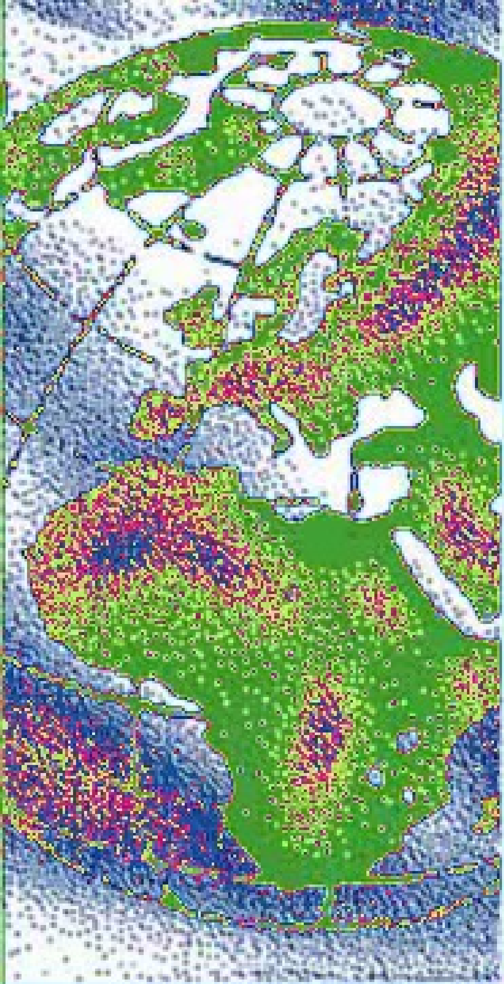


Tobias Huth

Organizing
New Prod
Projects

Tobias Huth

Organizing Cross-Functional New Product Development Projects

GABLER EDITION WISSENSCHAFT

Tobias Huth

Organizing Cross-Functional New Product Development Projects

The Phase-Specific Effects of Organizational Antecedents

With a foreword by Prof. Dr. Joachim Büschken

GABLER EDITION WISSENSCHAFT

Bibliographic information published by Die Deutsche Nationalbibliothek
Die Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data is available in the Internet at <http://dnb.d-nb.de>.

Dissertation Katholische Universität Eichstätt-Ingolstadt, 2007

1st Edition 2008

Editorial Office: Frauke Schindler / Nicole Schweitzer

Gabler-Verlag is a company of Springer Science+Business Media.
www.gabler.de

Cover design: Regine Zimmer, Dipl.-Designerin, Frankfurt/Main
Printed on acid-free paper
Printed in Germany

ISBN 978-3-8350-0926-4

Foreword

In theory and practice, cross-functional teams (CFTs) are considered an essential requirement for the success of innovation projects. However, empirical research indicates that the use of CFTs does not automatically lead to successful innovation. It appears favorable that the employment of CFTs has to be directed as systematically as well as other organizational actions.

Against this background, this dissertation deals with the phase-specific influence of organizational and environmental variables for the success of cross-functional innovation projects. New territory is entered by applying a phase-specific perspective. After having outlaid a theoretical framework, the effects of different variables on the success of cross-functional innovation projects during *the early* and the *late project stage* are empirically investigated.

At its core, the purpose of this study is related to the investigation of the intentional and phase-specific use of organizational infrastructures in order to increase the success of innovation projects. Thereby, a difference is made between the early and the late project stage. The intentional manipulation of different organizational and environmental variables may become a more complicated venture, if these structures impede and/ or foster creative processes, innovation and efficiency at the same time. Based on Duncan's theory of the ambidextrous organization, the author elaborates a framework, which focuses on the following organizational infrastructures:

- Organic Designs (participative decision-making, central budgets, team member proximity, decentralization)
- Mechanistic Designs (rewards, formalization, steering committees)
- Boundary Management (integration with functional departments, top management support)

Based on comprehensive theoretical reasoning, the author presents three structural models with the purpose of investigating the phase specific influence of the selected antecedents. Model I addresses the phase-specific influence of creativity and efficiency. Creativity is considered as a result of the successful transfer of innovative information, while efficiency is considered as a result of the successful transfer of coordinative information among the team members. Model II deals with the effects of the selected antecedents on efficiency and creativity during the early project stage, while model III is concerned with said effects during the late project stage.

The hypothesized relationships are theoretically derived and empirically tested. Great effort is spent on the empirical estimation. Thereby, the author applies the partial least squares method (PLS). In comparison to LISREL, PLS represents an iterative least square approach, where the postulated paths are not simultaneously estimated. For several reasons, this approach represents the preferred alternative.

All in all, this dissertation stands out due to its following characteristics:

- The author provides a comprehensive and well elaborated literature review on the success factors of cross-functional teams.
- The dissertation addresses an explicit gap in the literature.
- The empirical part demonstrates analytic expertise and the author's willingness to spend a lot of time and effort on the data survey.
- The empirical results are discussed in detail and they are adequately reflected. The results are relevant from a theoretical point of view as well as from a practitioner's perspective.

It is my hope that this study will be favorably adopted and be well recognized by the scientific community and the market.

Joachim Büschken

Preface

The present study was accepted as a doctoral thesis by the Faculty of Business Administration (WFI) of the Catholic University Eichstätt-Ingolstadt in September 2007.

A special thanks is directed to Prof. Joachim Büschken for supervising this thesis. His openness and interest in the topic, as well as his academic advice proved itself to be extremely valuable. Moreover, I would like to thank Prof. Michael Kutschker for his advice during the WFI doctoral workshop, and for being the second reviewer of this thesis. I would also like to express my gratitude towards the Deutsche Telekom AG, which financially supported this research by means of a scholarship and by mentoring. In this regard, I would like to thank Ursula Wahls and Dr. Andreas Roth.

All companies and project leaders, who provided project data for the empirical analysis remain undisclosed. However, I would like to thank them for their interest and support. A big thank you also goes to the current and former team members of the Department of Marketing: Gisela Datzmann, Marcus Gropp, Michael Jungbluth, Matthias Lötzer, Dr. Rainer Schlamp, and Dr. Helena Steeb, who all supported and encouraged me in their own special ways: Be it through stapling questionnaires, through homemade Tiramisu-tasting, or by updating me on the latest „valley-talk“. I would also like to thank Janine Herntier and Cornelia Thywissen for their active support during the survey period.

My dear friend and former roommate Dr. Alexander „Ali“ Zeisler encouraged and supported me in exceptional ways through our great discussions. The humorous nights in our shared apartment further contributed to the occasional desperately required distraction. The same special thanks goes to Mikael Salenstedt in Stockholm, Sweden.

My beloved partner Lina Berndtsson also played a vital role during the entire time I was engaged in writing this dissertation. I owe a lot to her. She accompanied me with plenty of love and with endless patience throughout this project. I hope I can make this up to her in the future. Finally, I would like to express my gratitude towards my father, Manfred Huth who significantly contributed to my education, and who supported me at all times and in all possible manners. I dedicate this dissertation to him and to my dearly loved grandmother Pauline Meletzki.

Tobias Huth

Table of contents

List of Tables

List of Figures

Abbreviations

AMOS	Analysis of Moment Structures
AVE	Average Variance Extracted
BITKOM	German Association for Information Technology, Telecommunications and New Media
CeBIT	Centrum fuer Buero und Informationstechnik
CFT(s)	Cross-functional team(s)
DAX	Deutscher Aktien Index
ICT	Information and Communication Technology
LISREL	Linear structural relation modeling
NPD	New Product Development
Od	Omission Distance
PDMA	Product Development and Management Association
PLS	Partial least squares
SEM	Structural equation model(ing)
VIF	Variance Inflation Factor

1 Introduction

1.1 Phase-Specific Organizational Infrastructures for Cross-Functional New Product Development Projects

Functions like R&D and marketing share common responsibilities in new product development, e.g. setting product goals, identifying opportunities for next generation products, or resolving engineering design and customer-need tradeoffs (Griffin & Hauser 1996, p. 192). In product development, the use of cross-functional teams (CFTs) provides a mean to establish a closer link between functions, and CFTs are considered to be a key factor to successful innovation (Griffin & Hauser 1996, Holland et al. 2000, McDonough 2000, Pinto & Pinto 1993).

Advocates of cross-functional teams mention several advantages. The interaction of team members from diverse backgrounds and experiences will enhance *creativity*, i.e. the development of new ideas and solutions (West et al. 2004, pp. 278-280). Moreover, instead of handing on outputs to the next department "in line", cross-functional teamwork transforms sequential development processes into more simultaneous ones. The early and synchronized cooperation of all relevant functions in the innovation process helps to recognize potential later problems in advance (e.g. serial problems or changed customer needs) and allows for early countermeasures. Thereby, the coordination and *efficiency* of the development process, along with the integration of the new product initiative into the firm's ongoing operations, is supported (Gebert et al. 2006, p. 433, Jassawalla & Shashittal 1999, p. 239, McDonough 2000, p. 222).

Although cross-functional teams are usually formed with great expectations, not all of them are successful. Previous research shows conflicting results when the CFT-performance relationship is investigated (Gebert et al. 2006, p. 432, McDonough 2000, p. 222). Recently, Gebert et al. (2006, p. 431), stated: *"The ubiquitous hope among managers of new product development (NPD) teams that a cross-functional team composition may be a royal road to enhancing team innovation appears to be an illusion."*

One potential hypothesis to the inconsistent findings, is that an increase in cross-functionality may not only lead to positive effects, but also to secondary negative effects in form of cross-functional conflicts and communication barriers (Dougherty 1992, Gebert et al. 2006, pp. 439-444, Griffin & Hauser 1996, pp. 195-197). A second hypothesis focuses on the organizational context within which CFTs operate (Griffin 1997, p. 435, Griffin & Hauser 1996, p.

197, McDonough 2000, p. 222, Olson et al. 1995).[1] Cross-functional teams may require certain organizational infrastructures, work conditions, integration mechanisms, and procedures in order to function well (Ayers et al. 2001, Bonner, 2005, Jassawalla & Shashittal 1998, McDonough 2000, Olson et al. 2001).

Due to the multiphase nature of the innovation process, CFTs may even require *different* organizational infrastructures as a project proceeds from the idea generation, to the development phase, and to the launch (Duncan 1976, Griffin 1997, Marino 1982, p. 76, Souder & Moenaert 1992, Spender & Kessler, 1995, Troy et al. 2001). In this context, scholars also highlight the tensions surrounding product development projects. Project managers must cope with conflicting and fluctuating contingencies as they seek to foster creativity *and* efficiency. By building up innovative capacities, project teams strive to develop new knowledge and achieve commercial objectives. Yet, the success of an idea also requires efficient execution to keep projects on schedule and within budget (Lewis et al. 2002, p. 546, Naveh 2005). While some organizational infrastructures may foster efficiency, they might also inhibit creativity and innovation, and vice versa. If this is the case, managing these tensions by selecting appropriate phase specific infrastructures is a crucial capability to the successful management of cross-functional teams.

1.2 Research Goal

Various researchers state that more research on the effectiveness of project management mechanisms and organizational antecedents in cross-functional new product development is needed (Ayers et al. 2001, Jassawalla & Sashittal 1998, McDonough 2000, Olson et al. 2001). Even though some scholars have studied organizational characteristics with respect to their effects on overall innovation performance (Leenders & Wierenga 2002, Sicotte & Langley 2000, Pinto & Pinto 1993, Thamain 2003), there is a lack of studies focusing on the effects of organizational characteristics on the specific stages of the product innovation process (Olson et al. 2001, p. 270, Troy et al. 2001, p. 90).

In addition, few studies have investigated the effects of project management styles and organizational antecedents on multiple facets of performance (Lewis et al. 2002, Naveh 2005). This is even more surprising, since efficiency and creativity are frequently highlighted as essential elements of new product development performance (Gebert et al. 2006, Lewis et al. 2002,

[1] Griffin (1997, p. 435) points out that *"We have not yet been able to define the organization and infrastructure which best supports effective multifunctional teams over time and across projects."*

Lovelace et al. 2001, Naveh 2005). Moreover, scholars highlight the tensions in managing and coping with these two elements (Naveh 2005, Lewis et al. 2002).

Therefore, this study will contribute to the existing research by an analysis of the organizational success drivers at the early and the late stages of the innovation process, and identify their phase-specific effects on creativity, efficiency, and overall performance.

A number of organizational structures ranging from bureaucratic and organic designs, to boundary spanning activities, have been proposed as critical for cross-functional teamwork throughout the past years (Griffin & Hauser 1996, Holland et al. 2000, pp. 241-244, McDonough 2000, Nihtila 1999, Sicotte & Langley 2000, Thamain 2003). They include rewards, steering committees, physical proximity, resources and budgeting, participative decision-making within the team, and boundary spanning activities like top management support and the level of integration between the team and functional departments (Ancona & Caldwell 1992a, 1992b, Gladstein 1984, Millson & Wilemon 2002). Table 1 presents the selection of the investigated antecedents. They represent a comprehensive and representative mixture of mechanisms applied in cross-functional new product development projects and are distinguished by organic and mechanistic structures (Burns & Stalker 1961), and boundary spanning activities (Ancona & Caldwell 1992a, Weinkauf et al. 2005, p. 100).

Table 1. Investigated Project Management Mechanisms and Organizational Antecedents

Organizational antecedents	Defined as
Organic Structures	
Decentralized decision-making structures	...the extent to which project decisions can be made without referring to higher management / escalation levels.
Participative decision-making within the team	...the extent to which team members are involved in the decision-making processes.
Central budget	...budget provided by a central function and not by an operational unit.
Physical proximity	...the extent to which team member are easily reachable on foot and the extent to which it is easy to get together for spontaneous meetings.
Mechanistic Structures	
Rewards	...the extent to which team members are rewarded for their participation and/ or the extent to which working in the project is captured in target agreements.
Project formalization / structuring	... the extent to which the project is planned by clear and specified guidelines and the extent to which the execution of the project follows a structured approach.
Steering committees	...the number of meetings and the relevance of this mechanism for the project management.
Boundary Management	
Integration with functional departments	... the extent to which information with internal functional units is exchanged and the quality of the cooperation and coordination with internal functional units.
Top management support	...the extent to which the top management supports cross-functional teamwork and takes part in the project by providing resources and giving feedback.

The theoretical fundament for the effectiveness of organic and mechanistic structures relies on Duncan's (1976) theory of the ambidextrous organization, as well as on Souder & Moenaert's (1992) closely related information-uncertainty reduction model, which focuses on the integration of R&D and marketing personnel in innovation projects. Duncan (1976) argues that due to varying levels of information needs and uncertainty regarding the alternatives for a new solution, organic structures (i.e. a wide span of control, horizontal communication modes, and high levels of cross-functionality) are more suited to the initiation stage (idea generation and conception) where they foster creativity. On the other hand, mechanistic structures (i.e. a narrow span of control, vertical communication modes, and low levels of cross-functionality) are more appropriate to the later implementation stage (development and market launch) of the innovation process where they foster efficiency.[2] This shift would result in a better fit between the organizational structure and the corresponding tasks.[3]

The theoretical fundament for the effectiveness of boundary spanning activities builds on resource dependency theory (Pfeffer 1982, Pfeffer & Salancik 1978). Researchers like Ancona (1990), Ancona & Caldwell (1992a, p. 324), and Gladstein (1984) suggest that a central challenge for teams is also to manage their boundaries with focal sources inside the organization, i.e. top management and functional departments. This is because teams face external dependencies from these sources in terms of information, protection, capital and implementation support (Ancona & Caldwell 1990, Ancona & Caldwell 1992a, Ancona & Caldwell 1992b, Gladstein 1984, p. 513, Hitt et al. 1999, p. 148, Holland et al. 2000, p. 242, McDonough 2000, p. 225, Weinkauf et al. 2005, p. 100).[4] These dependencies may exist during the entire innovation process, making boundary spanning a permanent organizational requirement for innovation success.

