team. This leads to the following hypotheses:

Hypothesis 6:  Intra-group trust plays a moderating role such that:

a) Intra-group trust moderates the relationship between information elaboration and escalation of commitment of groups such that the more intra-group trust in a team, the more negative the relation between information elaboration and escalation of commitment, and

b) Intra-group trust moderates the relationship between participation in decision making and escalation of commitment of groups such that the more intra-group trust in a team, the more negative the relation between participation in decision making and escalation of commitment.
3.2.6 Shared leadership

Shared leadership is the final moderator included in this study. It describes a collective team leadership by the team members and is characterized by collaborative decision-making and shared responsibility for outcomes (Hoch & Dulebohn, 2013). Shared leadership exists in self-managed project teams and decision-making teams (Bergman et al., 2012). Carte et al. (2006) found that in those self-managed teams, high-performing teams are characterized by higher incidence of shared leadership.

In teams with shared leadership, some of the team members take on a leadership role. Thus their contribution to the team goes beyond mere execution of the tasks assigned to them. In certain domains team members take the lead, where in others they might follow. This might be highly valuable in projects which encompass various distinct specializations. For example in the development of an electronic component within EMC, teams include software and hardware engineers. To simplify, the hardware engineers are electrical engineers who know all about the physical product and its components. The software engineers on the other hand, write the lines of code that drive these separate components to form a fully operational product. When design issues of the physical product are at stake the team benefits from leadership of a hardware engineer, for the lines of code the software engineer should take the lead. In this way, the people who hold the expertise can guide the team through the process. By this, teams with shared leadership roles can come to better decisions since the right person (e.g. with expertise on the current tasks and issues) is leading the team at the right time.

Findings of prior research indicate that shared leadership is related to improved innovative performance (Hoch, 2013), greater consensus, more trust and more cohesion (Bergman et al., 2012). Furthermore, shared leadership might lead to processes of information elaboration such that team members contribute more ideas and share the unique information they hold (Hoch, 2013). McIntyre and Foti (2013) found that shared leadership improved collaborative mental models. These improved mental models in turn can result in a more efficient way of decision making for teams with shared leadership roles.

Thus, in all, scholars argued for positive relationships of shared leadership with information elaboration and decision making (Hoch, 2013; McIntyre & Foti, 2013). Furthermore, shared leadership “is characterized by collaborative decision making” (Hoch, 2013: pp 161), and to collaborate in decision making one needs to participate in decision making. This leads to the following hypothesis.

Hypothesis 7: Shared leadership plays a moderating role such that:

a) Shared leadership moderates the relationship between information elaboration and escalation of commitment of groups such that the more shared leadership in a team, the more negative the relation between information elaboration and escalation of commitment, and

b) Shared leadership moderates the relationship between participation in decision making and escalation of commitment of groups such that the more shared leadership in a team, the more negative the relation between participation in decision making and escalation of commitment.
Chapter 4
Method
This study combines a survey with interviews and a group decision making task. The lion’s share of the study consists of testing the hypotheses with quantitative analyses of survey-data, these data were verified with the outcome of the decision making task. Furthermore interviews were conducted. The remainder of this chapter firstly explains the method employed for the survey, followed by an explanation of the decision making task, and how these insights were used to supplement the statistical analyses. Finally the method and use of interviews is described.

4.1 Survey
For the quantitative analysis this study included a cross-sectional survey conducted amongst 37 teams of various companies, working in a technological environment. Of those teams, 12 were engineering teams of EMC and 25 teams of an employer other than EMC, hereafter referred to as internal (i.e. EMC teams) and external (i.e. non-EMC teams). Important criteria that determined whether teams could be included in this study were:

1) The team should consist of two or more people and identify themselves as a team;
2) Team members should be authorized to make decisions as a team, or at least discuss important information with the decision maker; and
3) The team operates in the new product development process. The latter includes any team working on a new product, service or process, as well as teams with decision authority on those kinds of projects (e.g. strategic decision making and product portfolio management).

The external teams were contacted through personal networks and the career expo of the Eindhoven University of Technology. These teams were asked to participate in a study focusing on decision making in teams. Roughly 25% of the contacted teams committed to cooperate and sent the e-mail addresses of the team members, totaling 25 external teams. Combined with the 12 internal teams the sample totals 37 teams. Of the 37 teams in the sample 31 teams responded, resulting in data for 18 external and 12 internal teams. One team was dropped from the analysis since the team leader did not provide the team size. 112 people participated in the study, with an average age of 41,6 years (S.D.=10,5), 11,3% of those are females, their average tenure with the company is 8,8 years (S.D.=8,6). The average number of team members working in these teams is 8,7 (S.D. 6,0).

4.1.1 Procedure
Participating teams received a pre-announcement, announcing that they would receive the survey within a week, it furthermore included a brief explanation of the study, and a more detailed explanation of the survey. The second mail again contained an explanation of what was expected from the respondents, if known to the researcher it furthermore contained the name of the project, and finally it included the link to the web-based survey. Two weeks after distribution, respondents who did not filled in the questionnaire received a reminder asking their participation. Again this message contained project information and a link to the survey.
4.1.2 Measures
This study adopted measures from prior research, most of those measures were reformulated to cover a group level measurement. Since the number of field studies to escalation is limited, the application of measurement scales has mainly been limited to short cases with questions. Studies using multi-item questions, are rare and often published in relatively low quality journals. This makes it hard to find reliable and valid questions to measure escalation of commitment. To reduce the exposure to the risk of an uncertain independent variable, this study applied multiple methods and questionnaire items to measure escalation. Escalation was measured using questionnaire items and a decision making task, the latter is explained later. As for the questionnaire items, escalation of commitment was measured by combining existing measurement scales. An alternative measure for escalation of commitment – decision making quality – was included in the survey might the previously explained measurement fail. The rationale for including decision making quality was that decisions of low quality are assumed to be an indicator of escalation. By including decision making quality, and measuring it with items that have proven their worth in prior studies, the effects of the escalation antecedents could still be tested in case the escalation measurements failed.

The selected measures of the questionnaire are all published in peer reviewed journals in which they obtained Cronbach’s alpha’s of over 0.78. Each measure described below contains at least an example item, the remainder of the survey questions are listed in Appendix A. All items were measured using a 5-point Likert scale and were aggregated to team level preceding the analyses. A detailed description of the factor analyses and data transformations is covered in appendix B.

Dependent variables
Escalation of commitment was measured by combining a measurement scale of Mahlendorf (2013), with that of Schmidt and Calantone (2002) and a self-constructed question, which obtained a Cronbach’s α of 0.854. This measure in essence asks respondents whether the project has gone on for too long. The questions of the original scales were reformulated to group level. These are the questions used for this variable: 1) we sometimes doubt that this project continues too long, 2) we sometimes doubt this project continues for too long, 3) we sometimes believe that this project should be terminated, 4) we sometimes doubt this project will be profitable, and 5) our team believes that this new product will fail to meet the hurdle rates set by management.

Decision making quality is defined as the extent to which decisions favor and fit the organizational goals. It was measured using six items adopted from Dooley and Fryxell (1999). An example item is: Our decisions are based on the best available information (α=0.829).

Independent variables
Knowledge acquisition is defined as “the ability of employees to seek and acquire new knowledge or create new knowledge out of existing knowledge within or outside of the organization” (Kim & Lee, 2010: pp134). The measurement scale used in this study was adopted from Kim and Lee (2010). An example item is: Our team invests time and endeavor to seek external information and knowledge, such as news, index, trend, or policy issue reports related to the work. With Cronbach’s α=0.57.

Sharing knowledge was operationalized by using a scale developed to measure information elaboration, which is defined as “the exchange, discussion, and integration of task-relevant information and perspectives” (van Dick et al., 2008: pp 1464). Homan et al. (2007) used seven items to assess participants’ perception of the degree of elaboration. This study retained four out of the
seven items ($\alpha=0.82$). The three items that were dropped from the analysis relate to the integration aspect of information elaboration, which was not the primary subject under study here. ($\alpha>0.78$). The retained items are: 1) our team exchanges a lot of information about the task, 2) our team often says things about the task that make me think, 3) in our team, we discuss the content of our work a lot, and 4) in our team, we often talk about our ideas about the task.

Making the final decision was operationalized using participation in decision making, which I define as the extent to which team members (are allowed to) participate in the decision making process. Following De Dreu and West (2001) the items were adopted from Campion et al. (1993), who used three items. An example item is: My team is designed to let everyone participate in decision making ($\alpha=0.85$).

**Moderators**

Expertise localization is defined as the extent to which team members know who on the team knows what (Kanawattanachai & Yoo, 2007: pp785). The items were adopted from Faraj and Sproull (2000), who used four items. An example item is: This team has a good “map” of each others’ talents and skills ($\alpha=0.86$).

Task conflict is defined as “disagreements among group members about the content of the tasks being performed” (Jehn, 1995: pp 258). It was measured using the four-item scale as described by Jehn (1995). An example item is: How often do people in your team disagree about opinions regarding the work being done? One item (“to what extent are there differences of opinion in your team”) was dropped in the factor analysis in order to obtain a satisfactory percentage of nonredundant residuals, resulting in a three-item solution ($\alpha=0.75$). As mentioned above, detailed information regarding the factor analysis and the choices made for omitting and retaining items can be found in appendix B.

Trust is defined as “the expectation that other people will behave in ways that are helpful and not harmful” (Rispens et al., 2007: pp 329; Gambetta, 1988). The measurement scale used in this study was adopted from Simons and Peterson (2000), who used five items. An example item is: we absolutely respect each other’s competence. As with the task conflict scale, one item (“we expect the complete truth from each other”) was dropped in the factor analysis in order to obtain a satisfactory percentage of nonredundant residuals, resulting in a four-item solution ($\alpha=0.81$).

Shared leadership is defined as “an emergent team property that results from the distribution of leadership influence across multiple team members. It represents a condition of mutual influence embedded in the interactions among team members that can significantly improve team and organizational performance” (Carson et al., 2007, pp 1,218; Hoch et al., 2010: pp 105). The measurement scale used in this study was adopted from Hoch (2013), which is a shortened eighteen-item scale based on a scale developed by Hoch, Dulebohn and Pearce for a conference in 2010$^1$ to measure four constructs: transformational leadership, individual and team empowering leadership and participative leadership. An example item is: My team members provide a clear vision of whom and what our team is. These items resulted in four factors ($\alpha=0.79;0.80;0.86; and 0.94$). The average of these factors was used to represent shared leadership.

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$^1$ This original scale could not be obtained since it seems not to be published, but apparently it is the same scale as used by Hoch, Pearce and Welzel (2010).
Control variables
Following prior research to escalation of commitment, this study included age and gender of the team members as control variables (e.g. Mahlendorf, 2013; Wong & Kwong, 2007; Wong et al., 2006) as well as company tenure of the team members (e.g. Mahlendorf, 2013; Parayitam & Dooley, 2011; Staw et al., 1997). Also, following group level studies to decision making quality (e.g. Parayitam & Dooley, 2011) and conflict studies (e.g. Rispens, 2012), team size was included in this study.

Wong et al. (2006) argue for inclusion of age and gender while these demographics are proven to relate to differences in risk taking behavior (Slovic, 1966; Vroom & Pahl, 1971). In this study, age of team members was operationalized by calculating the average age of the group members. Gender is operationalized by the ratio of women/men per group. An argument to include company tenure is the assumption that over time people get a stronger connection with their employer and thereby its projects, making it harder for them to pull the plug. For this variable, the company tenure of the team members was averaged per team. Finally, there are many arguments to include team size as a control variable. In groups with more team members, discussions are more likely to emerge. Likewise, it might be harder to come to an agreement as a group. These kinds of aspects of team size could have an impact on escalation of commitment that needs to be controlled for.