2 The concept of organic and mechanistic organizations was initially developed by Burns & Stalker (1961).

3 Souder & Moenaert (1992, p. 497) follow a similar rationale. They consider innovation as a process of information uncertainty reduction. A high level of uncertainty during the planning stage is best reduced by informal procedures and decentralized decision-making structures, which enable project team members to exchange innovative information. After successfully having reduced technological, consumer-related and/ or competitive uncertainties, a formalized and centralized project infrastructure is assumed to contribute more to the success of the development stage. Whereas uncertainty reduction during the planning stage is related to the transfer of innovative information, (i.e. information that is helpful in problem solving, information on experimental, analytical and explanatory aspects), it is expected that the transfer of coordinative information, (i.e. information concerning the tasks and the time schedules assigned to team members and the output expected), will gain impact during the late stage of a project.

4 For example, in the early stage, the information exchange between the team and *functional departments* serves to reduce market-, and technology related uncertainties, while during the late stage deadlines and workflow procedures regarding the development have to be negotiated. Early *top management support* is likely to result in greater resources and willingness to take risks, while late top management support may facilitate the new product's implementation by reducing resistance.

1.3 Outline of the Investigation

The research approach of this dissertation can be broadly divided into five parts. Chapter II introduces the basic theoretical rationale for cross-functional integration (2.1.1), the concept of cross-functional teams (2.1.2), and provides an overview of literature dedicated to the question if a cross-functional team composition automatically leads to increased new product development performance (2.1.3). The discussed findings suggest that cross-functional teams do not appear to be a straightforward approach to achieve greater innovation success. Therefore, the subsequent section (2.1.4) presents problematic issues and challenges concerning the use of cross-functional teams. It is followed by an extensive literature review of the critical success factors for cross-functional teamwork (2.2). After a brief introduction on how the effectiveness of groups is modeled (2.2.1), the framework of the content analysis is presented (2.2.2). The literature review is structured along success factors pertaining to the organizational context (2.2.3), the behavioral processes and psychosocial traits of cross-functional teams (2.2.4), and additional factors (2.2.5). The subsequent section summarizes the findings of the literature review and presents gaps in the literature (2.2.6). It is leading over to the scope of this study and to the particular gaps addressed in the following sections (2.3).

Chapter III presents the theoretical framework for the phase-specific effectiveness of organic and mechanistic structures as well as for boundary spanning activities (3.1- 3.6). It consists of a discussion of organic and mechanistic organizations (3.1), the phase-specific characteristics of the innovation process (3.2), the particular information requirements and levels of uncertainty throughout the innovation process (3.3), the concept of phase-specific organization structures (3.4), and boundary management as a continuous – non phase-specific – requirement for successful innovation projects (3.5). An interim conclusion including the main research questions (3.6) leads over to the formulation of the conceptual models and their related hypothesis (3.7.1- 3.7.3.).

Model I addresses the effects of creativity and efficiency during the early and during the late project stages (3.7.1). Model II focuses on the effects of organic and mechanistic structures and boundary-spanning activities during the early project stage (3.7.2), and Model III presents the hypothesized effects of mechanistic and organic structures, and boundary spanning activities during the late project stage (3.7.3).

Chapter IV begins with a description of the development of the survey and describes the collection of the data for the empirical testing of the presented hypothesis (4.1). The subsequent description of the sample reports on the profile of the surveyed companies and on related project characteristics (4.2). It is followed by a presentation of the constructs and measures used for the empirical analysis (4.3). For the empirical testing of the hypothesis, the partial least squares technique (PLS) for structural modeling, is applied. Therefore, the main characteristics and the functionality of this method are presented. Furthermore, the appropriateness of a PLS analysis for the sample at hand will be evaluated (4.4). After having demonstrated that a PLS analysis suits well to the empirical investigation of the given sample and to the related hypothesis, the general procedures, principles, and guidelines of a PLS analysis are presented (4.5). The evaluation includes the assessment of the reliability and the validity of the measurement model (4.5.1) and the assessment of the structural model (4.5.1). Subsequently, these procedures are conducted to test the hypotheses related to model I (4.6), model II (4.7), and model III (4.8), followed by a summary of the results (4.9).

Finally, chapter V presents a comprehensive discussion of the findings including theoretical (5.1) and managerial implications (5.2). Furthermore, meaningful pathways for future research are provided (5.3) along with the limitations of this study (5.4). The study ends with a conclusion (5.5).

2 Cross-Functional Teams in New Product Development

2.1 Emergence of the Concept and Related Challenges

2.1.1 Theoretical Background for the Need to Integrate Functions

The scientific analysis of the cooperation between organizational subsystems is rooted in Lawrence & Lorsch's (1967, p. 3), theory of integration and differentiation. According to this theory, organizations are effective when they build specialized functional units and integrate them.[5]

By establishing specialized functions, the organization adapts to the uncertainties of specific sub-environments, e.g. the R&D department adapts to the scientific/ technological environment. It focuses on resolving problems related to newly emerging and competitive technologies. The marketing department adapts to the market environment and deals with uncertainties concerning market demand, preferences and competition (Lawrence & Lorsch 1967, pp. 8-9, Olson et al. 2001, p. 260, Souder & Moenaert 1992, p. 490). Such specialization enables the firm to segment uncertainty. This process is called "differentiation". At the same time, differentiation bears the danger of isolation and it ignores the interdependencies between functions in terms of resources, information and tasks (McCann & Galbraith 1981, p. 63). Accordingly, there is need to integrate these differentiated subsystems. Lawrence & Lorsch (1967, p. 4) define integration as *"The process of achieving unity of effort among the various subsystems in the accomplishment of the organization's task"*.

The need for integration across functions can also be theoretically established from a resource dependency perspective (Pfeffer 1982, Pfeffer & Salancik 1978). This view has been widely recognized to explain interactions between functional units and organizations (Gupta et al. 1986, Ruekert & Walker 1987, Stock 2006). It assumes that when employees have less relevant experience to draw on when developing innovative new products, they depend more on other functional competencies, information and resources in order to arrive at a creative, feasible, and successful solution. Thus, the lack of self-sufficiency creates potential functional dependencies on the parties from which critical inputs are obtained (Stock 2006). Hence, resource-dependency theory provides an additional theoretical explanation as to why cross-functional diversity may increase new product development performance.

---

[5] *"An organization is defined as a system of interrelated behaviors of people who are performing a task that has been differentiated into several subsystems, each subsystem performing a portion of the task, and the efforts of each being integrated to achieve effective performance of the entire system." (Lawrence & Lorsch 1967, p. 3)*

2.1.2 From Functional Lines to Cross-functional Teams

Cross-functional project teams have not always been the organizational approach of choice when developing new products (Larson & Gobeli 1988), and not all companies use cross-functional teams for new product development (Huizenga 2004, p. 134). A survey by McDonough (2000, p. 229) reveals that 97% of the companies in the USA have used CFTs, and that 33% use them 100% of the time. Griffin (1997, p. 431) demonstrates that over 84% of the more innovative projects are using CFTs, and 40-50% of the surveyed companies use CFTs for less-innovative projects. However, the identified best practice companies report a more extensive use of CFTs for less-innovative projects (50-60%).

In order to understand the popularity, and to illustrate the particular characteristics of CFTs against the background of other approaches to organize innovation, this section will provide a brief review of the most common in-house designs used for innovation, namely, functional non-project based structures, matrix designs, and finally cross-functional teams.

2.1.2.1 Functional Structures

Although functional structures are considered well suited for the accomplishment of routine and less complex tasks, it has been shown that new product development in functional structures is a complex venture (Griffin & Hauser 1996, p. 206, Larson & Gobeli, 1988). In functional structures, the participants of new product initiatives remain in their corresponding function, which exerts the managerial authority over its respective domain and co-workers (Larson & Gobeli 1988, p. 181). The traditional product development process in functional structures follows a sequential pattern, where the new product initiative and its corresponding responsibilities pass sequentially from one function to the next (Bhuiyan et al. 2006, p. 38, Clark & Wheelwright 1992, p. 10, Olson et al. 1995, p. 49). Typically, an idea is first conceptualized within R&D and then submitted to the marketing department to review its viability. It is then passed to the sales department in order to estimate the sales potential and then moved to engineering to determine the product costs. After an executive committee has made a decision to approve the initiative, it continues its journey through the organization where it is being forwarded from product design to manufacturing and engineering, and finally to the marketing and sales departments which share the responsibility for the market launch. Clark & Wheelwright (1992, p. 10), refer to the sequential nature of the product development process in functional structures by using the term "*Throwing it over the wall*".

The major advantage of a functional structure for product development is that it concentrates specialized expertise to deal with key issues. For instance, if a group of functional specialists is always and exclusively responsible for the design of a particular component over a wide range of development efforts, they will be able to benefit better from prior experiences when dealing with a particular issue (Clark & Wheelwright 1992, p. 12). However, the "best" components are only defined by technical parameters in the area of expertise, rather than by overall system characteristics or specified customer requirements. Hence, sequential and decompositional product development processes free managers in charge from having to look at the entire problem. These structures have also been shown to result in extensive development cycles (Larson & Gobeli 1988, p. 184). This can be explained by the lack of simultaneous activities. Apart from the fact that not all required steps in the development of an innovative solution can be well known in advance, the subdivision of a task into independent and dispersed activities bears an increased risk that coordination suffers and potential later problems are not identified in advance, or too late (Clark & Wheelwright 1992, p. 10). In addition, functional development structures are less adaptable in case of emerging changes within the technological or market environment, due to their scattered responsibilities. Another argument for the disadvantage of this design is that an organization, where people are grouped by discipline, does not encourage teamwork across functions (Griffin & Hauser 1996, p. 206). Harmonious operations are at risk due to conflicting performance standards and diverging decision-making responsibilities. When comparing the relative effectiveness of functional, matrix, and project structures, Larson & Gobeli (1988) demonstrate empirically that functional, i.e. sequential structures perform worst in terms of meeting schedules, cost performance, technical performance, and overall performance.

2.1.2.2 Matrix Structures

Another organizational alternative, ranging somewhat in between functional structures and cross-functional project teams, are matrix structures (Ford & Randolph 1992, p. 269, Larson & Gobeli 1987, p. 129).[6] In this design form, a dual authority structure is created. Functional specialists continue residing in their functional group, but also report to the project leader, who performs an integrating and coordinating function. Team members are partially assigned to the NPD-project and, at the same time, to perform functional non-project related activities.

[6] Additionally, one can distinguish between functional matrix and balanced matrix structures, where the level of authority and responsibility between the project manager and the functional manager vary. For further reading, compare Larson & Gobeli (1987, p. 129) and Ford & Randolph (1992, p. 269).

In theory, matrix organizations are expected to maintain functional excellence, while improving the cross-functional teamwork and information flows between functions (Ford & Randolph 1992, p. 273, Larson & Gobeli 1987, p. 130). Although intended to improve communication and coordination, dual lines of authority are costly and time-consuming and lead to new forms of stress, such as ambiguity about responsibilities and conflicts about schedules and resources (Ford & Randolph 1992, p. 283, Sicotte & Langley 2000, p. 6). Furthermore, since team members remain in their functions, and rather hold an "on demand function", the amount of cross-functional interaction remains on a low level. However, previous research provides evidence that matrix structures indeed outperform functional structures in terms of product development market success rates and cost effectiveness, but they do not outperform cross-functional project structures with clear responsibilities (Griffin & Hauser 1996, p. 207, Larson & Gobeli 1987, p. 136).

2.1.2.3 Cross-Functional Teams

Taking these findings into account, it is not surprising that CFTs have gained enormous popularity within new product development (Cp. 2.1.2). For the purpose of this study, a cross-functional team is defined as "*A group of people with a clear purpose representing a variety of functions or disciplines in the organization whose combined efforts are necessary for achieving the team's purpose" (Zimdars 2003, p. 6).*[7]

The key elements of CFTs are a variety of skills, interdependence of work, and the delivery of a common objective (Holland et al. 2000, p. 233). CFTs are typically designed as an overlay to the existing functional structure (Dension et al. 1996, p. 1005, Galbraith 1994). In contrast to functional and matrix structures, the functional team members report to a single and full-time project leader, who is assigned to oversee the project (Larson & Gobeli 1988). The project leader is responsible for the completion of the project, and represents the main authority. Thus, the responsibilities are centered within the team and dual authority structures are non-existent. Functional managers have no formal involvement. Sometimes, their participation may be limited to assigning personnel as needed and providing advisory expertise (Griffin &

---

[7] An alternative, but similar definition is given by Holland et al. (2000): *"A cross-functional team is a group of people who apply different skills, with a high degree of interdependence, to ensure the effective delivery of a common organizational objective."* The term cross-functionality is defined as *"the degree to which team members differ with respect to their functional background" (*Gebert et al. 2006, p. 432). Cross-functionality includes differences of the member's knowledge bases and experiential backgrounds. Moreover, it may also be associated with differences concerning deep-seated beliefs, values and attitudes.

Hauser 1996, p. 207, Larson & Gobeli 1987, p. 129). CFTs are considered to be more self-governing in establishing their own operating procedures (Olson et al. 1995, p. 50).

By concentrating all relevant functional specialists to participate in a project with a defined objective, CFTs appear to be better suited to consider a problem as an entity and to overcome the "throw it over the wall" mentality where tasks are sequentially transferred from department to department. By focusing the group on a single goal, CFTs may better facilitate overcoming functional differences and create a shared working environment (Griffin & Hauser 1996, p. 207, Olson et al. 1995, p. 50).

All functional members are involved in the project at the same time and from the outset (Gebert et al. 2006, p. 433). This supposedly helps speeding up estimates, generating and evaluating alternatives, performing activities simultaneously, and identifying emerging problems in advance to avoid time consuming redesigns (Ancona & Caldwell 1992, p. 338, Eisenhardt & Tabrizi 1995, p. 90, Gebert et al. 2006, p. 433, Olson et al. 1995, p. 51). Hence, cross-functional project structures are expected to maximize the coordination across functions (Griffin & Hauser 1996, p. 207) and the efficiency in terms of development speed and budget adherence (Gebert et al. 2006, p. 433).

Another major potential benefit is that the team members' different knowledge bases and experiential backgrounds are expected to increase the range of potentially useful and creative ideas (Jehn et al. 1999, Miliken & Martins 1996, Sethi et al. 2001). The potential advantages attributed to CFTs can be summarized in the following points (Wurst 2001, p. 11):

- *Controlling complexity:* The increasing complexity of innovative tasks exceeds the information processing and coordination capabilities of individuals or functional groups. The combined expertise of CFTs is expected to add to the accomplishment of these tasks.
- *Efficiency:* Cross-functional teams consider the innovation process as an entity and enable development steps to be integrated (Eisenhard & Tabrizi 1995, p. 90). Thereby, costly and time-consuming revisions may be better avoided. CFTs are expected to better perform certain activities simultaneously, which otherwise would be performed sequentially (Naveh 2005, p. 2790). Clear decision-making structures allow for flexibility, if required.
- *Creativity:* Proponents of the "value in diversity" hypothesis argue that the contact between workers from diverse backgrounds will lead to the development of creative and non obvious solutions (Jehn 1999, Shalley & Gilson 2004, p. 43, West 2002, p. 363). A greater variety of specialists offers a broader knowledge base giving rise to more varied interpre-

tations of the same information. These more varied interpretations are expected to result in more ideas being generated (Troy et al. 2001, p. 93).

2.1.3 Cross-Functional Teams and New Product Success – Empirical Evidence

Given the great popularity and the described advantages of CFTs, one could assume that a cross-functional team composition automatically leads to increased new product development performance. The purpose of this section is to refer to this matter, and provide the findings of previous research.

All in all, five studies were found indicating that the simple use of cross-functional teams is positively associated with greater innovation performance. In a study based on 510 respondents, Larson & Gobeli (1987, p. 136) investigate the relative effectiveness of different organization structures for new product development. They find that cross-functional projects outperform functional and matrix structures in terms of market success rates and cost effectiveness. Cooper's (1995) benchmarking study of 103 new product development projects of major chemical companies identifies cross-functional teams to be the major driver of project timeliness, and an important driver of profitability. Another benchmarking study conducted by Roberts (1995) investigates 244 firms responsible for 80% of the R&D spending in North America, Western Europe, and Japan. It finds that CFTs have the greatest impact on time to market for new products. Similar results are obtained by Eisenhard & Tabrizi (1995, p. 84), who find that cross-functionality is associated with faster time to market within the computer industry. Also, McDonough (2000, p. 230) finds that the employment of CFTs has a positive impact on project performance. The study is based on a sample of 172 members of the Product Development and Management Association (PDMA).

However, these positive results contradict the findings of other researchers. Three studies were found which report on non-significant relationships (Henard & Szymanski 2001, Webber & Donahue 2001, Sethi et al. 2001), and three studies demonstrate negative relationships between cross-functionality and team performance (Ancona & Caldwell 1992b, Keller 2001, Lovelace et al. 2001). It may be worth to mention that these studies were published more recently than the ones demonstrating positive associations between the use of cross-functional teams and performance.

Reviewing the literature, Gebert et al. (2006) states that mainly non-significant relationships with respect to the innovativeness of a solution, as well as with regard to constraint adherence are reported in the literature. The meta-analysis of 24 success factors of new product development performance conducted by Henard & Szymanski (2001, pp. 368-372) is consistent with this statement. The analysis is based on 41 studies. Although the authors do not particularly focus on cross-functional teams, their analysis yields a non-significant relationship for cross-functional communication/ cooperation and NPD-performance. Another meta-analysis by Webber & Donahue (2001) is based on 24 studies. It investigates the relationships between job related diversity, cohesion, and performance in work groups. It also results in non-significant relationships. The directional impacts found between different types of diversity and the criterion variables (group cohesion and performance) are mostly negative (Webber & Donahue 1999, p. 154). Sethi et al. (2001) investigated 141 cross-functional product development teams in the US. Consistent with the previous findings reported here, the authors do not find a significant relationship between functional diversity and innovativeness. The regression coefficient shows a negative sign.

In addition, there are studies reporting on negative effects due to cross-functionality in work groups. Ancona & Caldwell (1992b) find that the overall effect of diversity is associated with lower product development performance, even though some aspects of group processes are enhanced. Their study is based on 45 new product teams in five high technology companies. After surveying data from 93 R&D teams from four organizations, Keller (2001) finds that cross-functionality by itself has no direct effects on technical quality, meeting schedules, and a strong negative effect on budget adherence. However, he also finds that cross-functionality has a positive effect on a team's external communication, which in turn is positively related to quality, budget and constraint adherence, but negatively related to team cohesiveness. He concludes, that the benefits from cross-functionality may especially stem from the functional networks that team members have within a firm. Lovelace et al. (2001) focus on the relationship between conflict and cross-functionality in NPD-teams. Based on a sample of 43 CFTs (328 team members) they find that cross-functionality is positively related to the level of task disagreement within the team, which in turn is negatively related to innovativeness and budget adherence; the latter not being significant.

2.1.4 Challenges Concerning the Use of Cross-Functional Teams

The findings of previous research indicate that the relationship between the use of cross-functional teams and new product development performance is not positive in the majority of the cases. Particularly recent studies and the mentioned meta-analysis suggest that cross-functional teams do not appear to be a straightforward approach to greater innovation success under all circumstances.

The presented findings are in accordance with other scholars (Gebert et al. 2006, p. 434, Griffin & Hauser 1996, McDonough 2000, p. 222). For instance, Griffin & Hauser (1996, p. 208) state, that many companies using CFTs still have problems developing products efficiently and effectively, because all aspects and barriers to integration are not addressed. Griffin (1997, p. 435) points out, that research has not yet been able to define the organization and infrastructure which best support CFTs over time and across projects. A survey of Fortune 500 companies reveals several obstacles impeding the effectiveness of cross-functional teams, including conflicting organizational goals, overlapping responsibilities, no clear direction or priorities, and lack of cooperation (Holland et al. 2000, p. 233, Wall & Lepsinger, 1994). The notion that CFTs are no "self-sellers" is also affirmed by the existence of success factors studies for cross-functional teamwork. Holland et al. (2000) identify a total of 29 different success factors in 6 different domains for cross-functional teamwork, Denison et al. (1996) identify 12 success drivers in three domains, and McDonough's (2000) study suggests 11 factors in three domains.

These findings indicate that a cross-functional team composition should rather be considered as a first move towards successful innovation, than an ultimate solution. Therefore, it is necessary to go one step further, and to identify and present problematic issues and challenges concerning the use of cross-functional teams. The explanations put forward for these conflicting results are diverse (Denison et al. 1996, p. 1996, Gebert et al. 2006, Holland et al. 2000, pp. 233-235, McDonough 2000, p. 233). They can be categorized according to four domains:

1. *The organizational context within which CFTs operate.*

   The organizational context refers to the effectiveness of supporting factors like goal setting, empowerment, degree of autonomy of the team, top management support, or the extent and form of project monitoring.

2. *The behavioral processes and the psychosocial traits of the group.*

   Behavioral processes refer to the implications of interactions that occur among group members, such as the degree of collaboration, the quality and quantity of communication, and the effects and types of conflict, that occur in CFTs. Psychosocial traits relate to the norms, mental models, beliefs, and the degree of shared understanding between the team members. Psychosocial traits refer to the implications of a more unconscious and psychological dimension, which is different from work-related actions, behaviors and feelings (Cohen & Bailey 1997, p. 244, Holland et al. 2000, p. 235).

3. *The use of CFTs for highly innovative versus non-innovative projects.*

   This domain deals with the question if the use of CFTs is appropriate for all kinds of projects, or rather for selected projects.

4. *The particular functional mix of team members.*

   Research that focuses on the particular functional mix relates to the question if the relevance and effectiveness of cooperation between certain functions or functional members might depend on the particular stage of the innovation process.

In order to gain a better understanding of the particularities of cross-functional teamwork, the next sections will illustrate the specific challenges associated with the respective domains.

2.1.4.1 The Behavioral Processes and the Psychosocial Traits

Cross-functional teams differ from conventional teams in important ways. Each functional member has a competing social identity and loyalty to another subunit of the organization (Denison et al. 1996, p. 1005, Holland et al. 2000, p. 233). The advocates of social identity theory argue that diversity damages the cohesiveness of a group and reduces its communication, which ultimately results in discord, distrust, poor quality, a lack of customer focus, and market orientation (Ashforth & Mael 1989, Bassett-Jones 2005, p. 171, Tafjel 1982a, Tajfel 1982b). Stereotyping can lead to substantial barriers between functional members (Griffin & Hauser 1996, p. 195). Different functional origins may also result in greater interpretive differences and task and value conflicts (Gebert et al. 2006, p. 434, Jehn 1995). A task conflict for example refers to dissent regarding the most appropriate way to pursue a goal, while value conflicts relate to a situation when team members have different values and attitudes, of what the outcome of a group's effort should be. For instance, value conflicts emerge when one individual wishes to technically optimize a product, while another individual focuses on product usefulness from a customer's perspective (Gebert et al. 2006, p. 441, Jehn et al. 1999). Value conflicts are likely to occur, given the cultural differences ("thought worlds") between functional members (Dougherty 1992, Griffin & Hauser 1996, p. 196). While R&D professionals tend to have low tolerances for ambiguity and a focus on scientific methods of problem solving, marketing professionals accept ambiguity, rely more on intuition, and on general problem solving to make decisions (Griffin & Hauser 1996, p. 196).

The described processes caused by increasing cross-functionality might offset the potential benefits (i.e. increased creativity and efficiency) of cross-functional teams. Team-internal conflicts, created by different perspectives, may ultimately lead to inefficiencies in information sharing and faulty decision-making processes (Ancona & Caldwell 1992b). Although CFTs feature more creative potential, they might fall down on implementation because they have less flexibility and capability for teamwork than homogenous groups (Ancona & Caldwell 1992b, p. 338). This argument is also in line with Duncan's (1976) "ambidextrous model", proposing that cross-functionality facilitates the initiation of innovation by generating a broader range of possible solutions, while low cross-functionality facilitates the implementation of innovation due to reduced conflicts and less ambiguity.

To summarize, CFTs do not automatically overcome personality differences, thought worlds, functional stereotyping, and conflict. This results in a dilemma. While on the one hand cross-functionality is required for innovation, it may also obstruct cooperation and communication within the team (Bassett-Jones 2005, Gebert el al. 2006, p. 433, Griffin & Hauser 1996, pp. 195-196, 208). Therefore, studies that do not consider the dynamic characteristics of the innovation process and the described behavioral characteristics, might fail to reveal the benefits and pitfalls related to the use of cross-functional teams. This may also serve to explain, why some studies reported on non-significant or even negative relationships (Gebert et al. 2006, p. 433).

2.1.4.2 The Organizational Context

The function of organizational context as a critical factor to complement CFTs has also been intensively highlighted in the literature (Hackman 1987, Holland et al. 2000, Griffin & Hauser 1996, p. 197, 208, Larson & Gobeli 1987, McDonough 2000, Olson et al. 1995, Olson et al. 2001). West (2002) and West et al. (2004) argue that group diversity is only to result in creativity and innovation implementation if there are (amongst others) clarified group objectives, appropriate reward structures, participation in decision-making, and support for innovation. Research at 3M finds that keys to CFT-success include team member selection, training, performance evaluation, motivation, project sponsorship, and the role of middle management (Hershock et al. 1994). McDonough (2000, p. 222) explicitly refers to the inconsistent results regarding cross-functionality and performance. He argues that they may stem from the internal infrastructure of the firm using cross-functional teams and the organizational context within which cross-functional teams operate. He lists factors like project-goals, empowerment, the stimulation of commitment, and top management support as critical success factors for cross-functional teams. Duncan (1976) and Souder & Moenaert (1992) go even one step further and suggest that due to varying levels of uncertainty, and due to the particular nature of the tasks, the various stages of the innovation process require different organizational infrastructures for cross-functional teamwork. This might also explain why there have been inconsistent results regarding the relevance and directional impact of certain mechanisms when the different project stages were not considered.

However, Henke et al. (1993) finds that even those firms recognizing the importance of CFTs assert that implementing effective organization systems, structures, practices, and procedures is an extremely difficult task, and one that is not always performed successfully. Consistent with this view, Griffin (1997) points out that research has not yet been able to identify the organizational designs and infrastructures, which best support CFTs over time and across projects. The subsequent review of literature (2.2), will discuss which organizational structures have been found to best complement CFTs and address further questions.

2.1.4.3 The Appropriateness for Innovative vs. Non-innovative Projects.

The inconsistent results may also stem from the fact that CFTs might simply be only advisable in selected contexts (Henard & Szymanski 2001, p. 373). Based on resource dependency theory, Olson et al. (1995) argue that cross-functionality may only be advisable for highly innovative projects and under conditions of high uncertainty because these situations require a broader set of expertise. On the other hand, incremental innovations exhibiting low levels of uncertainty can be conducted within functional lines with standardized procedures. Although Olson et al. (1995) did not investigate CFTs in particular, their empirical analysis shows that a good fit between the newness of the product concept and the participativeness of the coordination mechanisms employed, results in better outcomes of product and team performance. Building on these results, Hoegl et al. (2003) provide a study by which they can partially confirm that the impact of cross-functional teamwork on new product performance is more crucial in highly innovative projects. These results are in contrast to Griffin's (1997, p. 431, 445) benchmarking study. Although, it shows that over 84% of the participants are using CFTs for more innovative projects and only 40-50% of the surveyed companies use CFTs for less-innovative projects, the identified best practice companies use CFTs in the majority of the projects, regardless of the level of innovation. Given the few studies within this domain, future research appears beneficial.

2.1.4.4 The Particular Functional Mix

A last possible reason for the conflicting results may be that the relevance of the cooperation between certain functions and functional members might depend on the particular stage of the innovation process (Griffin & Hauser 1996, p. 208, Rochford & Rudelius 1992). If this circumstance is not considered within studies, it may also lead to ambiguous results. Similar to Duncan (1976) and Souder & Moenaert (1992) who argue that every project stage requires different organizational conditions, this stream of research proposes that every project stage requires a particular functional mix (Olson et al. 2001, Song et al. 1998, p. 289). This approach might be more beneficial than integrating all functions during all NPD-stages.

Olson et al. (2001, pp. 261-2) note that the need for cooperation between marketing and R&D might be highest in the early project stage. Marketing provides knowledge about preferences, competitive offerings, and positioning, while R&D contributes with new technical solutions and bears responsibility for translating technology into desirable performance attributes and viable designs. On the other hand, cooperation between marketing and operations, and operations and R&D might become more relevant in the late project stage, because production levels must be defined according to market needs, and the transformation of the conceptual design from the lab into a workable and producible product will become an important task. The findings of Olson et al. (2001) reveal that early cooperation between marketing and R&D, and operation and R&D is a driver to NPD-performance and that late stage cooperation between marketing and operations, and R&D and operations is a key determinant for innovative products, but not for non-innovative products. In addition, early stage cooperation between marketing and operations is positively associated with superior performance in case of low innovation projects, but also associated with poor performance for innovative projects.

2.2 Literature Review on the Success Factors of Cross-Functional Teams

After having suggested that the simple use of CFTs does not automatically translate into greater innovation performance, four different domains concerning the particular challenges of cross-functional teams were presented. These domains imply that the contribution of cross-functional teams is subject to a variety of influences and contextual factors. More important, these factors have to be taken into account when using CFTs for new product development. This section will therefore take a closer look at the research on success factors for cross-functional new product development teams and finally address gaps in the present literature. Particular focus will be placed on the domains “behavioral processes and psychosocial traits”

(2.1.4.1) and "organizational context" (2.1.4.2). These domains exhibit a greater variety of facets and are more complex. Besides, most of the research concerning cross-functional product development teams has been conducted within these domains.[8]

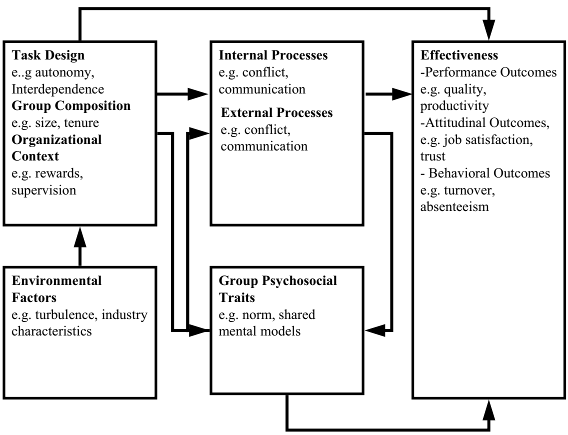
The identification and understanding of particular success factors requires a basic understanding about the way teams function and about the general frameworks that exist to explain the performance of groups. In addition, the way one thinks about groups has important implications for the way research on team success factors is conducted, for example when theoretical, testable models are developed, and when one has to decide on the inclusion of direct and indirect links between certain variables. To provide a better understanding on this issue, section 2.2.1 will introduce the basic concepts, models, and insights of research on group effectiveness. This research aims to describe what determinants and domains affect the behavior and the effectiveness of groups, and how these determinants are generally assumed to be linked with each other.