4.1.3 Aggregation
Measurements of the questionnaire items were done at the individual level. For this study, these individual level scores therefore need to be aggregated to group level. By means to check whether it is appropriate to aggregate the individual level data to the group level, the ICC 1, ICC 2, $R_{wg}$ and eta-squared values were calculated for each variable. These scores are shown in table 4.1, combined with the significance of the F-test. Only escalation of commitment, knowledge acquisition and expertise localization variables obtain significant results for the F-test. However, for all variables the ICC 1-scores are low, indicating little between group agreement. This could be related to low between-group variance as indicated by the $R_{wg}$ scores. Ideally these scores would be above 0,7, however this is not a cut-off value, $R_{wg}$ scores of 0,5-0,7 indicate moderate agreement amongst team members (LeBreton & Senter, 2008). Therefore aggregating these individual level variables to team level receives some support based on statistical grounds. Furthermore, there is a solid foundation of theoretical arguments to aggregate these individual level variables to the team level as discussed in the previous sections.

<table>
<thead>
<tr>
<th>Variable</th>
<th>F-test sig.</th>
<th>ICC 1</th>
<th>ICC 2</th>
<th>$R_{wg}$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escalation of commitment</td>
<td>.000</td>
<td>.21</td>
<td>.70</td>
<td>.71</td>
<td>.60</td>
</tr>
<tr>
<td>Decision making quality</td>
<td>n.s.</td>
<td>.01</td>
<td>.09</td>
<td>.51</td>
<td>.33</td>
</tr>
<tr>
<td>Knowledge acquisition</td>
<td>.001</td>
<td>.15</td>
<td>.61</td>
<td>.67</td>
<td>.54</td>
</tr>
<tr>
<td>Information elaboration</td>
<td>n.s.</td>
<td>.04</td>
<td>.26</td>
<td>.55</td>
<td>.38</td>
</tr>
<tr>
<td>Participation in decision making</td>
<td>n.s.</td>
<td>-.03</td>
<td>-.28</td>
<td>.46</td>
<td>.26</td>
</tr>
<tr>
<td>Expertise localization</td>
<td>.029</td>
<td>.08</td>
<td>.43</td>
<td>.59</td>
<td>.44</td>
</tr>
<tr>
<td>Task conflict</td>
<td>n.s.</td>
<td>.03</td>
<td>.21</td>
<td>.53</td>
<td>.35</td>
</tr>
<tr>
<td>Trust</td>
<td>n.s.</td>
<td>-.01</td>
<td>-.09</td>
<td>.49</td>
<td>.29</td>
</tr>
<tr>
<td>Shared leadership</td>
<td>n.s.</td>
<td>.02</td>
<td>.12</td>
<td>.77</td>
<td>.34</td>
</tr>
</tbody>
</table>

Table 4.1: ICC, $R_{wg}$ and eta-squared scores
4.1.4 Statistical analysis
With thirty teams the sample is fairly small. Hair et al. (2010) state a required minimum sample size of 50 observations for linear regression analysis, where the minimum ratio of observations to variables is 5:1. In order to comply to these restrictions as much as possible, each hypothesis is tested by entering only the control variables, and the direct and moderating effect under study. In this way, the number of variables in each model is reduced as much as possible.

4.2 Decision making task and interviews
Since escalation of commitment is a hard subject to measure using questionnaires, this study obtained additional data from a decision making task and interviews. The generated insights were a valuable addition to the theoretical analysis to minimize common method variance. Moreover, a more complete picture of escalation of commitment could be provided relative to a situation in which only one method was applied. The information originating from the questionnaire was limited to the questions asked. By conducting interviews and observing a decision making task, additional information emerged. Since both escalation of commitment as well as social processes in groups are highly complex, these methods point at important aspects not covered in the questionnaire. With this, the decision making model as proposed in the theoretical framework could be compared to the real world scenario.

4.2.1 Decision making task
The structured decision making task was executed by five of the project teams also participating in the survey. Prior to the task, the participating engineers filled in the questionnaire in relation to their team. Their survey-rating of decision making quality and escalation of commitment were combined with the outcome of the decision making task for verification purposes. The decision making task formed an objective measure of escalation and was used to verify the validity of the survey measurement.

This study applied a case that was aimed at the new product development process in order not to deviate too much from the situation of the engineering teams. For this reason the case of Schmidt, Montoya-Weiss and Massey (2001) was adapted. In this case, a product development team develops a hypothetical product. The full case and the rationale for choosing this specific case are included in Appendix C.
Procedure
All decision making tasks were conducted in a conference room, and tape recorded on the condition that everyone granted permission to do so. After a brief introduction of what was expected from the team, they were asked to choose one of two products. When they had come to an agreement to commit to one of the products, the team hypothetically proceeded in time. To accentuate, the teams took a short coffee-break outside the conference room.

Regardless of the choice they made, they received the same information on the product performance over the past months and the expectations for the future, their chosen product is expected to be profitable but the projected market share is below the level demanded by management. Subsequently the team was asked to discuss and decide between abandonment and continuation of the project (bring it to the market or not). Would they choose to continue, they again proceeded in time during a short break.

After their break they were confronted with negative information regarding the market performance of the product. The actual market share was even less than was projected and the product was incurring a loss. Again the team was asked to decide between abandonment or continuation of the project. After this decision the decision making task was finished and the team was de-briefed by explaining the decision making task and purpose of the study in detail. To obtain data, the researcher rated the group behavior on the concepts as included in the survey. Furthermore notes were taken by the researcher describing expressed behavior not included in the formal research model, in order to identify potential factors of influence. Finally, the outcome of the decisions served as a measure of escalating commitment where pulling the plug right away was not escalation at all, and not pulling the plug in both decisions represented full escalation of commitment.

4.2.2 Interviews
The semi-structured interviews conducted in this study served three purposes. First and foremost the interviews were used to assess the decision making process of EMC in more depth, to obtain practical insights not provided by the closed questions in the questionnaire. Secondly, the interview questions aimed to broaden the research by asking interviewees explicitly and implicitly which social factors play an important role within the decision making process as employed by the engineering teams. Examples of explicit questions are the following: “How does interaction with your colleagues influence the decision making quality?” and “What social factors play a role in the decisions you make as a team?”. An example of an implicit question is: “What are the strengths and weaknesses of the decision making process your team employs?”. Finally, the interview results were used to verify and/or reject the findings resulting of the survey data, depending on whether the results were congruent or contradictory. This methodology does not ensure complete objectivity since the researcher is also the rater, however the data is a valuable addition to the other measurement instruments. The implications of this methodology are discussed in the limitations section.
Chapter 5  
Analyses and results

This chapter describes the process and results of the data analyses. The first section combines the survey data with the results of the decision making task to validate the dependent variables. Thereafter the second section covers the analysis and results of the survey and interview data.

For interpretation I would like to note that high scores on the escalation of commitment variable represent a project being escalated, a low score on escalation of commitment represents the desirable situation.

5.1 Verification of escalation measurements with decision making task outcome

To verify the validity of the survey data, a linear regression was conducted in which the results of the decision making task were used as an independent variable. “Escalation of Commitment” and “Decision Making Quality” were separately included as dependent variables. Of the participating teams, none of the teams killed the project at first instance and two teams proceeded to the end by escalating commitment.

The results of the regression are presented in table 5.1. These results should be interpreted with caution since they are based on only five cases. Moreover, the data obtained in the questionnaire relates to a real-life project while the decision making task covers a fictional project. However, the results of the decision making task and survey results show great resemblance with the general tendency I observed within the organization. During this research I was stationed at the office of the project leaders, providing me the opportunity to informally observe day-to-day operations. Those teams that showed escalation of commitment tendencies in real life projects (e.g. holding on to a failing course of action even when they recognized the course would not be successful), escalated in the decision making task as well. To conclude, it is possible to interpret the results of these regressions and cautiously generalize them to the complete sample.

As shown in table 5.1, when conducting a linear regression, the escalation of commitment variable as obtained from the questionnaire was significantly related to the results of the decision making task at \( p < .10 \) where decision making quality was not. As mentioned above, this is commensurate with the observations of day-to-day operations. While the measurement of escalation of commitment seems to be successful, the hypotheses are tested by using this measure as dependent variable.

Table 5.2 shows the means, standard deviations and correlations between the variables used in this study. Some interesting significant correlations are briefly discussed in this section. Firstly, regarding the control variables, average company tenure and expertise localization are positively correlated to average age. Both these correlations are rather straightforward. Relatively speaking, young people are just starting their careers and therefore do not have as much company tenure. Likewise, groups with a high average company tenure probably know the company they work for better than groups new to their employer. With that experience could also come knowledge regarding who holds what expertise.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Escalation of commitment</th>
<th>Decision making quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-task outcome</td>
<td>.839†</td>
<td>-.630</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>.703†</td>
<td>.397</td>
</tr>
<tr>
<td>F-value</td>
<td>7.108†</td>
<td>1.972</td>
</tr>
</tbody>
</table>

Note: †\( p < .10; \ N=5 \); entries are standardized Beta coefficients

Table 5.1: Verification of survey data
The negative correlation of team size to escalation of commitment is less straightforward but still explicable. Team size was included to control for the effects of groups with more team members in which longer discussions are more likely to emerge. In bigger groups, it might be harder to come to an agreement as a group. These longer discussions might turn out positive in light of escalation of commitment. It could mean the team truly reflects on the situation and thereby de-escalate commitment.

Participation in decision making was positively correlated to information elaboration, knowledge acquisition and task conflict. An explanation could be that participating employees put more effort in the process by searching for and elaborating information. Furthermore, participants could have differences of opinion. The more participation, the more these differences of opinion get a chance to be ventilated and play up as task conflicts.

Finally, decision making quality is positively related to information elaboration, knowledge acquisition, participation in decision making, expertise localization and trust. All these correlations were no surprise since the theory already pointed at positive relationships of these variables with decision making quality. Of more interests is the absence of correlations between these variables and escalation of commitment. The regression results will need to learn us whether or not escalation of commitment is related to these variables. As hypothesized the relations between the decision making process, social factors and escalation of commitment could be more complicated than the single correlations presented above. Therefore we now turn to the regression results.

Table 5.2: Correlation table

Note: N=30, 1) Gender proportion is a ratio of women/men ranging from 0=only men to 1=only women,
*Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed).
5.2 Regression analyses

This section describes the regression analyses with which the hypotheses were tested, and furthermore presents insights obtained from the interviews. As previously explained, the hypotheses were tested while controlling for age, gender, company tenure and team size. These variables were entered in the first step of the regressions to form a baseline model. Thereafter the hypothesized relations were added in subsequent steps.

5.2.1 Baseline model

In table 5.3, the regression results of the relation between the decision making process and escalation of commitment are shown. I first turn to the baseline model as shown in table 5.3 step 1. In this model, the control variables explained 21.4% of the variance. There is a significant negative relation between team size and escalation of commitment indicating that team size is an important factor in the baseline model.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th>Step 2 (H1)</th>
<th>Step 2 (H2)</th>
<th>Step 2 (H3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.094</td>
<td>-.222</td>
<td>-.100</td>
<td>-.111</td>
</tr>
<tr>
<td>Gender</td>
<td>.203</td>
<td>.241</td>
<td>.210</td>
<td>.237</td>
</tr>
<tr>
<td>Company tenure</td>
<td>.021</td>
<td>.204</td>
<td>.010</td>
<td>.055</td>
</tr>
<tr>
<td>Team size</td>
<td>-.400*</td>
<td>-.378*</td>
<td>-.422*</td>
<td>-.400*</td>
</tr>
<tr>
<td>Information elaboration</td>
<td></td>
<td>-.399*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge acquisition</td>
<td></td>
<td></td>
<td></td>
<td>-.160</td>
</tr>
<tr>
<td>Participation in DM</td>
<td>.214</td>
<td>.349</td>
<td>.239</td>
<td>.224</td>
</tr>
<tr>
<td>R² change</td>
<td>.135*</td>
<td>.025</td>
<td>.009</td>
<td></td>
</tr>
<tr>
<td>F-value</td>
<td>1.705</td>
<td>2.577†</td>
<td>1.508</td>
<td>1.383</td>
</tr>
</tbody>
</table>

Note: †p<.10; *p<.05; N=30; entries are standardized Beta coefficients. Dependent variable is escalation of commitment.