8 Except of the research already presented with respect to "The use of CFTs for highly innovative vs. non-innovative projects" (2.1.4.3) and "The particular functional mix" (2.1.4.4), no more studies were found within these respective areas.

2.2.1 Modelling Group Effectiveness

McGrath (1965) pioneered the input-process-output model (IPO) as a way to think about groups and group performance. The IPO-model proposes that causal inputs lead to certain behaviors (processes), and these behaviors in turn lead to certain outcomes. No direct linkages between inputs and outputs are assumed. Inputs typically include the organizational context, the group composition, and the task design. Processes can be defined as the behaviors between team members, e.g. conflict, communication, and cooperation. Outputs refer to parameters such as the quality of the outcome, productivity or job satisfaction (Cohen & Bailey 1997, Holland 2000). However, during years of extensive research on group effectiveness the IPO-model has faced some criticism (Gladstein 1984, Hackman 1987, Hoegl & Parboteeah 2003, Stewart & Barrick 2000). It can be summarized in the following points.

Figure 1. A Heuristic Model of Group Effectiveness.



Source: Cohen/Bailey (1997).

- *Measuring processes (behaviors) implies a great risk of biased measurements due to respondents' implicit theories*

  Scholars like Gladstein (1984) and Ancona & Caldwell (1992b) appeal to be very cautious when interpreting the causal link between process characteristics and performance. It might rather be a result of what should have affected performance in accordance with the respondents' implicit theories, but not what has actually affected performance. This notion also finds empirical support in the studies of Hoegl & Gemünden (2001), Gladstein (1984), and Ancona & Caldwell (1992b). They show that the process-output relationship becomes weaker (Högl & Gemünden 2001, p. 44), or even non-existent (Ancona & Caldwell 1992b, p. 337, Gladstein 1984, p. 512), when performance is measured on the basis of (team external) managerial ratings and external figures. These findings suggest that process variables like communication and collaboration are not as crucial for group performance as assumed.

- *Behavioral processes are not useful as points of intervention*

  Hackman (1987, pp. 318-320) points out that behavioral processes are not useful as points of intervention in designing and managing teams, because changes of behaviors are impractical. This is because changing behaviors might take time and such a policy does not necessarily target the underlying causes. One should rather focus on creating effective conditions for groups, than attempting to manage a team's behavior (Holland 2000, p. 235). Within this context, Gladstein (1984, p. 512) states: *"Process changes alone are unlikely to be successful (...). For example, if poorly defined roles and goals lead to conflict in the group, then teaching the group skills in managing conflict is only a partial solution. The underlying cause of conflict has not been dealt with."*[9] This argument aims to shift the focus more on input factors like organizational context, in order to change the circumstances in which groups work, and thereby increase group effectiveness.

- *Effective group behavior is too complex to be explained by a limited set of variables*

  Hackmann (1987, p. 317) states that thinking in the IPO-paradigm may have misdirected the search for useful knowledge about group effectiveness. He argues that many types of behaviors can be productive and that research has not yet found out what really mediates between inputs and outputs. Limiting behavioral processes to a set of acknowledged parameters such as cohesion, communication and conflict, neglects the role of alternative parameters such as effort (Hackmann 1987, pp. 317-320, Holland et al. 2000, p. 235), flexibility, and knowledge creation (Leenders & Wierenga 2002, p. 313).

The skepticism towards the classical IPO-model has also been empirically justified (Hoegl & Parboteeah 2003, Stewart & Barrick 2000, p. 142-144). Some studies find evidence for additional direct (non mediated) effects of inputs on outputs (Campion et al. 1996, Leenders & Wierenga 2002, Stewart & Barrick 2000). Other studies find that context, i.e. input, is even a more potent determinant of cross-functional team effectiveness than behavior (Hoegl & Par-

[9] Consistently, Guzzo & Shea (1992, p. 306) state: *"Improvements in group effectiveness can best be obtained by changing the circumstances in which groups work. Thus, organizational reward systems can be changed to recognize team accomplishments, group and organizational goals must be actively managed to ensure that group and organizational goals are aligned, technical and human resource support systems can be adapted to promote the welfare of work groups, and so on. A diagnosis of the contextual factors facilitating or inhibiting group effectiveness should precede implementing changes in order to identify the specific changes to be made to enhance effectiveness."*

boteeah 2003, Gladstein 1984, Pinto & Pinto 1993, Sicotte & Langley 2001, Thamain 2003, p. 303).[10] For instance, besides demonstrating various direct input-performance relationships within a sample of 121 R&D projects, Sicotte & Langley (2001) find that formal leadership (input) has a stronger effect on new product performance than horizontal communication (behavior). When discussing their findings, the authors conclude that ways in which mechanisms such as planning and information systems might improve performance are by *helping to avoid the necessity of extensive communication* (Sicotte & Langley, 2001, p. 29). The findings of inputs not being (fully) mediated by behaviors indicate that an exclusive reliance on known behaviors is not sufficient to cover for the entire effects of inputs on group effectiveness.

Based on the criticism directed towards the IPO-model, research on group effectiveness has broadened its view from a strict focus on a group processes as the main predictor of team performance to a stronger consideration of the critical role of organizational context (Ancona & Caldwell 1992b, Bonner 2002, Denison et al. 1996, p. 1019-1020, Gladstein 1984, Hertel et al. 2004, Hoegl & Parboteeah 2003, Holland 2000, p. 235, Leenders & Wierenga 2002, Lewis et al. 2002, Olson et al. 1995, Pinto & Pinto 1993, Sarin & Mahajan 2001, Sicotte & Langley 2000, Thamain 2003, West et al. 2004). This is accomplished by:

- Forgoing processes (behaviors) and modeling only direct relationships between inputs and outputs.
- Allowing for additional direct relationships between inputs and outputs, while still considering process.
- Introducing alternative and additional process variables.

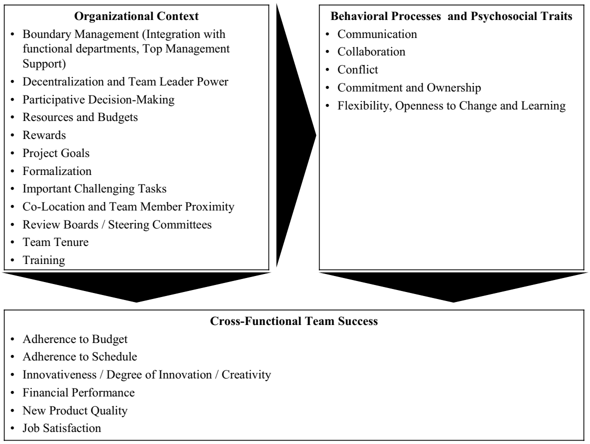
Figure 1 presents Cohen & Bailey's (1997) more comprehensive model of group effectiveness explaining how teams might function and in which ways certain domains such as organizational context, team processes and team performance may be linked with each others. It may also serve as a general framework for research on the success factors of cross-functional teams.

[10] For instance, Pinto & Pinto (1993) find a stronger direct effect of rules and procedures on the performance of cross-functional new product development teams, and a mediated effect across cross-functional cooperation. Thamain (2003, p. 303) collected data from team staff of 180 R&D projects in 27 companies. His analysis yields that clear organizational objectives, accomplishment and recognition, direction and leadership are positively associated with overall innovative performance, while no significant relationship is found between cross-functional cooperation and overall innovative performance. Hoegl & Parboteeah (2003) find that goal setting in new product development teams has a direct impact on team performance. This effect is not mediated, but moderated by the quality of teamwork.

2.2.2 Framework of the Content Analysis

After having discussed approaches and alternatives to model team effectiveness, the groundwork has been laid to review the literature of factors critical to the success of cross-functional new product development teams. An extensive literature search was performed in order to identify relevant papers. Particularly helpful were the studies of Denison et al. (1996), Holland et al. (2000), McDonough (2000) and Thamain (2003), which put a special focus on the success factors of cross-functional new product development teams. In addition Griffin & Hauser (1996) provides a literature review on the integration of marketing and R&D on the department level. The relevant papers were allocated according to their respective domain ("The Behavioral Processes and the Psychosocial Traits" and "The Organizational Context"). Figure 2 displays the identified success factors for cross-functional teamwork, which will be reviewed in the following sections.

Figure 2. Critical Success Factors For Cross-Functional Teamwork.



It should be mentioned that in some of the found studies, the effectiveness of the listed success factors is additionally investigated within various contingency frameworks. Popular contingency factors being investigated are "strategy", i.e. prospecting, analyzing, defending, (McDonough & Griffin 1997), "degree of innovation/ uncertainty/ experience" (Bonner et al. 2002, Hoegl et al. 2003, Lewis et al. 2002, Sarin & Mahajan 2001), "product complexity" (Sarin & Mahajan 2001), "national culture" (Garrett et al. 2006, Xie et al. 2003), "project phase" (Hoegl et al. 2004, Hoegl & Weinkauf 2005, Olson et al. 2001, Song et al. 1998), and "product program integration" (Bonner et al. 2002). Some studies even use some of the listed success factors as moderators, while other success factor-performance relationships are investigated (Hoegl & Parbotheeah 2003, Xie et al. 2003).

2.2.3 Organizational Context

2.2.3.1 Boundary Management

Boundary management (or boundary spanning) is defined as *"the process by which teams initiate interactions with, and respond to communication from other parts of the organization"* (Gladstein 1984, Holland et al. 2000, p. 246). The underlying assumption for the effectiveness of boundary management is that groups are considered as open systems, which depend on diverse sources inside and outside the organization with respect to resources, information, and support (Aldrich & Herker 1977, Weinkauf et al. 2005, p. 99, 102).[11] From this perspective, a central challenge for teams is to manage their boundaries with focal sources inside the organization.[12] Within the context of CFTs, intra-organizational dependencies exist in particular with respect to the top management and the functional departments (Ancona & Caldwell 1992a, Weinkauf et al. 2005, p. 100). An effective boundary management with these sources is considered a success factor for cross-functional new product development teams. The following two subsections will elaborate on this issue in discussing the specific relationships between CFTs and these two groups.

2.2.3.1.1 Integration with functional departments

Within the CFT context, deadlines for inputs, outputs and workflow procedures have to be negotiated between the team and functional departments, resources have to be obtained, and results have to be promoted (Ancona 1990, Ancona & Caldwell 1992a, p. 324, Ancona & Caldwell 1992b, p. 637, Gladstein 1984, p. 513). Amongst others, Ancona & Caldwell (1992b, p. 638) mention two types of boundary spanning activities "molding" and "coordinating and negotiating", which stand for influencing functional departments to suit the team's agenda, by shaping the beliefs and behaviors of outsiders, and by coordinating and negotiating about the way an innovation is implemented.

11 The rationale for the effectiveness of boundary spanning is based on resource dependency theory, which assumes that organizations are not internally self-sufficient with respect to their critical resources (Pfeffer 1982, Pfeffer & Salancik 1978, Stock 2006, p. 589). *"They require resources from the environment and, thus, become interdependent with those elements of the environment with which they transact" (Pfeffer 1982, p. 192-193)*. Resource dependence theory argues that all groups in an organization (to a certain degree) depend on external resources and information, and that groups need to transfer their outputs to external groups. Therefore, the capability to interact and collaborate with external groups will affect group performance. The higher the level of external interdependence, the greater the influence on performance caused by boundary-spanning activities (Cp. Stock 2006).

12 Gladstein (1984) was the first to show that teams act across their boundaries and that group processes do not only consist of internal elements. Consistently, Ancona (1990) and Ancona & Caldwell (1992a, p. 324) find that the performance of a CFT does not solely depend on intra-team factors, but also on interactions with other parts of the organization.

When investigating 45 R&D teams, Ancona & Caldwell (1992b, p. 337) find that the top management's ratings of innovation are related to the frequency of team members' external communication. Keller (2001) comes to a similar finding when he investigates 93 CFTs in four organizations. He finds that a team's external communication is positively related to product quality, budget, and constraint adherence. Interestingly, team internal communication only shows a positive association with schedule performance, leading Keller (2001) to conclude that the benefits from cross-functionality may especially stem from the functional networks team members have within a firm. Consistently, Ancona (1990) finds that for teams facing external dependence, external activities are better predictors of team performance than internal group processes.

Also, the type of external communication and not just the amount has been found to determine CFT performance. Ancona & Caldwell (1992b) identify four distinct sets of activities: "Ambassador" (protecting and persuading), "Task-Co-ordinator" (coordinating and negotiating), "Scout" (mapping and scanning), and "Guard" (avoiding releasing information). A mixture of "ambassador" and "task-coordinating" activities is found to be most successful, because these teams are able to manage both power- and workflow structure. The results suggest that opportunities for team members to communicate outside the group should be provided. Team members need to be aware that boundary management is an important part of their task (Holland et al. 2000, p. 247).

2.2.3.1.2 Top Management Support

Top Management support has gained a lot of attention as an important antecedent to successful innovation and several studies have confirmed a positive impact on innovation. Scholars stress both a direct effect on performance (Ancona & Caldwell 1990, Ancona & Caldwell 1992a, Ancona & Caldwell 1992b, Gladstein 1984, p. 513, Hitt et al. 1999, p. 148, Holland et al. 2000, p. 242, McDonough 2000, p. 225), for example by providing resources, reviewing, helping the team to surmount obstacles and integrating it into the firm's regular operations, as well as an indirect effect across encouragement to take risk and by stressing the importance of collaborative behavior (Hitt et al. 1999, p. 147, Jasswalla & Sashittal 1998, p. 245, Sethi et al. 2001, Swink 2000, Xie et al. 2003, p. 236). In addition, Duncan (1976) highlights top management's role to institutionalize, communicate, and to stand up for a phase-specific management of innovation processes in order for it to become accepted in the organization (Duncan 1976, p. 185).

Jassawalla & Sashittal (1998, p. 245) find more collaboration in those organizations, where top management actively proclaims that product innovation is a central component in the organization. By conveying a sense of urgency about new products and by attaching high priority to NPD processes, top management encourages cooperative efforts and reduces goal incongruities among functional team members (Gupta et al. 1986, p. 11, Jassawalla & Sashittal 1998, p. 245, Xie et al. 2003, p. 236). Swink (2000) notes, that a high level of visible support for the project generates enthusiasm, and product and process designers are likely to pay closer attention to details. Besides, top management support has also been shown to support creativity. CFTs receiving management support report that they are engaging in more challenging and relevant tasks. In turn, these are conditions that have been linked to creative performance (Tierney et al. 1999, Sethi et al. 2001, p. 78). In addition, employees receiving support from the top management are more likely to engage in job-related risk taking and freedom to deviate from the status quo (Tierney et al. 1999). Using Data from 191 R&D employees of a large chemical company, Tierney et al. (1999) confirm a positive link between top management support and creativity. A recent literature review on the antecedents of employee creativity comes to identical findings (Shalley & Gillson 2004, p. 40). During the literature review, no indication was found for top management support as a mechanism detrimental to CFT-performance.

2.2.3.2 Decentralization and Team Leader Power

Centralization defines the locus of authority within the organization to make decisions (Marino 1982, p. 83). It refers to the extent to which decision-making authority is concentrated within a few positions (Ayers et al. 2001). The higher the level of which decision-making takes place within the organization, the greater the degree of centralization (Gupta et al. 1986, p. 11).

As indicated by Zaltman et al. (1973), a strict emphasis on a hierarchy of authority reduces the organizational innovativeness. Centralized structures are thought to limit the involvement in decision-making, not communicate the values of trust and cooperation, and encourage individuals only to provide positive feedback about their performance (Ayers et al. 2001). A study conducted by Trent & Monczka (1994) shows that one of the greatest drawbacks for cross-functional sourcing teams is that managers outside the team attempt to influence team decisions and to control team activities.[13] If (external) functional managers create obstacles or

[13] Although Trent & Monczka (1994) study deals with cross-functional sourcing teams, it is suggested that their findings may also be transferred to the context of cross-functional product development teams. This is

attempt to override team decisions, then cross-functional teams are ineffective (Holland et al. 2000, p. 238). The empirical studies conducted by Deshpande (1982) and John & Martin (1984) find a negative association between centralization, the use of market research information, and the utilization of plan output. Hage & Aiken's (1967) and Daft & Becker's (1978) studies show negative correlations between innovative output und centralization.

In contrast, McDonough (2000, p. 224) argues, that by locating decision-making authority at the project level (i.e. decentralizing decision-making), firms are able to reduce the time it takes to make decisions, take actions, and solve problems. Also, Clark & Wheelwright (1992) highlight empowered project leaders as a critical success factor to NPD-success. Marino (1982, p. 77) notes that decentralized decision-making structures permit open communication, and increases the sources of information. Thoughts or proposals conceived at lower organizational levels are less likely to become filtered out. Thus, the ability of the organization to generate alternative proposals for the tasks at hand will be enhanced. Participation based on a decentralized structure on the project level can increase the team members‘ commitment, since they are more likely to derive a feeling of ownership (Gupta et al. 1986, p. 11).

Jassawalla & Sashittal (1998) find high levels of cross-functional cooperation where teams have the autonomy to make all product development decisions and design their own workflows. Eisenhard & Tabrizi (1995) find that project leader power (whether the project leader reported to the business unit manager or not) is associated with faster development time. Ayers et al. (2001) find that centralization impedes the development of relational norms between R&D and marketing personnel. Moenaert et al. (1994) confirm that centralization has a negative effect on the communication between R&D and marketing. Based on a sample of 95 NPD-projects across various industries, Bonner et al. (2002) show that increased team influence, e. g. in setting schedules, budgets, and project goals, is positively associated with project performance, while management interventions impede team effectiveness.

While some degrees of flexibility and freedom have shown to be essential ingredients to the speed and success of cross-functional NPD teams, decentralization is not without risks. Teams might "wander off" strategy, pursue design options that exceed the firm's competencies and resources, and run behind schedule or over budget (Bonner et al. 2002, p. 234). Therefore, some authors (Duncan 1976, Marino 1982, p. 77, Souder & Moenaert 1992) expect decentralization to hinder the implementation stage of the innovation process. During the late stages

because both team types require quick decision-making and flexibility when looking for alternative saving potentials (sourcing teams) or developing new product concepts (product development teams).

of the innovation process, centralized decision-making may be required to provide unity of action, facilitate control, and reduce negotiation and bargaining.

2.2.3.3 Participative Decision-Making

In contrast to decentralization, participative decision-making focuses on the distribution of authority within the team. It refers to the extent to which regular team members take part in and have influence over project related decisions. It has also been termed "project manager's operating style" (Sethi et al. 2001) or "empowerment" (McDonough 2000, p. 223).

If team members see themselves as the primary decisions makers and implementers, the motivation to collaborate with each other may be increased (Gupta et al. 1986, p. 11). Each team member will be more involved in the technical, functional, and market challenges the project is facing. The active participation in setting project standards increases the team members' ownership, accountability, and motivational commitment (Bonner et al. 2002, p. 237). To the extent that information and decision-making authority are equally shared, and point of views are openly exchanged, the cross-fertilization of perspectives, which can spawn creativity and innovation, is more likely to occur (Olson et al. 1995, p. 51, West 2002).

Studies investigating the association between participative decision-making in cross-functional teams and performance yield consistent results (Donellon 1993, Hershock et al. 1994, McDonough & Barczak 1991, Thamain 1990). For instance, McDonough & Barczak (1991) find that the speed of product development is significantly related to the amount of freedom and responsibility given to project team members by the project leader. Moreover, West (2002) reports on increased creativity due to participative decision-making.

Nevertheless, participative decision-making may be more time consuming and more costly than centralized and bureaucratic processes (Olson et al. 1995, p. 51). For this reason, some researchers (Duncan 1976, Marino 1982, Souder & Moenaert 1992) argue that participative decision-making is only effective during the initial stages of the innovation process, where it primarily supports the generation of new ideas. Once the concept has been generated and approved, a singleness of purpose and efficient operations are required. This makes participative decision-making within CFTs less favorable. Similarly, it has been argued that participative structures are better suited to highly innovative projects, while they might be contra-productive when the level of innovation is low (Olson et al. 1995).

2.2.3.4 Resources and Budgets

The availability of sufficient resources is a critical contribution to the potency of groups (Holland et al. 2000, p. 243). It is often argued that organizations with spare time, spare resources, and less strict performance monitoring have greater freedom for experimentation and are better capable of absorbing failures (Cyert & March 1963, Greve 2003, March 1981). Hence, cross-functional teams with sufficient resources and managerial patience may more likely innovate with success. In contrast, scarce resources and strict performance monitoring can cause new activities to be aborted before a team has accumulated sufficient experience to know whether it will eventually succeed (Greve 2003, p. 688, Lounamaa & March 1987). Garud & Van de Ven (1992) note that a rigid performance evaluation caused by low slack is detrimental for R&D projects.[14] They are particularly vulnerable to cutbacks due to the ambiguous performance signals that they usually generate (Greve 2003). Therefore, greater slack makes it easier to continue new product development projects.

The critical importance of resources also finds empirical support. Trent & Monczka (1994) find that the availability of resources is highly correlated with the effectiveness of cross-functional sourcing teams. In addition, van der Stede (2000) finds that rigid budgetary control increases management focus on business matters that affect short-term results. A rigid budgetary control style is one in which employees are evaluated primarily on whether or not they achieve their budget. A meta-analysis by Damanpour (1991, p. 569) based on 23 studies, confirms a positive but weak relationship between slack resources and innovation. When investigating R&D organization structures, Argyres & Silverman (2004, p. 930) find that a centralized R&D budget authority generates innovations that have a higher impact upon a broader range of technological capabilities, than budgets provided by business units. The authors explain their findings by the fact that centralized governance offers greater abilities to pursue non-specific research. Furthermore, central budgets facilitate the creation of knowledge across business units since the incentives for a business unit to invest in non-specific and firm wide knowledge initiatives are naturally low (Argyres & Silverman 2003, p. 933).[15]

---

[14] Slack is generally considered as resources and effort towards activities that cannot be justified in terms of their immediate contribution to the organizational objectives. Slack resources include excess inputs such as redundant employees, unused capacity, and “unnecessary” capital expenditures. They also include unexploited opportunities to increase outputs (Nohria & Gulati 1996, Grewe 2003).

[15] While central budgets are typically characterized by a higher level of slack resources and a relatively less rigid control style, divisional budgets are characterized by the opposite characteristics (Argyres & Silverman 2004, Birkinshaw & Fey 2000, Hoskisson et al. 1993). Budgets are generally defined as financially orientated planning and control mechanisms that underpin the evaluation of organizational and subunit performance (Dunk & Kilgore 2004).

Besides, the study of Hoskisson et al. (1993) demonstrates that R&D intensity decreases when division managers are responsible for innovation, because these agents have negative incentives to take risks. Consistently, Birkinshaw & Fey (2000, pp. 5, 9-10) argue, that operational funding relates negatively to the effectiveness of R&D activities due to its short term and commercial focus, while at the same time it is positively related to the efficiency of R&D activities. However, the authors could not support this assumption empirically.

While it has been shown that a greater availability of resources will enable more creative and experimental initiatives, there are also arguments that additional resources may not be efficiently deployed, and ultimately lead to diminished or even negative returns (Herold et al. 2006). Opponents of slack (Jensen 1986, Jensen 1993) argue that it diminishes incentives to innovate and promotes undisciplined investment in R&D projects. According to this view, slack encourages the pursuit of pet projects and breeds complacency by agents who show little regard for the interest of the principals they are expected to serve (Nohria & Gulati, 1996, p. 1246). Although slack leads to the pursuit of new projects, very few of these projects actually translate into value added innovations for firms, because loose controls placed on these projects allow decision makers to make choices that correspond better with their own preferences than with economic considerations (Child 1972, p. 11, Nohria & Gulati 1996, p. 1246). Considering both the pros and cons of slack resources, Nohria & Gulati (1996) assume that the relationship between (slack) resources and innovation is curvilinear. Slack fosters greater experimentation but also diminishing discipline over innovative projects. Their assumption is empirically supported. Recently, Herold et al. (2006) obtained similar results when patent data was investigated.

2.2.3.5 Rewards

Rewards are investigated in a variety of forms and contexts, and with respect to different outcome dimensions. Scholars focus on the relationships between rewards and collaborative behavior, efficiency, creativity, and overall team performance. There is research on outcome based and process based rewards, and also on equal rewards, or rewards which are allocated according to individual member contributions. Furthermore, the effectiveness of rewards is investigated in a variety of contexts (high vs. low innovativeness, long vs. short product development cycles, high vs. low risk environments).

There is no consensus among researchers to which degree *team based rewards* can support the effectiveness of CFTs (Bonner et al. 2002, Hertel et al. 2004, p. 7, Menon et al. 1997, p.

191, Sarin & Mahajan 2001, p. 38, Wageman 1995, Wageman & Baker 1997). Some researchers argue that by the using team rewards, functional complementarities and interdependencies between team members become emphasized (Leenders & Wierenga 2002, p. 312, Menon et al. 1997, p. 191, Xie et al. 2003, p. 236).[16] When goals are interdependent, it means that as one person moves towards goal attainment, others move towards reaching their goals as well (Alper et al. 1998). Involving and interrelating a team by collective rewards gives rise to cooperative behavior and to the reduction of dysfunctional conflicts. The importance of perceived goal interdependence is essential to Deutsch's (1949) theory of cooperation and competition, which states that groups collaborate and perform better when they perceive their goals to be interdependent. The studies conducted by Leenders & Wierenga (2002), Menon et al. (1997), Sethi (2000b), and Xie et al. (2003) show that collective rewards foster cross-functional integration, and Gomez-Meja & Balkan (1989) finds evidence that team based compensation is more effective than individual compensation in increasing overall team performance.

However, there may be also detrimental effects to team rewards. Wageman & Baker (1997, p. 142) note that rewarding based on team results may lead to free riding; the reduction of individual effort resulting from reduced accountability in groups. A necessity not to reward team members equally can also be derived from an organizational fairness and justice perspective (Sarin & Mahajan 2001, p. 38).[17] Perceptions of inequity or injustice may result in dissatisfaction, lower motivation, and finally in a lower level of productivity (Sarin & Mahajan 2001, p. 38). In fact, when Sarin & Mahajan (2001) interviewed cross-functional team-members, outstanding team members expressed a desire for extra recognition that acknowledged their above average contribution. In their subsequent analysis, the authors find that position based rewards display a positive effect on team member satisfaction, when individual contributions are easy to evaluate (p. 42). They also find that equal rewards are negatively related to self-rated performance and to team member satisfaction, when ease of individual evaluation is low (p. 43). Their findings imply that organizations should rather develop evaluation systems to monitor individual performance, than use equal rewards. Other studies yield non-significant results with regard to the team rewards-performance or innovation relationship (Bonner et al. 2002, p. 241, Sethi et al. 2001, p. 81).

---

16 Note that these studies were conducted at the department level.

17 Distributive justice relates to the perception of individuals whether they received a fair share of rewards; proportionally to their contribution to the group. Equity theory relates to fairness in social exchanges. Accordingly, individuals compare the ratio of their rewards (outputs) and contributions (inputs) to those of other team members (Sarin & Mahajan 2001, p. 38; Cp. also Adams 1965, Baron & Byrne 1997, Greenberg 1993).

Sarin & Mahajan (2001) also investigated the effectiveness of *process and output based rewards.* They find that the use of process-based rewards (i.e. rewards which are tied to procedures, behaviors, and means of achieving desired outcomes) are mostly negatively related to project performance, and in particular to projects with long development cycles and high complexity. Outcome based rewards (i.e. rewards which are tied to the bottom-line profitability of the project) are positively related to team performance, when product complexity is low and product development cycles are long (p. 43). Their results suggest that process based rewards are mostly detrimental to team performance, whereas output based rewards can have positive effects when team members perceive a clear link between efforts, performance and reward. Their finding is consistent with expectancy theory (Sarin & Mahajan 2001, p. 46, Vroom, 1964). By making the reward contingent on an objective outcome a clear link is established. Yet, their findings does not indicate that one should always favour outcome-based rewards. It also shows that the association between outcome based rewards and product quality is monotonically decreasing, in cases of high project risk, strong competition, and high dynamics. This finding can be explained from an agency perspective. When outcome based rewards are applied, risk is transferred to the agent (i.e. the CFT). However, too much risk exposure is detrimental, and agents prefer evaluations, which ensure compensation regardless of the project outcome (p. 47). A similar study conducted by Bonner et al. (2002, p. 240) yields non-significant relationships between team performance and outcome based control regardless of the level of innovation, and negative results for process based control. Eisenhard & Tabrizi (1995, pp. 91, 103-106) investigate the association between process-based rewards and product development speed. In accordance with the scholars mentioned above, a negative reward-speed relationship is found, particularly when uncertainty is high. As a possible reason, the authors mention that designers who are rewarded for schedule may neglect other outcomes such as quality and adherence to specifications. This could lead to inappropriate trade-offs and subsequent delays or surprises, which ultimately slow down the development process.

For this reason, outcome based rewards may be positively associated with CFT-performance, when development cycles are long and product complexity is low. There may be detrimental effects when there is a high project risk, strong competition, and high industry dynamics. On the other hand, process based rewards seem to be negatively related to team performance in general. The presented research left unclear, whether any of type of reward might enhance or hamper creativity. Both types have characteristics, which may foster and inhibit creativity at the same time. Although output based rewards do not prescribe a particular procedure to achieve objectives and therefore guarantee operational freedom and flexibility, they put risk on the team, which is detrimental to creative behavior. On the other hand, although process based rewards do not expose high risk on the team members, they prescribe the procedures and steps to be done for goal achievement (Bonner 2002).

Furthermore, there is also little agreement among scholars with reference to the direction of the *general effects of rewards on creativity* (Baer et al. 2003), independent from whether rewards are outcome or process based. Some authors argue that offering rewards will enhance individuals' subsequent creative performance (Eisenberger & Cameron, 1998) while others argue that the use of extrinsic rewards will actually reduce creativity by undermining individuals' intrinsic motivation (Osterloh et al. 2002, p. 68) and the willingness to take risks (Kohn 1993).