Table 5.3: Regression results hypothesis 1

5.2.2 The relation between the decision making process and escalation of commitment

The first hypothesized relation was that information elaboration was negatively related to escalation of commitment. Table 5.3 shows the regression results of this relation in ‘step 2 (H1)’. By adding information elaboration to the base-line model the explained variance increased with ΔR²=.136 (Sig.<.05). Furthermore there is a negative relation between information elaboration and escalation of commitment, such that more information elaboration is related to less escalation of commitment (β= -.399; Sig.<.05). In addition to these results, most of the interviewees stated the importance of information elaboration to break from escalation of commitment. As a project leader stated:

“Our engineers make design choices that affect others, when they do not share these choices, other engineers make flawed decisions since they do not have all the information necessary to decide correctly. (...) When engineers made such a design choice they have a strong tendency to stick to that choice regardless of the -sometimes unreasonable- extra effort it requires to make it to the finish line relative to other -much more efficient- possibilities”.

To conclude, information elaboration has the expected effect of inhibiting escalation of commitment.

The second hypothesis predicted a negative relation between knowledge acquisition and escalation of commitment. As can be seen in the table 5.3 ‘step 2 (H2)’ there was no support for this hypothesis. Although the survey data clearly does not support the hypothesis, interviewees reveal a different image. As an employee stated:
“When choosing components of which we don’t know the cost or lead time of a product, we cannot make a grounded decision. Therefore it is important to include purchasers in the process or at least make sure this information is available when necessary, without this information we need to delay our decision, or worse: we could choose the wrong component (too expensive or with a long lead time) or send out a faulty (sales price) quotation to a customer.”

In case of selling an undervalued project to a customer, the organization automatically commits to a failing course of action (legally bound to deliver a product under cost price). The above does not lead to the acceptance of the hypothesis, but does indicate that the role of knowledge acquisition is not totally unrelated to escalation of commitment as one would conclude from the results of the survey data, this is discussed in more depth in the next chapter.

Hypothesis 3 predicted a negative relation between participation in decision making and escalation of commitment. There were no significant results, and a marginal increase in the explained variance. Thus, there is no support for hypothesis 3. The regression results are presented in table 5.3 ‘step 2 (H3)’. When comparing the survey results with the interview data a similar picture emerged, in the interviews the employees reveal an ambiguous image. Where one employee stated: “engineers are the ones who have technical knowledge and therefore should be the ones to make technological choices” another stated that “it is important to let a single person decide on technological issues. When this responsibility is centralized one person can maintain an overview and be held responsible”. To conclude, hypothesis 3 was not supported by the survey data nor by the interviews.

5.2.3 Expertise localization – hypothesis 4

The fourth hypothesis stated that expertise localization has a moderating effect on the information elaboration-escalation of commitment relation (hypothesis 4a). To test hypothesis 4a, information elaboration and expertise localization were added to the baseline model as shown in table 5.4. The results indicate that there was no significant increase in explained variance and also no significant direct relation between expertise localization and escalation of commitment, but the model as a whole received some support with F=2,080 (Sig.<.10). Adding the interaction effect to the model (step 3) resulted in a F=1,709 (Sig.=n.s.) and no additional explained variance, therefore there was no support for hypothesis 4a.

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Step 2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
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<td>-.094</td>
<td>-.215</td>
<td>-.223</td>
</tr>
<tr>
<td>Gender</td>
<td>.203</td>
<td>.249</td>
<td>.284</td>
</tr>
<tr>
<td>Company tenure</td>
<td>.021</td>
<td>.219</td>
<td>.223</td>
</tr>
<tr>
<td>Team size</td>
<td>-.400*</td>
<td>-.382*</td>
<td>-.374†</td>
</tr>
<tr>
<td>Information elaboration</td>
<td>-.356</td>
<td>-.362</td>
<td></td>
</tr>
<tr>
<td>Expertise localization</td>
<td>-.071</td>
<td>-.057</td>
<td>.026</td>
</tr>
<tr>
<td>Interaction KS*EL</td>
<td></td>
<td></td>
<td>.026</td>
</tr>
<tr>
<td>R²</td>
<td>.214</td>
<td>.352</td>
<td>.352</td>
</tr>
<tr>
<td>R² change</td>
<td>.137</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>F-value</td>
<td>1,705</td>
<td>2,080†</td>
<td>1,709</td>
</tr>
</tbody>
</table>

Note: †p<.10; *p<.05; N=30; entries are standardized Beta coefficients. Dependent variable is escalation of commitment. Table 5.4: Regression results hypothesis 4a
Hypothesis 4b stated that expertise localization has a moderating effect on the knowledge acquisition-escalation of commitment relation. Turning to the regression results for hypothesis 4b learns that there was no support for this hypothesis either, as shown in table 5.5.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.094</td>
<td>-0.122</td>
<td>-0.157</td>
</tr>
<tr>
<td>Gender</td>
<td>0.203</td>
<td>0.256</td>
<td>0.215</td>
</tr>
<tr>
<td>Company tenure</td>
<td>0.021</td>
<td>0.151</td>
<td>0.121</td>
</tr>
<tr>
<td>Team size</td>
<td>-0.400*</td>
<td>-0.421*</td>
<td>-0.360†</td>
</tr>
<tr>
<td>Knowledge acquisition</td>
<td>-1.02</td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td>Expertise localization</td>
<td></td>
<td>-0.276</td>
<td>-0.232</td>
</tr>
<tr>
<td>Interaction KA*EL</td>
<td></td>
<td></td>
<td>0.302</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.214</td>
<td>0.295</td>
<td>0.364</td>
</tr>
<tr>
<td>( R^2 ) change</td>
<td></td>
<td>0.081</td>
<td>0.069</td>
</tr>
<tr>
<td>F-value</td>
<td>1.705</td>
<td>1.606</td>
<td>1.797</td>
</tr>
</tbody>
</table>

Note: †p<0.10; *p<0.05; N=30; entries are standardized Beta coefficients. Dependent variable is escalation of commitment.

It is nearly impossible to gain insights in moderating effects trough interviews. However, direct relations are more easily identified. As it turns out, engineers have difficulty de-escalating their own commitment to a course of action as individuals. To a greater or lesser degree, every engineer finds him or herself going in circles every now and then. The situation can be described as follows: an engineer made a design choice, is assigned to a difficult task, or gets stuck between a rock and a hard place trough some other event. This engineer can stay stuck unnoticed by others for multiple weeks, amongst other reasons due to the intangible nature of some projects (e.g. software projects), which makes it hard to monitor progress of task execution (Pan et al., 2006). To quote an employee:

"These situations happen and with some engineers I will only find out they are stuck after nearly interrogating them. Some of these issues are really hard to solve, even for experts, but other issues aren’t. Most of the time, once I identified an engineer got stuck and sent help, the pace of the project drastically accelerated".

Although most interviewees stated that it is some kind of a hurdle that prevents from breaking the cycle rather than not knowing who to turn to, some employees more explicitly stated that they found it hard to identify who had expertise on the issue they were dealing with:

"There is a nice sheet in which everyone should file their fields of expertise. Firstly, I don’t even know where to find it. Secondly, I’m not even sure if everyone is actively keeping this sheet up-to-date. In my opinion I should know by heart who to call when I got stuck. However, I have no insights in the fields of expertise of my colleagues working on the sites other than my own, preventing me from calling them. (...) More often than not my issues are resolved by simply talking to a colleague who looks afresh at the situation."

Therefore it seems a combination of timely localizing expertise to enhance problem solving and lowering the perceived hurdle that can result in quicker change in course of action. To conclude, the relation between expertise localization and escalation of commitment was not present in the results of the survey data, but the interviews support a positive relation between expertise localization and escalation of commitment, which is discussed in the following chapter.
5.2.4 Task conflict – hypothesis 5

Hypothesis 5a predicted a moderating effect of task conflict in information elaboration-escalation of commitment relation. To test hypothesis 5a, information elaboration and task conflict were included in the model in step 2 (table 5.6). Adding the interaction effect in step 3 did not result in significant change. Therefore, hypothesis 5a received no support.

Hypothesis 5b predicted a moderating effect of task conflict in knowledge acquisition-escalation of commitment relation. To test hypothesis 5b, knowledge acquisition and task conflict were entered in the second step of the model as shown in table 5.7. The result is a 37.8% increase in explained variance (Sig.<.05) and F=2.372 (Sig.<.05). Furthermore, escalation of commitment was negatively related to knowledge acquisition (Sig.<.05) and positively related to task conflict (Sig.<.05). Adding the interaction effect resulted in F=2.540 (Sig.<.05), however there was no significant effect between the interaction variable and escalation of commitment nor a significant increase in explained variance by adding this variable. Therefore, hypotheses 5b received no support. Instead, a positive relation was found between escalation of commitment and task conflict such that more task conflicts were related to more escalation of commitment.

Hypothesis 5c predicted a moderating effect of task conflict in participation in decision making-escalation of commitment relation. Hypothesis 5c did not receive support (Table 5.8). Adding participation in decision making and task conflict to the baseline model only marginally increased the explained variance, with a decreasing F-value. When entering the interaction effect again the R-square marginally increased and the F-value decreased even more.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.094</td>
<td>-.178</td>
<td>-.175</td>
</tr>
<tr>
<td>Gender</td>
<td>.203</td>
<td>.230</td>
<td>.215</td>
</tr>
<tr>
<td>Company tenure</td>
<td>.021</td>
<td>.156</td>
<td>.153</td>
</tr>
<tr>
<td>Team size</td>
<td>-.400*</td>
<td>-.364*</td>
<td>-.362†</td>
</tr>
<tr>
<td>Information elaboration</td>
<td>-.380*</td>
<td>-.381*</td>
<td></td>
</tr>
<tr>
<td>Task Conflict</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction KS*TC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>.214</td>
<td>.378</td>
<td>.380</td>
</tr>
<tr>
<td>R² change</td>
<td></td>
<td>.164†</td>
<td>.001</td>
</tr>
<tr>
<td>F-value</td>
<td>1.705</td>
<td>2.334†</td>
<td>1.924</td>
</tr>
</tbody>
</table>

Note: †p<.10; *p<.05; N=30; entries are standardized Beta coefficients. Dependent variable is escalation of commitment.

Table 5.6: Regression results hypothesis 5a

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.094</td>
<td>-.005</td>
<td>-.029</td>
</tr>
<tr>
<td>Gender</td>
<td>.203</td>
<td>.199</td>
<td>.240</td>
</tr>
<tr>
<td>Company tenure</td>
<td>.021</td>
<td>-.118</td>
<td>-.079</td>
</tr>
<tr>
<td>Team size</td>
<td>-.400*</td>
<td>-.420*</td>
<td>-.382*</td>
</tr>
<tr>
<td>Knowledge acquisition</td>
<td>-.450*</td>
<td>-.400†</td>
<td></td>
</tr>
<tr>
<td>Task Conflict</td>
<td>.484*</td>
<td>.283</td>
<td>.312</td>
</tr>
<tr>
<td>Interaction KA*TC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>.214</td>
<td>.382</td>
<td>.447</td>
</tr>
<tr>
<td>R² change</td>
<td></td>
<td>.168†</td>
<td>.065</td>
</tr>
<tr>
<td>F-value</td>
<td>1.705</td>
<td>2.373†</td>
<td>2.540*</td>
</tr>
</tbody>
</table>

Note: †p<.10; *p<.05; N=30; entries are standardized Beta coefficients. Dependent variable is escalation of commitment.

Table 5.7: Regression results hypothesis 5b
### Team decision making task

In support of the finding for a positive relation between task conflict and escalation of commitment were the observations during the decision making tasks. Those teams who calmly discussed their options with much agreement, were the teams who killed the project. Teams where the discussions were more fierce and where there was disagreement on what indicator to ground their choice escalated commitment. Also, the teams experiencing task conflicts seemed to experience more difficulties to empathize themselves with their role in the decision making task: they frequently mentioned to one another that the decision making task was more suited to be executed by the managing board rather than their team, and that their team had little experience in making the decisions covered in the case. However, this is not the complete picture, from the interviews the opposite image emerged. All interviewees seemed to agree to the notion that task conflicts are beneficial as long as the discussion is driven by proper argumentation. In all, the role of task conflict in escalation of commitment stays ambiguous. The decision making task and regression results point at a positive relation between escalation of commitment and task conflict such that high levels of task conflict were related to high levels of escalation. On the other hand, statements from the interviews point at a negative relationship in which high levels of task conflict were related to low levels of escalation. These findings are discussed in depth in the following chapter.

### 5.2.5 Trust – hypothesis 6

Hypothesis 6a stated that trust has a moderating effect on the information elaboration-escalation of commitment relation. Table 5.9 presents the regression results for hypothesis 6a, for which there was no support. Rather, trust had a direct negative relation with escalation of commitment.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
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<td>-067</td>
<td>-122</td>
</tr>
<tr>
<td>Gender</td>
<td>203</td>
<td>266</td>
<td>220</td>
</tr>
<tr>
<td>Company tenure</td>
<td>021</td>
<td>031</td>
<td>062</td>
</tr>
<tr>
<td>Team size</td>
<td>-400*</td>
<td>-372†</td>
<td>-351†</td>
</tr>
<tr>
<td>Participation in DM</td>
<td></td>
<td>-245</td>
<td>-254</td>
</tr>
<tr>
<td>Task Conflict</td>
<td></td>
<td>309</td>
<td>184</td>
</tr>
<tr>
<td>Interaction PDM*TC</td>
<td></td>
<td></td>
<td>253</td>
</tr>
<tr>
<td>R²</td>
<td>021</td>
<td>084</td>
<td>043</td>
</tr>
<tr>
<td>R² change</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-value</td>
<td>1,705</td>
<td>1,632</td>
<td>1,630</td>
</tr>
</tbody>
</table>

Note: †p<.10; *p<.05; N=30; entries are standardized Beta coefficients. Dependent variable is escalation of commitment. Table 5.9: Regression results hypothesis 6a
Hypothesis 6b stated that trust has a moderating effect on the participation in decision making-escalation of commitment relation. Table 5.10 presents the regression results for hypothesis 6b. Adding participation in decision making and trust to the baseline model resulted in a 17.2% increase in explained variance (Sig.<.10) and F=2,413 (Sig.<.10). Moreover, trust was negatively related to escalation of commitment (β=-.507; Sig.<.05). To test for moderation, the interaction effect was added in the third step. Unfortunately this did not yield any results, the F-value decreased to F=2,056 and the explained variance increased with a mere 0.9% (Sig.=n.s.). To conclude, hypothesis 6b was not supported. Rather, trust had a negative relation with escalation of commitment.

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Step 2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
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<tr>
<td>Gender</td>
<td>.203</td>
<td>.313</td>
<td>.306</td>
</tr>
<tr>
<td>Company tenure</td>
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<td>.218</td>
<td>.208</td>
</tr>
<tr>
<td>Team size</td>
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<td>-.398*</td>
<td>-.380*</td>
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<tr>
<td>Participation in DM</td>
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<td>.019</td>
<td>.023</td>
</tr>
<tr>
<td>Trust</td>
<td></td>
<td>-.465*</td>
<td>-.507*</td>
</tr>
<tr>
<td>Interaction PDM*T</td>
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<td>.107</td>
</tr>
<tr>
<td>R²</td>
<td>.214</td>
<td>.386</td>
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</tr>
<tr>
<td>F-value</td>
<td>1.705</td>
<td>2.413†</td>
<td>2.056†</td>
</tr>
</tbody>
</table>

Note: †p<.10; *p<.05; N=30; entries are standardized Beta coefficients. Dependent variable is escalation of commitment.

Table 5.10: Regression results hypothesis 6b

5.2.6 Shared leadership – hypothesis 7

The last hypothesis stated that shared leadership moderates the information elaboration-escalation of commitment (hypothesis 7a, table 5.11) and participation in decision making-escalation of commitment (hypothesis 7b, table 5.12) relationships. Although adding shared leadership and information elaboration to the baseline model did result in a significant increase in explained variance of 15.3% (Sig.<.10) and F=2,229 (Sig.<.10), there was no significant relation between shared leadership and escalation. Adding the interaction effect in step 3 did not add anything to the model. Therefore, hypothesis 7a was not supported.

To test hypothesis 7b, participation in decision making and shared leadership were added to the baseline model. Again this did not yield any results. In the third step, the interaction effect was added to the model, which resulted in an increase in explained variance of 10.1% (Sig.<.10). Furthermore, the interaction effect was positively related to escalation of commitment (β=.101; Sig.<.10). The moderating effect is plotted in figure 5.1 on the next page, although caution with the interpretation of these results is necessary since F=1,860 (Sig.=n.s.).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.094</td>
<td>-.267</td>
<td>-.239</td>
</tr>
<tr>
<td>Gender</td>
<td>.203</td>
<td>.290</td>
<td>.249</td>
</tr>
<tr>
<td>Company tenure</td>
<td>.021</td>
<td>.205</td>
<td>.207</td>
</tr>
<tr>
<td>Team size</td>
<td>-.400*</td>
<td>-.343†</td>
<td>-.316†</td>
</tr>
<tr>
<td>Information elaboration</td>
<td></td>
<td>-.355†</td>
<td>-.312</td>
</tr>
<tr>
<td>Shared Leadership</td>
<td></td>
<td>-.166</td>
<td>-.110</td>
</tr>
<tr>
<td>Interaction KS*SL</td>
<td></td>
<td></td>
<td>.212</td>
</tr>
<tr>
<td>R²</td>
<td>.214</td>
<td>.368</td>
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<tr>
<td>R² change</td>
<td></td>
<td>.153†</td>
<td>.037</td>
</tr>
<tr>
<td>F-value</td>
<td>1.705</td>
<td>2.229†</td>
<td>2.134†</td>
</tr>
</tbody>
</table>

Note: †p<.10; *p<.05; N=30; entries are standardized Beta coefficients. Dependent variable is escalation of commitment.

Table 5.11: Regression results hypothesis 7a
### Table 5.12: Regression results hypothesis 7b

Teams with little shared leadership benefit from higher levels of participation in decision making, whereas teams with high amounts of shared leadership benefit from relatively low participation in decision making.

When asking questions regarding shared leadership, most people brought up the role of lead-engineer and systems architects. EMC tries to assign a systems architect to every project. A systems architect is a function within the organization, for someone who has a broad set of technical knowledge. Amongst other responsibilities, the task of a systems architect is to come up with a rough draft design and a sales price quotation. After the customer has accepted the quotation, the systems architect takes a step back and takes on an advisory role to the lead-engineer and project team. From this point an engineer assigned with the role of lead-engineer reviews the design and quotation and starts to fill in the details. Would there be major deficiencies in the initial concept design or if deficiencies turn up during the detailed design phase, a redesign by the systems architect follows. In this sense the roles are similar to building a house, the architect sketches the house and the structural engineer produces a detailed design of the foundation, wall structure etc. Both the systems architect as well as the lead engineer can serve as a bridge in connecting the engineers with the project leader, by translating technical jargon into plain language and vice versa. But where the systems architect is a function, a lead-engineer is an assigned role for the duration of one specific project.

![Figure 5.1: Moderating effect of participation in decision making (PDM) with shared leadership (SL)](image-url)
None of the interviewees however, seemed to know the real difference between the two positions, there was not even agreement on whether “lead-engineer” was a position or a temporary role. Some interviewees stated that a lead-engineer was just a regular engineer who got assigned the role of lead-engineer for a specific project. Other interviewees saw lead-engineers and engineers as a completely different position within the company, where the lead-engineer would be a kind of senior engineer. Both the lead-engineer as well as the systems architect was seen as someone on nearly the same hierarchical level as the project leader, where they are both responsible for a different part of the same project.

Regardless of the confusion regarding the roles of the lead-engineer and systems architect, all project leaders explicitly stated that these roles served an important mechanism in project execution. Firstly, these system architects are the ones who put the project on the right track by sketching the rough picture. Secondly, by taking ownership for the design and being able to make informed decisions regarding technical issues, the presence of a lead-engineer or systems architect improves decision making quality and making decisions in a timely manner. Thirdly, project leaders recognize that they find it hard to identify when an engineer is making little progress or going in circles. According to these project leaders, lead-engineers or systems architects identify these situations sooner and more easily because they are better able to relate to the engineer. Furthermore, these lead-engineers or systems architects can point the engineer the right direction to continue development.

These interview findings support the notion that shared leadership -in the form of project leaders with lead-engineers and systems architects on their side- was negatively related to escalation of commitment. To conclude, the relation between shared leadership and escalation of commitment was not present in the results of the survey data, but still there is reason to believe shared leadership plays a role, which is discussed in the following chapter.
Chapter 6
Discussion
The purpose of this paper was to analyze what social factors influence escalation of commitment in groups, and to identify additional factors not included in the survey. This chapter discusses the results of the analyses, the second section covers the limitations of this study and presents future research directions.

6.1 General discussion for new product development teams
Figure 6.1 presents the significant relationships of the survey data. The following section discusses these results.

Information elaboration
Participation in decision making
Task conflict
Trust

Control variables:
- Age
- Comp. tenure
- Gender
- Team size

Escalation of Commitment

Figure 6.1: Significant relationships

Decision making process and escalation of commitment
In today’s organizations, success depends on effectively integrating the knowledge of skilled professionals (Bergman et al., 2012). Prior studies found that teams who communicate, efficiently identify and combine unshared information improve their decision quality (Schulz-Hardt et al., 2000). This study finds that information elaboration also is beneficial in case of escalation of commitment. Although causality cannot be tested, the interviews draw the picture that knowledge exchange can prevent escalation of commitment from occurring in interdependent project teams. Employees state it is important for their group to communicate their design choices effectively to the other team members, while this prevents these others from making flawed decisions based on wrong information. Thus, effectively sharing knowledge provides others with relevant information. Prior studies have recommended companies to provide better information to managers in order to decrease the likelihood of escalation (e.g. Chakravorty, 2009; Mahlendorf, 2013; Winch, 2013).

The second hypothesis of this study predicted, but did not find a statistically significant relation between information acquisition and escalation of commitment, which is unexpected since for example Sleesman et al. (2012) identify it as one of the strongest inhibitors of escalation of commitment. Furthermore, prior research found information collection and distribution to be related to good decision making (Hollenbeck et al., 1995). The reason why this study failed to find an effect were other studies did could be related to the nature of the task. Where this study has a focus on engineering teams and their decisions, Sleesman et al. (2012) state that many of the studies on the role of information in escalation situations, have focused on finance decisions. Where engineering decisions are in large a creative process, finance decisions could be described as mathematically driven. Turning to this study, the survey items relate to the acquisition of mostly subjective information, whereas the interviewees focus on quantifiable objective information like costs and lead
times. In order to find a relation between escalation of commitment and information acquisition, it therefore seems to be important to differentiate between quantifiable objective information and non-quantifiable subjective information.

The third variable of the decision making process, participation in decision making, did not have a uniform relation with escalation of commitment. Based on the interviews it was also not possible to identify a direction for the relation between these constructs. Adding shared leadership as a moderator revealed that the direction of the relation depends on the level of shared leadership within a team. The results of this interaction are discussed in the section ‘shared leadership’. Possibly other factors act as moderators. De Dreu and West (2001) found positive effects of participation in decision making when a minority in a group publicly opposes the beliefs or ideas assumed by the majority of the group. To test for the assertion, a post hoc analysis was conducted with the skewness of task conflict as a moderator by means to check for minority dissent, this did not yield results. A second possibility is a moderating effect of the expertise participating members bring to the table, since experts make better and faster decisions (Campitelli & Gobet, 2010). When comparing two groups with a similar level of participation in decision making, it is likely that a group of experts benefits more from this situation, relative to a group of ‘normal’ people. Similarly, a group who is able to localize their experts during decision making could reap the benefits of them participating. In a post-hoc analysis I tested whether expertise localization had an effect in this relationship, again without results.