According to cognitive evaluation theory (Deci & Ryan 1985), offering extrinsic rewards to individuals should have detrimental effects on their intrinsic motivation, and subsequently their creativity (Deci et al. 1999, Calder & Staw 1975). Individuals are likely to perceive their behavior as being motivated by the extrinsic reward contingency rather than by the work itself. The evaluation aspect promotes a feeling of external control (Harackiewicz et al. 1984). In the presence of rewards, employees will no longer explore new opportunities outside the realm of the rewarded behavior (McShane & Glinow, 2006). This effect has also been termed "crowding out" (Osterloh et al. 2002, p. 68). In contrast, proponents of rewards argue that they can increase creativity if a clear link between rewards and creative performance is established (Eisenberger & Cameron 1998, p. 676). This link can increase the participants' stated interest in a task. With rewards, individuals receive something tangible as a symbol of their excellence. This symbolic meaning or "cue value" is proposed to affect interest and involvement by intensifying the importance of the accomplishment (Harackiewicz et al. 1984, Sansone & Harackiewicz, 1998).

As indicated, there is empirical research providing support for both positions. For instance, positive associations are demonstrated by Eisenberger et al. (1998), Eisenberger & Rhoades (2001), and negative effects are demonstrated by Amabile et al. (1986), Kruglanski et al. (1971). Sethi's et al. (2001) study yields insignificant results, when the relationship between rewards and CFT-innovativeness is investigated. In a recent study, Baer et al (2003) integrate both perspectives. The findings of this study suggest that the inconsistent results obtained in previous investigations might have been a function of job complexity and cognitive style variables. The authors find a negative effect between rewards and creativity for adaptors in complex jobs (i.e. those jobs characterized by high levels of autonomy, skill variety, feedback, and non routine), and a non significant effect for innovators. For less complex jobs, they find that adaptors respond positively to rewards, while innovators' creative performance decreases as rewards increase.[18] Their findings are explained as a result of the particular combination of job type and employee cognitive style. Receiving a reward for creative actions in simple jobs, seems to enhance adaptor's feelings of self-determination and leads to creative actions. On the other hand, if employees with an innovative cognitive style occupy simple routine jobs, they may view the possibility of being rewarded as a poor substitute for the opportunities provided by the job itself and therefore experience more dissatisfaction and frustration with their work. Innovators in complex jobs seem to be a good person to job match, which results in intrinsic motivation being sufficiently high to immunize these employees against the undermining effects of rewards (Amabile 1996). In contrast, employees with an adaptive cognitive style prefer routine work and predictable tasks and tend to derive less enjoyment and intrinsic motivation from challenging activities (Amabile et al. 1994, Kirton 1994). Because adopters tend not to appreciate the motivational quality of complex jobs to the same extent as innovators, their creative performance is more likely to suffer from extrinsic rewards. The findings of Baer et al. (2003, p. 580) suggest that rewards can promote, inhibit, or not affect creativity, depending on the task type and the employee's cognitive style.

In summary, rewards can take many forms and each form is sensitive to their particular context (Bonner et al. 2002, Sarin & Mahajan 2001). Furthermore, there is evidence that not all individuals respond in the same way to rewards (Baer et al. 2003). Therefore, one can not make a particular recommendation against or in favour of rewards. In complex and risky settings, rewards appear to have detrimental effects (Baer et al. 2003, Sarin & Mahajan 2001). Furthermore, relative to other success factors, rewards do not seem to be very critical. For instance, the study of Bonner et al. (2002) shows that participative control mechanisms outperform formal team rewards. Consistently, Thamain's (2003) study on the success factors of R&D team performance identifies salary increases and bonuses as a less important driver to team success. In addition, the results of Baer et al. (2003) and Sarin & Mahajan (2001) suggest that rewards can lead to more damages than benefits (Cp. Hennessey & Amabile 1998, p. 674 for a similar point of view).

---

[18] *Adaptors*, i.e. individuals with an adaptive cognitive style, tend to operate within given procedures and paradigms. They do not question their validity. Adaptors value being recognized for their efforts and achievements. *Innovators*, i.e. individuals with an innovative style, are rather willing to take the risk of violating the agreed upon way of doing things. They propose creative ideas and develop solutions that are different from previous ones. Innovators describe themselves as less depending on extrinsic reinforcements. Employees with an innovative style tend to appreciate complex and challenging activities, whereas those with an adaptive style prefer tasks that are relatively straightforward and routine (Kirton 1994, Baer et al. 2003).

2.2.3.6 Goals

McDonough (2000) and McShane & Glinow (2006) note that establishing goals provides project members with a common frame of reference, and goal-setting keeps heterogeneous team members oriented towards a common task outcome. Thereby, goals offset the problem of differentiation and promote a higher level of cross-functional cooperation. Goals also serve as a way to create boundaries, so that the team will not continually redefine its direction. In this regard, goals do not only serve as tool to tell a team what to do, but also what not to do. Moreover, Holland et al. (2000, p. 241) add that a compelling vision builds commitment among the team members.

There is considerable empirical evidence that goals positively affect team performance (Guzzo & Shea 1992, Hertel et al. 2004, Holland et al. 2000, Pinto & Pinto 1993). For instance, Pinto & Pinto's (1993) study demonstrate a direct effect impact of superordinate goals on project outcomes and an indirect effect across cross-functional integration. No indications for negative effects of goal setting were found during the literature review.

2.2.3.7 Formalization and Structured Planning

Gupta et al. (1986) define formalization as the emphasis placed on following rules and procedures in performing one's job. Formalization refers to the degree to which activities and tasks on a project team are mandated or controlled. It offers a mechanism for integrating and coordinating activities in CFTs (Cooper 1996, Moenart & Souder 1990, Pinto & Pinto 1993, p. 284, Sicotte & Langley 2000, p. 8) and ensures that teams do not pursue random opportunities that are inconsistent with the strategic objectives of the organization (Ayers et al. 2001). Little formalization may result in role ambiguity and conflict (Gupta et al. 1986). Consistently, Garrett et al. (2006, p. 295) argue that formalization assists in removing the barriers of different organizational responsibilities by clearly articulating what roles and tasks each function has to fulfill. Some authors (Ayers et al. 2001, p. 136, Pinto & Pinto 1993) even argue that formalization will foster better cross-functional relationships. The clarification of responsibilities should lead to an appreciation of the interdependencies between functional personnel and help in increasing mutual respect and commitment.

While Ayers et al. (2001) can not confirm the hypothesis that formalization leads to the creation of relational norms between R&D and Marketing, Pinto & Pinto's (1993) study shows that rules and procedures enhance cross-functional cooperation and project performance. Similar results are obtained by Sicotte & Langley (2001). In addition, Moenaert & Souder

(1994) confirm that formalization is positively attributed to the communication between R&D and Marketing personnel during the development stage of new products.

Another stream of literature is less enthusiastic about the benefits of formalization. Gupta et al. (1986) and Denison et al. (1996, p. 1012) argue that formalization may cause estrangement, noninvolvement, and might release team members from taking their collective responsibility. Work environments characterized by the excessive use of rigid rules and controls may restrict the resources of information consulted in the formulation of ideas (Zaltman et al. 1973), lead to ritualization, impede thoughtful reflection by constraining the way a job is done, and ultimately inhibit creativity (Andrews & Smith, 1996, p. 177, Shalley et al. 2000). There is also empirical evidence supporting these assumptions. Troy et al. (2001) find a negative effect between formalization and the generation of new product ideas in work groups, and Deshpande (1982) demonstrates that less formalization leads to a greater use of market research information.

Some authors attempt to consider both the benefits and disadvantages of formalization and propose an integrated perspective. For instance, Andrews & Smith (1996) assume a curvilinear formalization-creativity relationship. Under a moderately formal planning process some degree of emphasis is placed on thinking about a product's future, yet formalization is not so great that managers are inhibited from using non-routine methods to generate ideas. Their hypothesis is empirically confirmed. Olson et al. (1995) argue that formalized procedures are rather appropriate for incremental projects but less appropriate for extremely novel projects. The authors confirm their hypothesis by showing that a good fit between the level innovativeness and the selected organization structure leads to increased performance. Duncan (1976) advocates a selective use of formalization as well. While low levels of formalization in the initiation stage of innovation contribute to an organizations flexibility and search for alternative courses of action, high levels of formalization ensure a singleness of purpose, and provide clear guidelines for implementation. This point of view is also in line with Daft & Lengel's (1986) media richness theory proposing to use richer media (e.g. face to face) in case of non-routine situations, and to rely more on less rich media, e.g. rules and procedures, in more routine situations. Although no direct empirical test directed at Duncan's (1976) ambidextrous model was found during the literature review, Damanpour's (1991) meta-analysis shows consistency with the proposed directional signs. Yet, the differences are not significant. Vandevelde & Van Dierdonk (2003) demonstrate empirically that increasing formalization facilitates the production start up of new products. However, the authors do not investigate the early project stage.

2.2.3.8 Important Challenging Tasks and Intrinsic Motivation

Several breakthrough-products came from individuals who focused primarily on solving a problem rather than on exploiting markets or seeking fortune (Griffiths-Hemans & Grover 1996). Intrinsic motivation is the motivation to engage in a task primarily for its own sake because the task itself is interesting, engaging, or satisfying (Andrews & Smith 1996, Griffiths-Hemans & Grover 2006). Many scholars point out that individuals are likely to be most creative when they experience high levels of intrinsic motivation. (Amabile 1996, Baer et al. 2003, Oldham & Cummings 1996). Baer et al. (2003) note that intrinsically motivated individuals tend to be more persistent in the face of barriers, more curious, more willing to take risks, and more cognitively flexible.

Empirical work provides support for the positive association between intrinsic motivation and creativity. The studies by Tierney et al. (1999) and Andrews & Smith (1996) demonstrate positive relations between intrinsic motivation and individual creativity. Moreover, Thamain's (2003) study provides strong empirical support for the importance of intrinsically team members in the R&D team context. The statistically most significant drivers of innovative R&D team performance are derived from the work itself, including personnel interest, pride and satisfaction with the work, professional work challenge, accomplishment, and recognition. On the other hand, only weak support is found for extrinsic influences, like salary increases and bonuses.

2.2.3.9 Co-Location and Team Member Proximity

New product development teams can vary in terms of team member proximity. Co-location or team member proximity refers to the degree to which all team members are in direct vicinity over the course of a project (Hoegl & Proserpio 2004). Scholars have proposed several advantages to team member proximity. Allen (1986) notes that isolation could increase the problem of separate cultures, jargon, and perceived personality differences. When co-located, establishing effective cross-functional contacts requires less effort as compared to situations where team members are geographically dispersed (Hoegl & Proserpio 2004). Close proximity also allows for a better synchronization of task activities, and a real time observation of team members progress. Since all team members are more likely to be informed about the work of other members, gaps or overlaps can be avoided (Hoegl & Proserpio 2004, p. 1156). Furthermore, the possibility of spontaneous and informal face-to-face interaction, in form of so called kitchen talks becomes facilitated (Hoegl & Proserpio 2004, p. 1156).

According to media richness theory, spontaneous and frequent face to face interaction is particularly necessary in case of non-routine situations. It suits well to the information processing requirements of innovative tasks (Daft & Lengel 1986, p. 563). Decreasing team member proximity is likely to result in a reduction of face to face communication, and consequently in an increasing use of communication media, e.g. telephone and email, which does not provide the same level of information richness (Daft & Lengel 1986).[19]

The empirical study conducted by Hoegl & Proserpio (2004) based on 145 software development teams demonstrates that the proximity of team members is positively associated with task related team processes like team member communication, coordination, and also with social team processes like mutual support, effort, and cohesion. Additional support for a positive relationship between physical proximity and cross-functional cooperation is demonstrated by Pinto & Pinto (1993). In contrast Sethi's (2000b) study does not reveal a significant relationship between physical proximity and superordinate identity. No studies investigating the direct relationship between team member proximity and new product development performance were found.

2.2.3.10 Steering Committees and Milestone Reviews

Steering committees or review boards typically consist of senior managers from different functional areas who evaluate new product business cases and monitor the progress of a project. Review boards act as project sponsors. They have decisive power over "go- and no-go" decisions and provide a formal platform to solve cross-functional conflicts (Griffin & Hauser 1996, p. 210, Leenders & Wierenga 2002, p. 305).

Fundamental to review boards is that this mechanism controls the team's behavior and its actions across project stages by setting predefined milestones. In this sense, they represent process or behavior based information systems (Eisenhardt 1989, p. 61) because they specify how the project should be completed. Eisenhardt & Tabrizi (1995, p. 93) point out that frequent milestones assist in the early identification of problems, and consequently allow for early countermeasures. They provide a sense of order and routine, which serve as a counterpoint to more freewheeling activities within the innovation process. They are also motivating by conveying a sense of urgency and frequent achievements. The empirical study of Eisen-

19 Information richness is defined as the ability to change understanding within a time interval (Daft & Lengel 1986, p. 560).

hard & Tabrizi (1995, p. 106) yields that frequent milestones (i.e. formal project review points) accelerate product development projects.

However, some researchers argue that behavior based control may exert a negative influence on creativity and market orientation because predefined means end relationships keep a team away from exploring new ways (Bonner et al. 2005, Lewis et al. 2002). Lewis et al. (2000, p. 550) state, *"(...), if teams are forced to follow top-down plans, the might not explore novel scientific or commercial opportunities."* Another potential critical point to steering committees is that they indeed serve as a platform for co-ordination and information exchange, but do not necessarily foster the teamwork between functions (Kahn 1996).

Nihitila (1999) conducted a qualitative analysis on the integration of R&D and production in the early phases of the development process. Although, it was observed that respondents consider the principle of having milestones and design reviews necessary to achieve cross-functional integration, they also acknowledged that early milestone reviews lack data and result in inefficiencies and overly detailed reviews. Early meetings were perceived less effective. For instance, respondents stated that too many people were involved, which resulted in endless discussions (p. 69). This finding is also in line with Bonner et al. (2002), who finds that projects, which are subject to detailed a priori, process requirements by upper managers are associated with delays, cost overruns, lower product performance, and lower team performance. Consistently, Lewis et al. (2002) demonstrate that formal review activities are negatively associated with budget adherence. However, they also reveal a positive association with innovation. Leenders & Wierenga's (2001) study also yields ambiguous results. Review boards have the highest positive beta with respect to cross-functional integration. However, apart from this relationship, they also find a direct and negative relationship with new product performance. The authors argue, that this effect may be caused by the fact that this mechanism may lower employee initiatives and cause some loss of flexibility.

2.2.4 Behavioral Processes and Psychosocial Traits

Many researchers highlight the need for CFTs to overcome the barriers between functional departments, which for instance consist of real or perceived differences in personality, departmental culture, use of language, priorities, and measures of success (Griffin & Hauser, 1996, Holland et al. 2000, p. 235). A high quality of communication, cooperation, and an effective management of conflict between functional actors has been labeled "cross-functional integration" (Leenders & Wierenga 2002, p. 315, Song et al. 2002, Xie et al. 2003). Cross-functional integration serves as a collective term for the overall quality of the behavioral processes within CFTs, and is assumed to be an important contributor to the success of cross-functional new product development teams (Leenders & Wierenga 2002, p. 315, Song et al. 2002, Xie et al. 2003). The following sections will present the findings of previous research with respect to facets of cross-functional integration; namely *communication, collaboration and conflict*. However, note that other researchers state to be cautious when considering process variables as critical success factors (2.2.1).