A reason for not finding direct effects could lie in the distribution and lack of variability (ICC 2 = .12) of the participation in decision making variable. There were no teams in this dataset with a low score on participation in decision making (mean=3.8; S.D.=.54), indicating an absence of teams in which the leader or one team member makes all the decisions. By this absence the dataset is biased, there are simply no cases of centralized decision making to compare to the participative decision making cases.

**Expertise localization**

I did not find support for a direct or moderating effect of expertise localization on escalation of commitment of the teams. The interviews indicate that not knowing who to turn to does hamper engineers from de-escalating commitment. Some employees stated they experience difficulties identifying who had expertise on the issue they were dealing with. From this we can deduce that the arguments used in the development of the hypothesis are based on a different mechanism than perceived by the employees. Where the hypotheses were mainly based on the importance assigned to information provided by credible experts during group decision making, the underlying mechanism in reality seems to be more closely related to the definition of expertise localization: the extent to which team members know who on the team knows what (Kanawattanachai & Yoo, 2007: pp785).

Another reason for not finding the expected relations could lie in the group focus of this study. The interviewees relate expertise localization mainly to individual level situations in which they get stuck with their problem. Expertise localization is seen as an important way to solve their problem at hand and to head in the right direction. In this way, expertise localization reduces escalation tendencies by effective and efficient problem solving for engineers at the individual level. Timely and effective problem solving could also translate into reduced escalation tendencies for the group. But in order to test this, expertise localization should be measured at the individual level rather than the group level.
at which it is measured in this study. Furthermore the dimension of time plays an important role in this mechanism, since unsuccessful problem solving at the individual level is unlikely to result in an immediate escalation of commitment situation for the group.

**Trust and escalation of commitment**

Although a moderating effect of intra-group trust was expected in the relation between the decision making process and escalation of commitment, it was not found. The results indicate there is a direct negative relation between trust and escalation of commitment. Gao et al. (2011) found that employees who trust their manager are more likely to voice their opinions and suggestions, furthermore they may challenge the status quo and established beliefs. The results of this current study relate to these findings, by indicating that a team with intra-group trust, is more likely to step up and challenge the established beliefs, thereby de-escalating commitment. Future research is necessary to investigate the causality of this relation. Prior research has proven the worth of trust. It is not uncommon for employees to take task or process conflicts personally and misinterpret it for a relationship conflict (De Wit et al., 2013; Jehn & Bendersky, 2003). This misinterpretation is proved to be lower in groups with higher levels of intra-group trust, thus companies are able to reap the benefits of task conflict with an appropriate basis of intra-group trust (Simons & Peterson, 2000). A similar study pointed at the positive interaction effect of cognition-based trust in the relation between task conflict and decision quality (Parayitam & Dooley, 2009). Finally, “Trust among members encourage them to explore ideas, communicate openly, and concentrate on a task” (Parayitam & Dooley, 2007: pp 44).

**Task conflict**

Contrary to expectations, task conflict was positively related to escalation of commitment, such that high levels of task conflict are related to high levels of escalation -the undesirable situation. In what way differs this escalation of commitment situation from ordinary situations that can cause a negative relationship? To provide a possible answer to this question we turn to the decision making task, since Jehn and Bendersky (2003) opted that other factors might influence the effect of task conflict on performance. During these sessions, the teams experiencing task conflicts seemed to experience more difficulties to empathize themselves with their role in the decision making task. These role difficulties seemed to result in lower group confidence. It might be due to this lack of confidence that the team could not benefit of the task conflicts but instead escalated their commitment. Escalation of commitment was found to be a consequence of the lower confidence (Moon, 2003). Moon (2003) also found that group decisions are affected depending on whether or not there was individual consideration of the problem before meeting as a group. Groups who had prior consideration were less confident in their decisions (Moon, 2013). However, this seems unlikely to be at play here, since each group was treated similarly regarding the information they received prior to the meeting.

Another possibility could be that relationship conflicts explain these findings. A combination of high relationship- and task conflict is related to bad performance and lowered team member motivation (e.g. De Dreu & Weingart, 2003; De Wit et al., 2012; Shaw et al., 2011). However, relationship conflict was not measured in the survey, all that can be said from the observations and interviews is that there is no reason to believe that relationship conflicts play a role in the teams that participated in these sessions. For the other teams in the sample I have no information.
The interviews contradicted the survey and decision making task data in that interviewees stated that task conflicts would be beneficial for their group. In an attempt to find a reason for these contradictory results between the interview data, and the survey and decision making task data post hoc analyses were conducted. Firstly, intra-group trust played an important role in discussions and conflict situations (De Wit et al., 2013; Jehn & Bendersky, 2003), companies are able to reap the benefits of task conflict with an appropriate basis of intra-group trust (Simons & Peterson, 2000). Whether trust issues play a role is tested in a post-hoc analysis where trust and task conflict were added to the baseline model, but without significant results. Secondly, Weingart et al. (in press) opt for a mediating effect of information acquisition in the task conflict-decision making relation. This effect was tested in a post hoc analysis with escalation as a dependent variable, unfortunately the effect was not found. Thus a direct effect of trust and a moderating effect of information acquisition do not explain the contradictory results.

An alternative explanation could lie in a difference between perception and actual expressions of task conflicts (Weingart et al., in press). As an observer, I clearly identified the team having task conflicts in the decision making task. These task conflicts originated from the lack of confidence of the team members during the decision making task. In the interviews, participants only stated they experienced difficulties to emphasize themselves with their role in the decision making task. In short, teams did not perceive but did express task conflicts. Possibly this bias also played up with the survey measurement.

Shared leadership

There are grounds to believe that shared leadership moderates the relation between participation in decision making and escalation of commitment since a significant effect (at p<.10) was found within this small sample. For teams with shared leadership, participation in decision making had a positive relationship with escalation of commitment. These teams benefit from a relatively centralized decision making process in which one individual makes the decisions. On the other hand, the relationship between participation in decision making and escalation of commitment was negative for teams with relatively little shared leadership. These teams benefit from a participative decision making process. In this way it seems that one way or another, teams need to have one individual who takes the lead sooner or later, or a decentralization of power in some way.

As for the remainder of the survey results regarding shared leadership, the absence of significant findings could be related to the measurement and calculation of shared leadership. Shared leadership was measured using survey-items developed by Hoch, Pearce and Welzel (2010), this measurement comprised four constructs that needed to be grouped to one. However, the authors fail to describe how to combine these four factors into one shared leadership factor. Possibly, another calculation as used in this study would have been more appropriate. One such example is to force the survey items into one factor in the factor analysis, something I tried but which resulted in various objections from a statistical perspective (e.g. too little variance retained from the original items).
6.2 Discussion of EMC-specific results

From these general results we now turn to the discussion of the results that are specific for EMC. This discussion is mainly build on the interview and decision making task data.

Contrary to the survey-results, the interviews do state the importance of information acquisition for project teams of EMC. During sales price quotation of projects it happens that there is no clear indication of costs or lead time of certain components, making it hard or impossible to make a grounded choice. Although these issues are solved with some creativity when they occur, it should be easier to find this information when necessary. Especially since employees recognize the importance of putting the project on the right track during early stages of the project. Particularly the systems architect plays an important role in the early stages of a project, for example to ensure a reliable project quotation. Projects that are properly started, with the right documentation in place, flow through the process more smoothly according to the project leaders.

Engineers seem to escalate their own commitment when they choose to walk a specific path. There is some sort of hurdle which prevents engineers from asking for help. The most important factor is hard to pinpoint, but it seems to be related to trust, stubbornness and saving face. The hurdle relates to the organization not helping the engineers out when they need it. Multiple employees stated that some projects require expertise not present at EMC. In some of these projects, employees requested help from an expert (e.g. external consultancy). Unfortunately, the request was rejected or left in a drawer somewhere. The result of this ‘policy’ is twofold, firstly the project runs out of control since the engineers do not have the competencies to efficiently execute their tasks. Secondly, employees are less likely to ask for help in the future, since their voice is not heard (Baron & Galizio, 2005).

Besides trust, a mix of self-justification and saving face seems another important aspect of why engineers do not ask for help. Prior studies identified decision makers who want to save face to their environment (Keil, 1995; Ross & Staw, 1986; Ross & Staw, 1993) and therefore did not alter their decision. According to the self-justification theory, people will pursue a failing course of action because they do not want to admit to themselves that initiating the action was a mistake (Greitemeyer et al., 2009). Particularly self-justification is seen as one of the most important factors in escalation situations (Sleesman et al., 2012). Face saving and self-justification could have the effect that prevents the decision maker to ask for help.

Another reason why employees do not ask for help is related to not knowing who to turn to. Currently, a competency matrix should help employees to find the right person. However, employees are concerned the matrix is not up-to-date and furthermore do not even know where to find it. Engineers are in search of knowledge to solve their specific issue at hand, and therefore need to identify the person who is able to provide that knowledge. Experts can understand and decide quickly and come up with the correct decisions for routine problems (Campitelli & Gobet, 2010). When they know who to turn to and indeed call in for help, their problem is more often than not solved, putting the project back on track.
6.3 Limitations and future research

This section addresses the limitations of this study and provides directions for future studies. As with any cross-sectional study, this study cannot assess the causality of the relationships. Although the interviews generally provided reason to believe that escalation of commitment is the effect of the variables under study, it is not completely certain. There are two interesting directions for a longitudinal design in particular. Firstly a lack of expertise localization seemed to fuel escalation of commitment by inhibiting individuals from solving problems they encountered during execution of their tasks. If these issues remain unsolved for too long, they could become a problem for the group and may eventually result in escalation of commitment. Thus, future research could focus on the potential effect of problem solving issues and expertise localization on escalation of commitment levels of the project team they are part of. A second interesting direction for a longitudinal study is the relation between task conflict, confusion and escalation of commitment. The decision making task showed that teams with confusion on roles, indicators etc. expressed more task conflicts and escalated commitment. It would be interesting to see whether it is task conflict or the confusion that triggers these escalation of commitment outcomes. Task conflicts are generally seen as beneficial for decision making performance (e.g. De Wit et al., 2012). Would task conflicts indeed trigger escalation of commitment, then task conflict could both increase and decrease decision making outcomes.

A second limitation of this study is its sample size, with only 30 complete teams in the sample it was hard to find any significant results. Hair et al. (2010) state a required minimum sample size of 50 but preferably 100 observations for a simple regression, where the minimum ratio of observations to variables is 5:1 but preferably 20:1. In this study, the simplest model included six variables, fulfilling the conditions of the 5:1 ratio. Most models however, violated these sample size considerations. Future research could conduct a study with an increased sample size, which could result in finding more relationships for the hypothesis of this study, furthermore it would increase the reliability of the results.

Also, the ICC and $R_{wg}$ scores showed that aggregation from individual level data to group level data was not fully supported from a statistical point of view. The constructs used in this study are widely applied in group research and all questions were formulated to address group tendencies. Still, the results of this study should be used with caution since the $R_{wg}$ scores indicate that team members had some differences of opinion on the aggregated constructs.

A specific methodological limitation of this study is the measurement of the knowledge acquisition and shared leadership variables. Factor analysis of knowledge acquisition resulted in $\alpha = 0.57$. For shared leadership, it was uncertain how to combine the four underlying constructs into one. Similarly, the escalation of commitment variable used in this study was comprised from multiple scales since field studies on escalation of commitment are rare (e.g. Mahlendorf, 2013; Turino & Soetjipto, 2012). Future research could address these issue by applying other measurement instruments for shared leadership and knowledge acquisition. As for the escalation of commitment variable, creating a reliable measurement instrument for escalation tendencies of teams or individuals would enable researchers to conduct the highly needed field studies to escalation of commitment (e.g. Mahlendorf, 2013).
This study failed to identify teams low on shared leadership. Another limitation of the sample was the legal obligation to deliver. Some of the participating teams had a legal obligation to deliver the product while it is already sold to a customer. Thereby these teams were bound to a course of action. Future studies could focus on other types of teams or industries to deal with these issues by identifying teams low on shared leadership and teams who really have a choice to abandon a project.