2.2.4.1 Communication

Effective communication has been highlighted as an important element to integrate the diversity of viewpoints within CFTs (Sicotte & Langley 2001, p. 10), and ultimately as an important driver to NPD-success. Pinto & Pinto (1990) refer to communication as the vehicle through which personnel from multiple functional areas shares information. Managerial skills of allocating, monitoring and organizing, which are crucial to new program implementation, become operationalized not until there is communication between the team members.

Several studies support the hypothesis that communication is beneficial to team success. Sethi et al. (2001) identify cross-functional communication (considered as a covariate) as an antecedent for new product innovativeness. In another study (Sethi 2000a), effective communication is found to have a positive effect on new product quality. Based on a sample of 50 cross-functional teams, Hauptman & Hirji (1996) show that frequent two-way communication within teams has a positive influence on team performance. Sicotte & Langley's (2001, p. 25) study demonstrates that horizontal communication is strongly related to project performance, especially in non-routine situations.

However, some authors argue that frequent communication may only be a necessary but not sufficient condition for new product success. For instance, Ayers et al. (2001) note that frequent meetings and interaction alone do not guarantee that participants will abandon narrow and compartmentalized views, and engage in cross-functional teamwork. According to Kahn (1996), what is rather required is collaboration among functions. While collaboration focuses on the willingness to work together and features a high level of goal commitment, informality and shared values, interaction (communication) stands for the formal and coordinated exchange of information. The results of Kahn's (1996) study support this notion. It shows that collaboration is positively related to new product performance, while no significant effect is observed for interaction. In fact some responses even indicate negative effects for phone mail and the exchange of documented information. Ayers et al. (2001) find that communication (labeled as integration) is positively, but weaker related to new product performance than co-operation (labeled as relational norms).

In fact, some authors find that communication effectiveness is rather a result of cooperation between functional individuals (Pinto & Pinto 1990, Alper et al. 1998, p. 35), and therefore one should focus mostly on cooperation. In accordance with Deutsch's (1949) theory of cooperation and competition, Alper et al. (1998, p. 36) note that cooperating people are more willing to share information, discuss opposing ideas, and use higher quality reasoning. In addition, the strength of ties literature (Ganesan et al. 2005, p. 47, Granovetter 1973) suggests that valuable knowledge is more likely to be transmitted through strong ties than through weak ones. This perspective shifts the focus more on the quality and type of communication that is achieved with or without cooperation. In this context, Pinto & Pinto (1990) demonstrate that highly cooperative teams are more effective than less cooperative teams, and that cooperative teams make more use of informal communication.

2.2.4.2 Cooperation

Cooperation (or collaboration) has also been highlighted as a key process element and an important antecedent to the success of cross-functional teams. It is defined as working together to accomplish the work of the team (McDonough 2002). According to Kahn (1996), collaboration expresses interdepartmental relationships that feature a high degree of shared values, teamwork, and mutual goal commitments. The need for cross-functional cooperation stems from the interdependencies among functional members working together on the project (Pinto & Pinot, 1990, Pinto & Pinto 1993, Cp. 2.1.1).

Empirical support for a positive relationship between cross-functional cooperation and performance was found. Kahn's (1996) and Ayers et al.'s (2001) studies reveal a positive cooperation-performance relationship on the department level, and Pinto & Pinto (1993), Pinto & Pinto (1990), and Thamain (2003) demonstrate the same for the project level. As already discussed in section 2.2.4.1, teams showing a high level of collaboration are likely to communicate more effectively and tend to rely more on informal communication modes (Pinto & Pinto 1990).

However, Ayers et al. (2001, p. 146) state that a note on the closeness of cross-functional relationships is warranted. It is possible that cross-functional relationships become so close that they turn out to be dysfunctional ("too good friends syndrome"). For instance, this may be the case when individuals hesitate to point out problems. Too much conformity and harmony in groups may inhibit the debate and critical reflection, which is necessary for innovation (Subin & Workman 2004, p. 125). Janis (1982) refers to this phenomenon as “groupthink” – the psychological drive for consensus, that suppresses dissent and appraisal of alternatives in highly cohesive decision-making groups (Holland et al. 2000, p. 247). Some recent studies lend some support to this notion. It was found that high levels of cross-functional cooperation/ cohesion are not (Subin & Workman 2004) or negatively associated with new product novelty (Sethi et al. 2001). Other studies investigating the cooperation-performance relationship show that their statistical relationship becomes weaker (Hoegl & Gemuenden 2001, p. 444), or even non existent when performance is measured based on managerial ratings or external figures (Ancona & Caldwell 1992b, p. 337, Gladstein 1984). As already mentioned in 2.2.1, Hackmann (1987, p. 317) argues that many types of different behaviors can be productive and that research has not yet found out, what really mediates between inputs and outputs. Consistently, Gladstein (1984, p. 512) and Ancona & Caldwell (1992b, p. 337) highlight to be cautious when interpreting the causal link between certain process characteristics and performance. It might rather be a result of the respondent’s implicit theories of what should have affected performance, but not what has actually affected performance.

2.2.4.3 Conflict

As noted by Ancona & Caldwell (1992b, p. 338) the potential benefits of cross-functional teams might be offset because of team-internal conflicts and misunderstandings, which distract team members from performing their tasks. A common view in the early literature assumed that conflict was always detrimental to both performance and team member satisfaction. However, in recent years research has been re-evaluating the basic assumptions assumed to underlie organizational conflict (Song et al. 2006). For instance, some research recognizes that moderate levels of conflict can be beneficial to team performance (Xie et al. 1998). A moderate level of conflict stimulates information processing since people in conflict confront issues and become aware of different perspectives. On the other hand, when conflict is completely absent, teams might not realize that inefficiencies exist; and when conflict is overly intensive, discussions may be perceived as hostile. This may negatively affect team member’s cognitive flexibility, and impede information processing (DeDreu & Weingart 2003, p. 742).

In addition, it is argued that the (dys-)functionality of conflict depends on the conflict type, and on they way by which conflict is managed. Jehn (1994), Jehn (1995), and Jehn (1997) differentiate between task conflict, i.e. disagreements over work issues, and relationship conflict, i.e. disagreements over personal or social issues (DeDreu & Weingart 2003, McShane & Glinow 2006, p. 412). Relational conflict tends to be emotional and focused on personal incompatibilities. Differences are viewed as personal attacks rather than attempts to resolve an issue, perceptual biases are introduced, and information processing is impeded. Relational conflict is therefore generally considered to be dysfunctional (Amason 1996). On the other hand, when conflict is task related, it is focused on judgmental differences about how to best achieve common objectives (Amason 1996, DeDreu & Weingart 2003). As long as task conflict remains focused on the issue and controlled on a moderate level, it can be potentially healthy and valuable. It may lead team members to re-evaluate the status quo and adapt their objectives and processes more appropriately to their situation (Amason 1996, De Dreu & Weingart 2003, Jehn 1995, McShane & Glinow 2006, p. 41, West 2002).

However, a recent meta-analysis by DeDreu & Weingart (2003) demonstrates that task conflict alone is negatively related to team performance. Yet, the authors do not rule out the possibility that task conflict might result in increasing performance if it is handled in an appropriate manner (p. 747). Based on a survey of work and manager teams, Jehn (1995, p. 274) demonstrates that norms which reflect the acceptance of conflict and promote an unrestricted and constructive atmosphere for discussion, enhance the (beneficial) effect of task conflict. In addition, Chen et al. (2005), Chen & Tjosvold (2002), and Song et al. (2006) presented strong supportive evidence that a constructive and open exchange of conflicting views improves team effectiveness, the quality of decision-making, and leads to more innovation. When investigating the antecedents of a cooperative conflict management, Song et al. (2000 p. 61) identifies superordinate goals, participative management, the early involvement of functions, and job rotation as important drivers.

2.2.5 Additional Success Factors

In addition to the ones mentioned, some other success factors of cross-functional team performance have also been discussed in the literature. To provide a complete picture, this section will give a brief overview of these additional factors found during the literature review.

Katz (1982) finds that team internal and external communication along with team performance declines once *team tenure* exceeds five years. Therefore, it is proposed that teams should be broken up periodically to maintain their creativity in decision-making (Holland et al. 2000, p. 241). Parker (1994) argues that *training* should be provided to help team members and strangers work together effectively. Typically, more effort is invested in the design of the team structure, than in the preparation of the team members to work in highly interdependent relationships (Holland et al. 2000, p. 243). According to McDonough (2000, p. 226), project managers, who gain *commitment and ownership* of their project team members and actively manage their commitment, have a higher probability of achieving the project's goals.[20] Several antecedents have been identified to affect commitment and ownership, including goal setting, team member participation, decentralized decision-making, and top management support (McDonough 2000, p. 226). *Respect and trust* among team members is also highlighted as an additional success factor since it is assumed to lead to a more open communication. Previous research provides evidence that trusting team members are more prepared to share information, seek help, and take the risk of suggesting innovative ideas (Holland et al. 2000). The team leader's interpersonal skills and role model behavior has been found to be a good predictor of trust and respect in cross-functional teams (McDonough 2000). Finally, a positive link between *team members' willingness to change* and the degree of cross-functional integration represents a success factor. The capability to adopt new attitudes and behaviors is found to be a part of effective cross-functional teamwork (Holland et al. 2000, p. 247).

2.2.6 Summary of the Literature Review and Research Gaps

To identify critical factors for the success of cross-functional teams, a significant body of literature has been reviewed. It was found that cross-functional teams are subject to a variety of success factors and to a considerably complex context that spans both outside and inside the team. Cross-functional teams represent an approach to resolve the integration problem formulated by Lawrence & Lorsch (1967). They can also be considered as a response to increased resource dependencies within a firm when complex and innovative initiatives are tackled (Pfeffer & Salancik 1978). Consequently, CFTs differ from conventional teams in terms of their composition. The diversity of team members results in a multifaceted behavioral process. These facets seem to be closely intertwined with each other, and moreover do not seem to be always associated with performance by straightforward and linear relationships.

In addition, cross-functional teams are embedded in an organizational context, to which they strongly respond, interact with, and are dependent from. For instance, this is demonstrated by the importance of boundary spanning activities like top management support. Thus, there are not only immediate attributes that may be directly tackled by the team to lay the foundation

[20] *Commitment* refers to the sense of duty that the team members feel in order to achieve the project's objectives and to the willingness to do what is required for the project's success. *Ownership* goes beyond commitment, in that team members begin to tie their identify to a project's progress (McDonough 2000).

for team performance, but also factors that are outside the realm of the team. Given these findings, the use of cross-functional teams appears not to be an easy and secure warranty to foster creative and faster new product development. Instead, the implementation of CFTs rather turns up to be a first step towards innovation success, and the process of achieving cross-functional performance seems to be a sensitive operation requiring sure instinct and awareness about the described success factors. In order for CFTs to actually become “the royal road to innovation”, an appropriate organizational infrastructure has to be laid out, while at the same time various contingency relationships have to be considered. More precisely, decision makers have to know, which functions to include and when. They have to know, which success factors work best under which condition, e.g. stage of the innovation process or degree of innovation, and which dimension of project performance (creativity and efficiency) is tackled by a certain success factor and when.

Identified research gaps:

For some of the success factors (boundary management, goals, intrinsic motivation), the review of literature clearly indicates a positive influence on performance. However, the results with respect to the remaining success factors are less clear. For some (formalization, review boards, rewards and to a lesser extent budget policies/ resources), the literature presents ambiguous results. It remains an open question whether and under which circumstances these success factors may contribute to the performance of cross-functional teams. Moreover, it is not clear whether these mechanisms can enhance a cross-functional team’s efficiency and creativity at the same time, or if they rather exert diverging effects (Lewis et al. 2002, Naveh 2005). In addition, the effectiveness of some factors (formalization, decentralization, participative decision-making, rewards) might depend on the particular context (degree of innovation, innovation stage, cognitive style). Accordingly, a hasty and un-reflected use of these factors could lead to reduced, insignificant, or even reversed performance relationships. Clearly more research on contingency relationships is needed. Examples of contingency factors that may be further investigated are project risk, project stage, degree of innovation, product program integration, project size, product complexity, project length and national culture.

Most studies only consider a limited set of success factors. Investigations simultaneously considering a broader set of success factors or meta-analysis can shed light on their relative effectiveness. Given the described complexity and amount of potential success factors, further research is needed to investigate in which way these factors interact with each other, i.e. whether, how and under which conditions success factors influence each other’s effectiveness with respect to certain dimensions of team success. The studies of Leenders & Wierenga (2001), Pinto & Pinto (1993), and Xie et al. (2003) may serve as inspiring examples.

Finally, more research on the actual effectiveness of team behavior ("processes") is required. To what extent are collaboration, communication, and conflict really driving CFT-performance? Future research should simultaneously incorporate alternative processes like "effort" or "applied knowledge" to gain insights about the relative effectiveness of behavioral processes. Another fundamental question is to what extent team processes in fact mediate between context and outcome (Ancona & Caldwell 1992b, Gladstein 1984, Hackman 1987). Do appropriate organizational structures really avoid the need to communicate intensively (Sicotte & Langely 2001), or alternatively, do empirical models actually fit better, when processes are considered as moderators (Hoegl & Parboteeah 2003)? Future research investigating these issues should collect performance data based on external or managerial ratings in order to avoid biased results due to the respondents' implicit theories (Ancona & Caldwell 1992b, Gladstein 1984).

2.3 Scope of this Study and Addressed Research Gaps

Troy et al. (2001, p. 89) note that although product innovation is widely considered a cumulative process (including idea generation, product development, testing and launch), yet there is a dearth of empirical research employing a decompositional approach, i.e. an analysis of the success drivers at each stage of the process. *"These gaps in the literature persist despite evidence that organizational characteristics have the potential to differentially affect innovation initiation (i.e. the generation of new product ideas) and innovation implementation (i.e. screening product ideas, developing and testing new products, and launching new products into the marketplace) stages of the process." (p. 90).* This statement is also in accordance with the review of literature, which yields that phase-specific research approaches are almost non-existent.

Therefore, this study will respond to the need for more research on the particular success drivers at different stages of the innovation process (Adler 1995, Garrett et al. 2006, Henard & Szymanski 2001, Olson et al. 2001, Troy et al. 2001) and will test a contingency model for the phase-specific design of cross-functional new product development projects (Duncan 1976, Souder & Moenaert 1992). Hereby, the study will *also* address the question, if certain success drivers rather qualify for enhancing a team's efficiency or a team's creativity (Lewis et al. 2002, Naveh 2005). The focus of this study is on the *direct effects* of organizational context on team performance. Behavioral processes (communication, collaboration, conflict) are not considered within this study. This is because of the discussed weaknesses and complications that occur when behavioral processes are included within models of group effectiveness (Cp. section 2.2.1).