As described in the methodology, the interview results are not processed in a way that ensures complete objectivity. The researcher served as a rater as well. Despite the possible bias introduced due to this methodology, the data obtained from the interviews is of great value for this research. Future research could ensure objectivity by assigning independent raters who do not know the research objectives.

Finally, group size was an important factor in this study. Groups outperform individual decision-makers (Mojzisch & Schulz-Hardt, 2011), and this study found that large groups outperform small groups in escalation scenarios. Studies could focus on finding how many group members is optimal and why in light of escalation of commitment. Possibly it has something to do with the length of discussions in the larger teams. It is likely that those teams need more time to come to an agreement and thereby make a more deliberate choice. Whether or not this is the true could be studied in future research.
Chapter 7
Managerial recommendations

From this study, a number of recommendations can be made which aid in the prevention or control of escalation of commitment. Firstly recommendations for new product development teams in general are discussed. These recommendations cover the role of information elaboration, task conflicts, trust and shared leadership in escalation of commitment situations. Secondly EMC specific recommendations are presented. These recommendations cover three general subjects, first of which is to role clarity regarding functions on the project team. The second subject is the hurdle that prevents engineers from de-escalating their commitment. Thirdly, engineers should be facilitated in their search for expertise.

7.1 General recommendations for new product development teams

By now it is clear that escalation of commitment is unwanted in new product development teams or any other team for that matter. By means to curb escalation of commitment, information elaboration could serve an important role. In today’s organizations, success depends on effectively integrating the knowledge of skilled professionals (Bergman et al., 2012). Prior research found that teams that communicate effectively benefit from improved performance (Jeffery et al., 2005; Mohammed et al., 2000). Although causality could not be tested in this study, it is fairly safe to state that team members should be facilitated to share information with one another in order to reduce escalation tendencies.

The role of task conflict is more ambiguous, making it hard and risky to provide guidance to managers. Generally, studies have found that task conflicts can result in beneficial situations. One of these findings is that groups experiencing task conflict make better decisions (De Wit et al., 2012; Pelled et al., 1999). Our survey results contradict with the findings of the previously mentioned studies, since task conflict was positively related to escalation of commitment. The decision making task pointed out that task conflict might not have been the true cause of escalation of commitment. Therefore, the role of task conflict in escalation of commitment situations remains ambiguous. As a result, there is not enough ground to provide managers with recommendations on how to deal with task conflicts in light of escalation of commitment.

Intra-group trust plays an important role in discussions and conflict situations (De Wit et al., 2013; Jehn & Bendersky, 2003). This study found that trust also plays an important role in escalation of commitment situations. Although prior research found situations in which team performance suffered due to high levels of trust (Langfred, 2004), this study did not find such effects. Based on these results, I recommend organizations to create an environment that encourages team members to trust one another.

Finally, this study found a relationship between combined effects of participation in decision making and shared leadership in their relationship with escalation of commitment. In terms of escalation of commitment, teams who have a participative decision making process benefit from a centralized leader. On the other side, teams who have a centralized decision maker, benefit from shared leadership roles. Therefore, I recommend organizations to structure their new product development teams in such way that they always have a combination of one shared and one centralized aspect (e.g. shared leadership with centralized decision making or a one leadership role with participative decision making).
7.2 EMC specific recommendations

Following these recommendations for new product development teams in general are the EMC specific recommendations.

Providing role clarity

EMC structures its projects by assigning a project leader, systems architect and account manager at the start. Later, at the start of project execution the systems architect takes a step back and is replaced by a lead-engineer. These cooperating leadership roles hold great potential in theory. However, it is striking to hear that only a few employees knew the differences between systems architects and lead-engineers, the distinction of who holds what responsibilities during which phase needs to be clarified. The following points should be addressed to clarify all issues encountered in the interviews to benefit more from the team structure:

- During the starting stages of projects, no matter how big or small, a systems architect should draw the big picture and put the project on the right track. Since projects that have started without proper quotation and project planning seem the ones who get out of control. An architect and project leader should closely cooperate to define what type of project it is, make a reliable sales price quotation and sketch the big picture and project planning. From there, the architect can move to his advisory role, and only step back in when problems arise. Day-to-day operations can be monitored by the lead-engineer under supervision of the project manager.
- During project execution, the lead engineer can fulfill an important role since he/she can closely relate to the engineers, is able to ask in-depth questions and come up with solutions on the spot. With this, engineers who got stuck and do not make progress can be timely identified. But it is not the sole responsibility of the lead-engineer to identify if colleagues got stuck on their tasks, also the project leader and team leader should keep their eyes open and ask for regular updates when talking to their engineers.
- By clearly assigning an architect or lead engineer, major design choices could be made by them rather than by engineers themselves. With that structure, it is likely engineers more easily de-escalate commitment, since they did not initiate the course of action themselves. This is in line with the survey findings in which teams with shared leadership roles benefit from centralized decision making.

Lower hurdles

Currently, employees who blow the whistle when they identify problems, are frequently left on their own or even ignored by upper management. In order to lower the hurdle which inhibits de-escalation of commitment the organization should make sure that if an engineer asks for help, he gets a positive reinforcement in some way. People make decisions in favor of their egocentric position (Chakravorty, 2009). If continuing a failing course of action is favorable for the decision maker in any way, he/she is more likely to escalate commitment (Chakravorty, 2009).

- In order to decrease negative effects of an engineer who is not able to execute a task assigned to him or her (e.g. a task not in line with the field of expertise of the engineer), I once more state the importance of asking questions by the project leader, lead engineer and system architect. The sooner the issue is identified, the easier it is to solve.
- When an engineer admits he or she cannot solve an issue him- or herself, make sure to be glad with the information even if it is very bad news. By reacting positively instead of negatively the chance grows instead of shrinks (Baron & Galizio, 2005) that this engineer de-escalates commitment in future instances.

- If external expertise is asked for and truly needed, than provide that help. Multiple employees stated that there were instances in which there was a lack of expertise, but that there exists a cultural rule that the organization can solve every issue without external help, causing unnecessary delays. Verify at the start of projects whether all necessary expertise is present within the organization and take action accordingly. If there is no need for additional expertise, provide internal expertise to solve the issue, but don’t leave the request unanswered. Engineers and project leaders should be rewarded for taking the hurdle in order for them to take it again in future instances.

**Expertise localization**

Another issue for EMC-engineers in their search for expertise is identifying the experts. Engineers should be facilitated in their search for expertise. At this moment there is a competency matrix in which engineers should be able to find the expertise they need. Multiple employees stated not to know who holds what expertise, and do not know where the competence-matrix can be found. Furthermore they are not sure when it was last updated.

A simple e-mail or memo containing a catalog and short description could point employees on the various information systems that are available to them. However, employees stated they were in need of an easier way to find knowledge, they want to pick up the phone and call the right person. There are numerous possibilities to serve these needs, and there is not one right way. Examples of possibilities are:

- Appoint a technology owner who keeps in touch with the engineers related to the technology of his or her responsibility. This technology owner can serve as a hub to bring engineers in need of expertise, in contact with engineers who have the knowledge.
- Encourage engineers to work at a different site from time to time, or conduct some sort of team-building exercise. Both serve the purpose to introduce engineers of the different sites to one another.

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1 Similarly, there are multiple tools available with available components and to lesser extent, lead times and product costs which are not known to employees. For quotation purposes it is important that all information is available and people know where to find it.
Chapter 8
Conclusion

Research on escalation of commitment has had a focus on the project and psychological antecedents at the expense of social and structural antecedents (Mahlendorf, 2013; Patzelt et al., 2011; Sleesman et al., 2012). Field studies on escalation of commitment are rare (e.g. Mahlendorf, 2013; Turino & Soetjipto, 2012) which causes some authors to urge the need to find new ways to study escalation with field-study designs (Sleesman et al., 2012). This research aimed to fill the methodological gap by conducting a field-study on group decision making and tried to unravel some of the social group processes related to escalation of commitment by applying a multitude of methodologies.

The decision making tasks outcome was similar to the escalation of commitment score of the survey data. Nevertheless, the statistical analyses of the survey data did not yield the expected results, only the information elaboration-escalation of commitment relation was positive and significant as expected. The interviews revealed important additional insights. Information elaboration, knowledge acquisition, trust, and particularly shared leadership and expertise localization serve important mechanisms through which escalation of commitment potentially can be controlled. The role of task conflict remains unclear since the survey did not yield results and the additional information sketches an ambiguous picture.

As for the decision making process as employed by EMC: their strength lies in the structured approach of executing projects. By assigning a systems architect, project manager and account manager to nearly every project, projects are set on the right track right from the start. From there, the group structure with a lead-engineer and project leader has the potential to identify escalation of commitment in an early stage. However, simultaneously this is a weakness at this point in time, since only a few people know the real difference between system architects and lead engineers. This distinction is quite easily clarified, and can yield a great return on a small investment of time.
Bibliography


Appendix A

Measures as included in the survey

Despite the original questionnaires might have applied another scale, the current study applied a 5-point Likert scale for all items. Below are all the questions as included in the survey.

Dependent variables

*Escalation of commitment (1)* is measured by combining the likelihood of product failure with commitment to a new product and the continuation intention and are measured on a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree. Likelihood of product failure is measured using four items (Schmidt & Calantone, 2002):

1. Our team believes that this new product will fail to meet the hurdle rates set by management
2. Our team believes that this new product will be successful
3. Ultimately, our team believes that this new product will contribute negatively to our annual performance rating
4. The performance of this new product will help our careers

Commitment to a new product (Schmidt & Calantone, 2002):

5. We are committed to this new product
6. We would feel guilty if we stopped funding this new product development project
7. We will stick with this new product no matter what problems are encountered
8. We feel a sense of loyalty to this new product

Continuation intention is measured with a scale ranging from 1 = very unlikely to 5 = very likely agree (Schmidt & Calantone, 2002):

9. How likely is it that this team would authorize the funds necessary to complete the next phase of this product’s development?

*Escalation of commitment (2)* adopts three questions (Q10, 11 and 12) from Mahlendorf (2013), supplemented with two self-constructed questions.

10. We sometimes doubt that this project continues too long
11. We sometimes doubt that this project is insisted for too long
12. We sometimes believe that this project should be terminated
13. We sometimes doubt that this project will be profitable
14. The estimated profits of this project based on today’s expectations indicate that this project will turn out highly profitable

*Decision making quality* is measured using six items on a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree adopted from Dooley & Fryxell (1999). The items are:

15. Our decisions are based on the best available information
16. Our decisions are made based on valid assumptions
17. Our decisions help this company achieve its objectives
18. Our decisions make sense in light of this company’s current financial situation
19. Our decisions are consistent with this company’s current strategy
20. Our decisions contribute to the overall effectiveness of this company
Independent variables

Knowledge acquisition is adopted from Kim and Lee (2010). It contains three items to be answered from 1 = strongly disagree to 5 = strongly agree:

21. Our team invests time and endeavor to seek external information and knowledge, such as news, index, trend, or policy issue reports related to the work
22. Our team actively uses various sorts of databases within my organization to acquire knowledge
23. Our team acquires knowledge through best practice or benchmarking within or outside our organization

Knowledge sharing is operationalized using information elaboration, the items are adopted from Homan et al. (2007) and are measured using a 5-point scale ranging from 1 = totally not applicable to 5 = totally applicable:

24. Our team exchanges a lot of information about the task
25. Our team often says things about the task that make me think
26. In our team, we discuss the content of our work a lot
27. In our team, we often talk about our ideas about the task
28. Our team often says things that lead me to learn something new about the job
29. My team members often say things that lead me to new ideas
30. I often think deeply about what other group members say about the job

Making the final decision is operationalized using participation in decision making, the items are adopted from Campion et al. (1993), and are measured on a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree:

31. As a member of this team, team members have a real say in how the team carries out its work
32. Most members of my team get a chance to participate in decision making
33. My team is designed to let everyone participate in decision making

Moderating variables

Expertise localization is measured using items adopted from Faraj and Sproull (2000) and are measured using a 5-point scale ranging from 1 = to a very small extent to 5 = to a very large extent:

34. This team has a good “map” of each others’ talents and skills
35. Team members are assigned to tasks commensurate with their task-relevant knowledge and skill
36. Team members know what task-related skills and knowledge they each possess
37. Team members know who on the team has specialized skills and knowledge that is relevant to their work

Task conflict is measured using the scale as described by Jehn (1995), with four items measured on a 5-point scale ranging from 1 = none to 5 = a lot. Items for task conflict:

38. How often do people in your team disagree about opinions regarding the work being done?
39. How frequently are there conflicts about ideas in your team?
40. How much conflict about the work you do is there in your team?
41. To what extent are there differences of opinion in your team?

Trust is measured using items as described by Simons and Peterson (2000), who used five items to be answered on a 7-point scale ranging from 1 = never to 5 = always. The items are:

42. We absolutely respect each other’s competence
43. Every team member shows absolute integrity
44. We expect the complete truth from each other
45. We are all certain that we can fully trust each other
46. We count on each other to fully live up to our word

*Shared leadership* is measured using eighteen items adopted from Hoch (2013). The items are measured on a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree. The items are:

**Transformational leadership:**
47. My team members provide a clear vision of whom and what our team is
48. My team members are driven by higher purposes or ideals
49. My team members show enthusiasm for my efforts
50. My team members encourage me to rethink ideas which had never been questioned before
51. My team members seek a broad range of perspectives when solving problems
52. My team members encourage me to go above and beyond what is normally (e.g., extra effort)

**Individual empowering leadership:**
53. My team members encourage me to search for solutions to my problems without supervision
54. My team members urge me to assume responsibilities on my own
55. My team members encourage me to learn new things
56. My team members encourage me to give myself a pat on the back when I meet a new challenge

**Team empowering leadership:**
57. My team members encourage me to work together with other individuals who are part of the team
58. My team members advise me to coordinate my efforts with the others, who are part of the team
59. My team members urge me to work as a team with the others, who are part of the team
60. My team members expect that the collaboration with the other members in the team works well

**Participative leadership:**
61. My team members decide on my performance goals together with me
62. My team members and I work together to decide what my performance goals should be
63. My team members and I sit down together and reach agreement on my performance goals
64. My team members work with me to develop my performance goals
Appendix B

Data examination and transformation

After importing the data, the first step in the process is to anonimise the data by deleting e-mail addresses of respondents as well as company and project names. Thereafter 14 incomplete cases out of the total sample of 112 are removed. These are the cases in which the respondents started their response without finishing it. Deletion is justified for two reasons: firstly, there is a response pattern that shows respondents did not answer the last questions truthfully (i.e. one strait line across multiple distinct items). Secondly, “cases with missing data for dependent variable(s) typically are deleted to avoid any artificial increase in relationships with independent variables” (Hair et al., 2010: pp 48), since the dependent variables were among the last questions, the dependent variables are not measured for these 12 respondents. The remaining variables do not contain missing values, thus a missing value analysis is inappropriate. Following the missing value analysis is the detection of outliers. However, none of the cases identified as outliers since all observations fall within the ordinary range of observations.

Report of Factor Analyses

To prepare the data for the analysis, the next step is to run factor analyses on the data. Due to the large number of constructs relative to the sample size, five separate factor analyses are conducted. These analyses are conducted on multiple related constructs simultaneously (e.g. all questions related to dependent variables in one analysis). Table B.1 contains the results of the factor analyses, the following sections report more detailed results, in these reports all factor loadings under 0.35 are repressed for readability purposes.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Eigenvalue</th>
<th>% of variance</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge acquisition</td>
<td>1,591</td>
<td>22,730</td>
<td>0,573</td>
</tr>
<tr>
<td>Information elaboration</td>
<td>2,730</td>
<td>39,006</td>
<td>0,823</td>
</tr>
<tr>
<td>Making final decision</td>
<td>1,705</td>
<td>24,362</td>
<td>0,847</td>
</tr>
<tr>
<td>Expertise localization</td>
<td>3,466</td>
<td>49,511</td>
<td>0,861</td>
</tr>
<tr>
<td>Task conflict</td>
<td>2,877</td>
<td>41,105</td>
<td>0,750</td>
</tr>
<tr>
<td>Trust</td>
<td>1,716</td>
<td>24,515</td>
<td>0,809</td>
</tr>
<tr>
<td>Individual empowering leadership (Shared leadership)</td>
<td>6,697</td>
<td>39,395</td>
<td>0,863</td>
</tr>
<tr>
<td>Transformational leadership, (Shared leadership)</td>
<td>2,161</td>
<td>12,715</td>
<td>0,802</td>
</tr>
<tr>
<td>Participative leadership, (Shared leadership)</td>
<td>1,454</td>
<td>8,666</td>
<td>0,936</td>
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<td>Team empowering leadership, (Shared leadership)</td>
<td>1,328</td>
<td>7,812</td>
<td>0,787</td>
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<td>Escalation of Commitment</td>
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<td>0,854</td>
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<tr>
<td>Decision making quality</td>
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<td>15,464</td>
<td>0,829</td>
</tr>
<tr>
<td>Commitment to product</td>
<td>1,701</td>
<td>10,005</td>
<td>0,809</td>
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<td>Profitability</td>
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<td>0,667</td>
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<td>Decision making justification</td>
<td>1,073</td>
<td>6,311</td>
<td>0,569</td>
</tr>
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</table>

Table B.1: Results factor analyses
Knowledge exchange and information acquisition

For the first two variables, component 1 represents information elaboration (α=0,573) and component 2 knowledge acquisition (α=0,823). A principal components analysis with oblique rotation was conducted on 10 items. However, one of the items of Knowledge exchange had an individual Kaiser-Meyer-Olkin (KMO) measure < 0,50. Field (2009) states an individual KMO-value < 0,50 is reason for deletion. This still led to unsatisfactory results since all indicators pointed at a three-component solution where two were expected. After some iterations and based on visual inspection the questions of this third component were excluded and the previously excluded factor was included again. Exclusion of three items loading on the third component are justified by their content since they more relate to integration of task-relevant information and perspectives rather than purely the sharing of knowledge. The final solution is presented below, attempts to raise the Cronbach’s Alpha of knowledge exchange have failed to deliver a better solution.

**KMO and Bartlett’s Test**

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | .682 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 211,630 |
| df | 21 |
| Sig. | .000 |

**Total Variance Explained**

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Rotation Sums of Squared Loadings&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1: Information elaboration</td>
<td>2,730</td>
<td>39,006</td>
</tr>
<tr>
<td>2: Knowledge Acquisition</td>
<td>1,591</td>
<td>22,730</td>
</tr>
<tr>
<td>3</td>
<td>.806</td>
<td>11,508</td>
</tr>
<tr>
<td>4</td>
<td>.736</td>
<td>10,517</td>
</tr>
<tr>
<td>5</td>
<td>.570</td>
<td>8,139</td>
</tr>
<tr>
<td>6</td>
<td>.378</td>
<td>5,401</td>
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<tr>
<td>7</td>
<td>.189</td>
<td>2,698</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.
Our team invests time and endeavor to seek external information and knowledge, such as news, index, trend, or policy issue reports related to the work.

Our team actively uses various sorts of databases within my organization to acquire knowledge.

Our team acquires knowledge through best practice or benchmarking within or outside our organization.

Our team exchanges a lot of information about the task.

Our team often says things about the task that make me think.

In our team, we discuss the content of our work a lot.

In our team, we often talk about our ideas about the task.

<table>
<thead>
<tr>
<th>Pattern Matrix(^a)</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Our team invests time and endeavor to seek external information and knowledge, such as news, index, trend, or policy issue reports related to the work.</td>
<td>0.679</td>
</tr>
<tr>
<td>Our team actively uses various sorts of databases within my organization to acquire knowledge.</td>
<td>0.798</td>
</tr>
<tr>
<td>Our team acquires knowledge through best practice or benchmarking within or outside our organization.</td>
<td>0.712</td>
</tr>
<tr>
<td>Our team exchanges a lot of information about the task.</td>
<td>0.755</td>
</tr>
<tr>
<td>Our team often says things about the task that make me think.</td>
<td>0.685</td>
</tr>
<tr>
<td>In our team, we discuss the content of our work a lot.</td>
<td>0.892</td>
</tr>
<tr>
<td>In our team, we often talk about our ideas about the task.</td>
<td>0.878</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 3 iterations.
Participation in decision making and expertise localization

For these variables, component 1 represents participation in decision making ($\alpha=0.847$) and component 2 expertise localization ($\alpha=0.861$). A principal components analysis with oblique rotation was conducted on 7 items. The solution is presented below.

### KMO and Bartlett's Test

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | .795 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 336,751 |
| df | 21 |
| Sig. | .000 |

### Total Variance Explained

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Rotation Sums of Squared Loadings$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1: Participation in decision making</td>
<td>3,466</td>
<td>49,511</td>
</tr>
<tr>
<td>2: Expertise localization</td>
<td>1,705</td>
<td>24,362</td>
</tr>
<tr>
<td>3</td>
<td>.583</td>
<td>8,332</td>
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<td>4</td>
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<td>.348</td>
<td>4,970</td>
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<tr>
<td>6</td>
<td>.273</td>
<td>3,894</td>
</tr>
<tr>
<td>7</td>
<td>.198</td>
<td>2,825</td>
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</table>

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

### Pattern Matrix$^a$

<table>
<thead>
<tr>
<th>Component $^a$</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>As a member of this team, team members have a real say in how the team carries out its work.</td>
<td>.863</td>
<td></td>
</tr>
<tr>
<td>Most members of my team get a chance to participate in decision making.</td>
<td>.878</td>
<td></td>
</tr>
<tr>
<td>My team is designed to let everyone participate in decision making.</td>
<td>.881</td>
<td></td>
</tr>
<tr>
<td>This team has a good view on each others’ talents and skills.</td>
<td>.775</td>
<td></td>
</tr>
<tr>
<td>Team members are assigned to tasks commensurate with their task-relevant knowledge and skill.</td>
<td>.776</td>
<td></td>
</tr>
<tr>
<td>Team members know what task-related skills and knowledge they each possess.</td>
<td>.924</td>
<td></td>
</tr>
<tr>
<td>Team members know who on the team has specialized skills and knowledge that is relevant to their work.</td>
<td>.897</td>
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</tbody>
</table>

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 4 iterations.
Trust and Task conflict
Component 1 represents trust ($\alpha=0,809$) and component 2 task conflict ($\alpha=0,750$). A principal components analysis with oblique rotation was conducted on 9 items. However, this leads to a solution in with 58% of nonredundant residuals with absolute values greater than 0,05 where the cut-off value is 50% (Field, 2009). After some iterations the final solution excludes one item of trust and one item of task conflict. The final solution is presented below.

### KMO and Bartlett’s Test

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | .730 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 211,470 |
| df | 21 |
| Sig. | .000 |

### Total Variance Explained

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Rotation Sums of Squared Loadings$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1: Trust</td>
<td>2,877</td>
<td>41,105</td>
</tr>
<tr>
<td>2: Task Conflict</td>
<td>1,716</td>
<td>24,515</td>
</tr>
<tr>
<td>3</td>
<td>.672</td>
<td>9,598</td>
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<td>7</td>
<td>.302</td>
<td>4,320</td>
</tr>
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</table>

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

### Pattern Matrix$^a$

<table>
<thead>
<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>We absolutely respect each others competence.</td>
<td>.816</td>
<td></td>
</tr>
<tr>
<td>Every team member shows absolute integrity.</td>
<td>.833</td>
<td></td>
</tr>
<tr>
<td>We are all certain that we can fully trust each other.</td>
<td>.734</td>
<td></td>
</tr>
<tr>
<td>We count on each other to fully live up to our word.</td>
<td>.804</td>
<td></td>
</tr>
<tr>
<td>How often do people in your team disagree about opinions regarding the work being done?</td>
<td>.752</td>
<td></td>
</tr>
<tr>
<td>How frequently are there conflicts about ideas in your team?</td>
<td>.895</td>
<td></td>
</tr>
<tr>
<td>How much conflict about the work you do is there in your team?</td>
<td>.810</td>
<td></td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 3 iterations.
Shared leadership items
These components represent the shared leadership items. When including all items, the determinant < 0.00001 indicating a problem in multicollinearity. By excluding an item of the transformational leadership construct this problem is eliminated. This leads to the expected four-component solution in which the following components represent the following constructs:

Component 1  Individual empowering leadership  (α = 0.863)
Component 2  Transformational leadership  (α = 0.802)
Component 3  Participative leadership  (α = 0.936)
Component 4  Team empowering leadership  (α = 0.787)

The final solution of the factor analysis is presented below. The items for this scale are adopted from (Hoch, 2013). For the analyses these four components need to be merged into one. Unfortunately, the author does not explain their original calculation. After some deliberation the choice has been made to simply take the mean of the four components to represent shared leadership. The reasoning for this choice is that with higher levels of one or more of these components, come higher levels of shared leadership.

<table>
<thead>
<tr>
<th>KMO and Bartlett’s Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</td>
</tr>
<tr>
<td>Bartlett’s Test of Sphericity</td>
</tr>
<tr>
<td>df</td>
</tr>
<tr>
<td>Sig.</td>
</tr>
<tr>
<td>Component</td>
</tr>
<tr>
<td>------------------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1: Individual empowering leadership</td>
</tr>
<tr>
<td>2: Transformational leadership</td>
</tr>
<tr>
<td>3: Participative leadership</td>
</tr>
<tr>
<td>4: Team empowering leadership</td>
</tr>
<tr>
<td>5</td>
</tr>
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<td>6</td>
</tr>
<tr>
<td>7</td>
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<tr>
<td>16</td>
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<tr>
<td>17</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

<sup>a</sup> When components are correlated, sums of squared loadings cannot be added to obtain a total variance.
My team members have a clear vision of whom and what our team is.  .783
My team members are driven by higher purposes or ideals.  .814
My team members show enthusiasm for my efforts.  .713
My team members encourage me to rethink ideas which had never been questioned before.  .669
My team members seek a broad range of perspectives when solving problems.  .676
My team members encourage me to search for solutions to my problems without supervision.  .706
My team members urge me to assume responsibilities on my own.  .822
My team members encourage me to learn new things.  .574
My team members encourage me to give myself a pat on the back when I meet a new challenge.  .749
My team members encourage me to work together with other individuals who are part of the team.  .472  .634
My team members advise me to coordinate my efforts with the others, who are part of the team.  .609  .466
My team members urge me to work as a team with the others, who are part of the team.  .589
My team members expect that the collaboration with the other members in the team works well.  .811
My team members decide on my performance goals together with me.  .831
My team members and I work together to decide what my performance goals should be.  .968
My team members and I sit down together and reach agreement on my performance goals.  .951
My team members work with me to develop my performance goals.  .858

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 10 iterations.
Dependent variables
This study includes multiple measures in an attempt to grasp the concept of escalation of commitment. Since some of the questions in these scales are closely related, they are all covered in one factor analysis. When including all items this leads to a solution in which some items load on another component as initially expected. On visual inspection, the questions of the new components are highly related. Therefore it seems justified to retain this solution which is presented below in which the following components represent the following constructs:

Component 1  Escalation of commitment  (α = 0.854)
Component 2  Decision making quality  (α = 0.829)
Component 3  Commitment to product  (α = 0.809)
Component 4  Profitability  (α = 0.667)
Component 5  Decision making justification  (α = 0.569)

KMO and Bartlett’s Test

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | .758 |
| Bartlett’s Test of Sphericity | Approx. Chi-Square | 848.535 |
| df | 136 |
| Sig. | .000 |

Total Variance Explained

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Rotation Sums of Squared Loadings^a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1: Escalation of commitment</td>
<td>5,495</td>
<td>32.323</td>
</tr>
<tr>
<td>2: Decision making quality</td>
<td>2,629</td>
<td>15.464</td>
</tr>
<tr>
<td>3: Commitment to product</td>
<td>1,701</td>
<td>10.005</td>
</tr>
<tr>
<td>4: Profitability</td>
<td>1,188</td>
<td>6.986</td>
</tr>
<tr>
<td>5: Decision making justification</td>
<td>1,073</td>
<td>6.311</td>
</tr>
<tr>
<td>6</td>
<td>.803</td>
<td>4.722</td>
</tr>
<tr>
<td>7</td>
<td>.762</td>
<td>4.482</td>
</tr>
<tr>
<td>8</td>
<td>.665</td>
<td>3.913</td>
</tr>
<tr>
<td>9</td>
<td>.495</td>
<td>2.913</td>
</tr>
<tr>
<td>10</td>
<td>.446</td>
<td>2.624</td>
</tr>
<tr>
<td>11</td>
<td>.415</td>
<td>2.444</td>
</tr>
<tr>
<td>12</td>
<td>.335</td>
<td>1.972</td>
</tr>
<tr>
<td>13</td>
<td>.306</td>
<td>1.800</td>
</tr>
<tr>
<td>14</td>
<td>.222</td>
<td>1.307</td>
</tr>
<tr>
<td>15</td>
<td>.207</td>
<td>1.220</td>
</tr>
<tr>
<td>16</td>
<td>.164</td>
<td>.965</td>
</tr>
<tr>
<td>17</td>
<td>.094</td>
<td>.550</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

^a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.
### Pattern Matrix

<table>
<thead>
<tr>
<th>Statement</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
<th>Component 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>We sometimes doubt that this project is insisted for too long.</td>
<td>-.938</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We sometimes doubt that this project continues too long.</td>
<td>-.926</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We sometimes believe that this project should be terminated.</td>
<td>-.709</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We sometimes doubt that this project will be profitable.</td>
<td>-.644</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our team believes that this new product will fail to meet the hurdle rates set by management.</td>
<td>-.520</td>
<td>-.382</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our decisions are consistent with this company's current strategy.</td>
<td></td>
<td>.917</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our decisions contribute to the overall effectiveness of this company.</td>
<td></td>
<td></td>
<td>.791</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our decisions make sense in light of this company’s current financial situation.</td>
<td></td>
<td></td>
<td>.781</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our decisions help this company achieve its objectives.</td>
<td></td>
<td></td>
<td></td>
<td>.699</td>
<td></td>
</tr>
<tr>
<td>We feel a sense of loyalty to this new product.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.821</td>
</tr>
<tr>
<td>We will stick with this new product no matter what problems are encountered.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.752</td>
</tr>
<tr>
<td>Our team believes that this new product will be successful.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.730</td>
</tr>
<tr>
<td>We are committed to this new product.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.690</td>
</tr>
<tr>
<td>We would feel guilty if we stopped funding this new product development project.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.758</td>
</tr>
<tr>
<td>The estimated profits of this project based on today’s expectations indicate that this project will turn out highly profitable.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.665</td>
</tr>
<tr>
<td>Our decisions are made based on valid assumptions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.829</td>
</tr>
<tr>
<td>Our decisions are based on the best available information.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.734</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 12 iterations.
Appendix C

Decision making task

Rationale for choosing this case

Prior escalation studies applied various cases, such as the widely applied Adams & Smith case (e.g. Schultze et al. 2012; Staw, 1976) in which participants are confronted with declining profits for two departments of their company. Consequently they are asked to assign resources to one of both departments, by which they enter an escalation scenario. Other studies applied cases in which participants are provided with a set of products, thereafter they are asked to invest their resources in one of the products only to find out their bet was on the wrong horse. Examples of these cases are the blank radar-plane case (Wong et al., 2008), blank radar-boat case (Harvey & Victoravich, 2009), and the radar-scrambling device case (He & Mittal, 2007). This study applies a case that is aimed at the new product development process.

In order not to deviate too much from the situation within EMC, the case of Schmidt, Montoya-Weiss & Massey (2001) is adapted. In their original case, a new product development team first discusses and then makes a choice between two similar products. After committing to one of the products, the team hypothetically proceeds in time. Regardless of their choice they receive the same information on the product performance over the past months and the expectations for the future, the product is expected to be profitable but the projected market share is below the level demanded by management. Subsequently the team is asked to discuss and decide between abandonment and continuation of the project (bring it to the market or not). Would they choose to continue, they again proceed in time and are confronted with negative information regarding the market performance of the product. The actual market share is even less than was projected and the product is incurring a loss. Again the team is asked to decide between abandonment or continuation of the project. After this decision the decision making task is finished. Within EMC, the teams mainly develop products on request of their customers. These orders are bound by contracts. An implication of this situation is that EMC is legally obliged to provide its customer with the product they agreed upon. The choice to abandon a project therefore is not to be made by EMC but, depending on the type of agreement, is in the hands of its customer. To bring the case and EMC closer together, a hypothetical situation is sketched in which EMC wants to expand its business by developing own products. The engineering team of EMC is told they assist in the development of the new product, as they would normally do for an external customer. Since they hold a key-position in the project, they are asked to decide whether the project should be continued.
New product development case

This is an altered version of the task used by Schmidt, Montoya-Weiss & Massey (2001).

Product choice
Imagine EMC would want to expand its business into new markets with a product of its own. After a long process of brainstorm sessions, market research, and other activities, you and your colleagues came up with numerous opportunities. Two of those seem especially promising.

The first opportunity is a compact all-optical data-link. Compared to a conventional data-link, this optical link is a relatively low-power application and therefore does not dissipate much heat. Due to these properties the data-link is an energy efficient solution. Furthermore, its compact design saves valuable space. Design objectives of this optical data-link as compared to a conventional data-link:

- Space-requirements to apply the new product are preferably smaller than, or comparable to a conventional solution.
- Low energy consumption.
- Comparable sales price.
- Signal integrity is untouched and EMC-emissions are reduced.

The second opportunity is a software package that allows software engineers to transform regular lines of code into a code that can be used in an asynchronous processor. Normally, writing code for an asynchronous processor is a real challenge. The software engineer has to adapt his code to the specific properties of the processor in order to benefit from them. However, if the code is written correctly, these processors offer great advantages. Design objectives of this software package are:

- Provide a user-friendly application to transform code.
- No changes in functionality between input and output code.
- Output code benefits optimally from the advantages of asynchronous processors.

Corporate mandated that all products brought to market should achieve 30% market share and must be profitable. Although both the proposed products are expected to meet these criteria, EMC can only fund the development of one of those products. Since your team is selected to be of important assistance during the development process, you are asked as a team which product should be developed.
**Stage 1 scenario**
Due to long lead times, several pieces of hardware and tooling necessary for testing the new [optical data-link/ software package] have been ordered, and a few have already been received and installed. In addition, training of the development engineers is nearly complete.

Stage 1 of the new product development process has just been completed. So far, €3,5 million has been spent on developing the new [optical data-link/ software package]. The projected performance information is presented below.

- Projected annual sales: €24,5 million
- Projected annual profits: €5 million
- Projected market share: 25%

**Gate 1 Decision**
Your product development team has been working on the development of the [optical data-link/ software package]. Since your team has detailed knowledge on the project, your product development team is responsible for determining if the [optical data-link/ software package] should be commercialized (launched) at a total cost of €12 million (for production, distribution, and marketing).

**Stage 2 Scenario**
Stage 2 of the new product development process was completed 18 months ago at a total cost of €15,5 million. The actual performance information to date is presented below.

- Actual annual sales: €17,1 million
- Actual annual profits: -€1,5 million (loss)
- Actual market share: 22%

**Gate 2 Decision**
Your product development team is responsible for determining if the [optical data-link/ software package] should remain on the market at an annual cost of €500,000.