Although some research has been conducted to study the stage specific effects of organizational drivers, no study has investigated this issue within the context of cross-functional teams. Moreover, previous studies focus only on a limited set of two or three antecedents, like formalization, decentralization, and diversity (Damanpour 1991, p. 580, Marino 1982, Troy et al. 2001).[21] However, the literature review indicates that the effectiveness of other mechanisms, like participative decision-making within the team, rewards, budgets, and review boards may also depend on the particular stage of the innovation process (Cp. 2.2.3). Therefore, the influence of nine project management instruments and organizational antecedents on a cross-functional team's efficiency, creativity, and overall performance in the early and late stages of the innovation process will be investigated. Table 2 displays the investigated antecedents, which at the same time reflect the organizational success factors that have been discussed within the literature review.[22] The selected antecedents correspond to a representative mixture applied in cross-functional new product development projects. They are distinguished by organic and mechanistic structures (Burns & Stalker 1961), and boundary spanning activities (Ancona & Caldwell 1992a, Weinkauf et al. 2005, p. 100).[23]

[21] Marino (1982, p. 79) investigates the effects of formalization and decentralization during the stages of affirmative action programs. Troy et al. (2001) investigate the effects of formalization and decentralization when new product ideas were generated within work groups. Damanpour (1991) conducts a meta analysis on the phase specific effects of formalization, centralization, and functional differentiation.

[22] Out of the discussed success factors within the organizational context (Cp. the review of literature), goals are not investigated within this study since it is assumed that their effect can be also captured by the existence of rewards. The success factor "Important challenging tasks and intrinsic motivation" will be considered as a covariate.

[23] Appendix I discusses the assignment of the antecedents to these categories and provides evidence that justifies this categorization from the literature review.

Table 2. Investigated Project Management Mechanisms and Organizational Antecedents

Organizational Antecedents	Defined as
Organic Structures	
Decentralized decision-making structures	...the extent to which project decisions can be made without referring to higher management / escalation levels.
Participative decision-making within the team	...the extent to which team members are involved in the decision-making processes.
Central budget	...budget provided by a central function and not by an operational unit.
Physical proximity	...the extent to which team member are easily reachable on foot and the extent to which it is easy to get together for spontaneous meetings.
Mechanistic Structures	
Rewards	...the extent to which team members are rewarded for their participation and/ or the extent to which working in the project is captured in target agreements.
Project formalization / structuring	... the extent to which the project is planned by clear and specified guidelines and the extent to which the execution of the project follows a structured approach.
Steering committees	...the number of meetings and the relevance of this mechanism for the project management.
Boundary Management	
Integration with functional departments	... the extent to which information with internal functional units is exchanged and the quality of the cooperation and coordination with internal functional units.
Top management support	...the extent to which the top management supports cross-functional teamwork and takes part in the project by providing resources and giving feedback.

Chapter 3 will outlay the theoretical framework and hypothesis for the phase-specific effectiveness of organizational antecedents in cross-functional new product development projects. The hypothesis related to the phase-specific effectiveness of organic and mechanistic structures build on Duncan's (1976) concept of the ambidextrous organization, and on the closely related information uncertainty reduction model proposed by Souder & Moenaert (1992). The hypothesis related to the phase-specific effectiveness of boundary spanning activities build on resource dependency theory (Pfeffer, 1982, Pfeffer & Salancik 1978).

3 Theoretical Framework for the Phase-specific Effects of Organizational Antecedents in Cross-Functional New Product Development

Duncan's (1976) and Souder & Moenaert's (1992) theories are based on distinguishing between mechanistic and organic organization designs. Moreover the theoretical framework of this investigation, requires an understanding of the specific stages of the innovation process and their characteristics. Therefore, Burns & Stalker's (1961) concept of organic and mechanistic organizations (3.1) will be discussed initially. It is followed by a presentation of the innovation process and its stages (3.2) and a discussion of the stage specific (and uncertainty-related) information processing requirements of the innovation process representing important characteristics (3.3). As indicated, the theoretical fundament for the phase-specific effectiveness of organic and mechanistic structures relies on Duncan's (1976) concept of the ambidextrous organization, and on the closely related information uncertainty reduction model proposed by Souder & Moenaert (1992) (3.4). The theoretical fundament related to the phase-specific effectiveness of boundary spanning activities relies on resource dependency theory (Pfeffer 1982, Pfeffer & Salancik 1978) (3.5).

3.1 Theory of Mechanistic and Organic Organizations

A classic distinction in organizational thinking is between situations than can be characterized as predictable, well understood or routine, and situations that can be described as unpredictable, uncertain or non-routine (Burns & Stalker 1961, Eisenhardt & Tabrizi 1995, Galbraith 1973). A prominent implication of this distinction involves that when situations are predictable, then an organization can plan and organize its activities to rely on routine and bureaucratic systems. When uncertainty is high, then an organization adjusts to this lack of information by being more experimental, flexible, and improvisational.

The central premise of Burns & Stalker's (1961) theory is that as rates of environmental change vary, organizations require different systems of control, information processing, and authorization (Burns & Stalker 1961, Courtright et al. 1989, p. 773). The authors describe two organizational structures representing a continuum along which organizations can be located. Mechanistic structures are assumed to be more appropriate for stable environments, while organic structures qualify better for changing and innovative environments.

Mechanistic structures are characterized by a narrow span of hierarchical control and a high degree of formalization and centralization. They imply an emphasis on rules and procedures, limited decision-making at lower levels, tall hierarchies in specialized roles, and vertical rather than horizontal flows of communication and coordination. Tasks are exactly defined and altered only when approved by higher authorities (Burns & Stalker 1961, McShane & Glinow 2006, p. 569). The communication in mechanistic systems involves a managerial top-down command style in which higher level instructions and decisions govern operations and procedures. Supervisors place more emphasis on setting the route and defining the limits than on negotiation and feedback (Courtright et al. 1989, p. 774). Mechanistic structures are more qualified for stable environmental conditions and routine operations. They do not encourage employees to try new ways of doing their work (Shalley & Gilson 2004, p. 45, Woodman et al. 1993, p. 314). The more stable the environment, the more is it possible to specify and standardize tasks. Under such conditions, this approach is effective. On the other hand, in unstable and dynamic environments mechanistic structures are considered not flexible enough in responding to external change. Formalized procedures and strict authorities do not allow for flexibility in finding appropriate responses to altered conditions.

Organizations with an organic structure reside on the other side of the continuum. They are characterized by a wide span of control, high levels of autonomy over work procedures and work standards, and participative decision-making. Tasks are fluid and adjusting to new situations and organizational needs. The organic structure values knowledge and takes the view that information is located anywhere in the organization rather than exclusively among senior executives. Control, authority, and communication are problem specific, and expected to always shift to the most knowledgeable parties (Burns & Stalker 1961, Courtright et al. 1989, p. 775). The communication is rather consultative and places emphasis on negotiation and discussion. It flows in all directions with little concern for the formal hierarchy (Burns & Stalker 1961, Marino 1982, p. 76, McShane & Glinow 2006, p. 569). Organic structures are applied to unstable conditions when problems and requirements cannot be broken down and distributed among specialists within a defined hierarchy. The open exchange of information across all functions enhances the search for, and the generation of non-routine solutions (Woodman et al. 1993, p. 314). In addition, their loose structures enable organic organizations to adapt quickly to new situations. However, a potential shortcoming of organic structures may be that informal communication patterns and participative decision-making are more time consuming and less cost efficient when compared to centralized and bureaucratic processes (Olson et al. 1995).[24]

[24] See Appendix I for a discussion of the organic and mechanistic structures within the context of this study.

3.2 The Innovation Process – The Characteristics of the Early and the Late Stage

Development projects progress through a series of stages, such as opportunity identification, idea generation, concept development, product design, testing, process design, and commercialization (Olson et al. 2001, p. 261). Following other scholars (Duncan 1976, Hoegl & Weinkauf 2005, Schulze & Hoegl 2006, Souder & Moenaert 1992, Olson et al. 2001) the innovation process can be broken down into two general stages: "Initiation" (also referred to as the "concept phase") and "implementation" (also referred to as the "development phase and market launch"). Whereas the *early* concept phase is about generating new ideas and defining a new product, the *late* development phase is about translating the concept into the marketable product, and integrating it into the firm's regular business processes (Duncan 1976, Schulze & Hoegl 2006). Schulze & Hoegl (2006) point out that these two project phases are not always entirely distinct and single activities may overlap each other. However, the primary objectives and project activities will shift over time (Naveh 2005, p. 2794).

During the initiation stage, the project team gathers information with the aim of generating, evaluating, and planning the potential innovation. Initial ideas are developed into product specifications. The emphasis is on determining and evaluating the future product in its key dimensions, rather than suggesting concrete technical solutions. The product concept will contain a description of the future products properties, such as functionality, durability, and costs. In addition, several strategic decisions are being made, for instance regarding target markets and competitive positioning. Typical activities of a project team during this stage are market research, idea generation, evaluation of promising technologies, feasibility analysis, and finally, the development of a business plan. The aim is to move from a general idea to a defined set of product characteristics. This will ultimately lead to the decision to continue, or not to continue with the development (Duncan 1976, Hoegl & Weinkauf 2005, Schulze & Hoegl 2006, Souder & Moenaert 1992). A *reference point for the ending of the early stage* marks the acceptance of a business plan, or more general, the decision to continue and translate the product concept into a marketable product.

During the implementation stage, the necessary actions are undertaken to develop and finally launch the new product. The product specifications are translated into design plans and the technical development is conducted. Central to this phase is the implementation of concrete technical solutions to meet the defined set of product characteristics. This phase tends to involve larger resource commitments than the concept phase. Typical activities during this stage include the development of prototypes, product testing, the actual development and the launch of a marketable product. The implementation stages typically ends with the market launch (Duncan 1976, Hoegl & Weinkauf 2005, Schulze & Hoegl 2006, Souder & Moenaert 1992).

3.3 Differing Information Requirements and Levels of Uncertainty During the Early and Late Stages of the Innovation Process

As indicated, central to the initiation stage is to become aware of alternative product configurations, to search for, and to propose new courses of action (Duncan 1976, pp. 170-172). On the other hand, critical to the implementation stage is the development according to predefined product specifications, and the implementation of the new initiative into the firms ongoing business processes (Duncan 1976, p. 170). Whereas the initiation stage requires the firm to be strategically responsive and to react to change and new demands, the implementation stage deals with operating problems and is concerned with carrying out defined activities in the most efficient manner (Naveh 2005, p. 2794).[25]

Souder & Moenaert (1992) point out that the innovation process includes *varying information requirements, and that different levels of uncertainty relate to its particular stages*.[26] There are technological, market, competitive uncertainties and uncertainties related to the specific resources that are needed to reduce the aforementioned uncertainties (Souder & Moenaert 1992, pp. 487-488). From an uncertainty perspective, the major challenge facing the innovation task consists of identifying as much of the potentially relevant uncertainty, i.e. reducing the variability of a task, and identifying the instruments to reduce uncertainty, i.e. increasing the analyzability of a task (Souder & Moenaert 1992, p. 493). If product innovation is considered to be a process of uncertainty reduction, a new product development team tries to make a trajectory from relatively low task analyzability and high variability (non-routine task), to a relatively low task variability and high task analyzability (routine task).

Whereas uncertainty reduction during the planning stage is mainly related to the transfer of innovative information (i.e. information that is helpful in problem solving, information on experimental, analytical and explanatory aspects), Moenart & Souder (1992) expect that the transfer of coordinative information (i.e. information concerning the tasks and the time sched-

---

25 Naveh (2005, p. 2794) notes that *"innovation needs to be emphasized in the early stages so that teams seeking new ideas are galvanized, and in the later stages it is efficiency that has to be emphasized, enabling routine orientation in order to successfully complete the project."*

26 Uncertainty is defined as the difference between the amount of information required to perform a particular task and the amount of information already possessed by an organization (Souder & Moenaert 1992, p. 487, Galbraith, 1973). Uncertainty consists of two main elements: *"The variability of a task"*, which refers to the amount and variation by which uncertainty emerges, and *"the analysability of a task*" referring to extent to which there are known procedures to identify uncertainty and reduce it.

ules assigned to team members, and the output expected) will gain impact during the late stage of a project (Naveh 2005, p. 2794, Souder & Moenaert 1992, p. 497). However, Souder & Moenaert (1992, p. 496-497) also propose a minimum of coordinative information exchange in the planning stage, because of the simple fact that the project personnel has to interact with each other, and therefore needs to be informed about each other's activities. On the other hand, innovative information transfer has its main impact during the planning stage. It should level off during the late project stage, because otherwise it will restart the innovation process again and lead to delays of decisions and actions.

Since the exchange of innovative information is aiming at reducing uncertainty, or alternatively is aiming at collecting the relevant knowledge that is necessary for successful innovation (Souder & Moenaert (1992, p. 487-8), and since creativity has been defined as an outcome, focusing on the production of new and useful ideas concerning products, services, and procedures (Shalley et al. 2004, p. 34), *creativity may also be considered as a result of the successful transfer of innovative information*. Similarly, since the transfer of coordinative information is aiming at distributing information concerning tasks and time schedules assigned to team members and outputs expected (Souder & Moenaert 1992, p. 497), and since efficiency is expressed in meeting time-to-market and cost objectives (Naveh 2005, p. 2791), *efficiency may also be considered as a result of the successful transfer of coordinative information*.

In sum, Souder & Moenaert (1992) propose that the transfer of innovative information (creativity) is only relevant at the outset of the project, while the transfer of coordinative information is relevant throughout the entire innovation process. Furthermore the level of uncertainty is expected to decrease when the project proceeds from the early to the late project stage. These notions have important implications for the phase-specific selection of appropriate organizational infrastructures to support these facets of performance.

3.4 Phase-specific Organization Structures for Innovation Projects

Given the different tasks of the innovation process and based on varying information requirements, and on the varying levels of uncertainty, Duncan (1976) and Souder & Moenaert (1992) propose that different organizational designs are most effective in the two different stages. Under high levels of uncertainty, an organic project management design is the more effective mode for the early stage, whereas a mechanistic structure is the key driver to team performance in the implementation stage since uncertainty is low (Tushman et al. 2004, p. 7).

The switch is necessary, because those organizational characteristics that facilitate the initiation may impede the implementation of innovation and vice versa (Duncan 1976, p. 173, Naveh 2005, p. 2790). For example, organic structures foster cross-functional information exchange and creativity. They do not restrict the search for new alternatives and allow for flexibility, while this would be the case for mechanistic structures. On the other hand, mechanistic structures would better guarantee the clarification of roles and responsibilities, as well as the adherence to budgets and deadlines through detailed planning and monitoring procedures when a product is under development. However, this would not be the case for organic structures (Duncan 1976, p. 172, Souder & Moenaert 1992, p. 498).

The optimal structure of the organization is therefore contingent on the particular stage of the innovation process, implying that the organization has to shift its structure as it moves through the various stages of innovation (Duncan 1976, Naveh 2005, p. 2794). Consistently with Duncan (1976) and Souder & Moenaert (1992), Naveh (2005, p. 2794) notes: *"(...), early stages require more innovation, which could be gained by providing engineers with flexibility, autonomy, and freedom. However, in the late stages, implementation becomes the major issue and more co-ordination and control are required."*

In order to define under which conditions an organization should shift its structure, Duncan (1976, p. 182) defines switching rules. These rules relate to the need for innovation, the level of uncertainty, and the complexity (radicalness) of the innovation. The greater the need, the uncertainty, or the complexity, the more the organization should use different structures for the two stages. For instance, when uncertainty or complexity is high, the information needs during the initiation stage are going to be high as well. This requests organic structures and high levels of cross-functionality. Subsequently, more specific rules and procedures are required during the implementation stage. This is necessary because the members of the organization need to understand how the development process applies to their role and to guarantee the efficiency of the development.[27]

In order to facilitate the shift between structures, Duncan (1976) recommends to increase the organizational ability to confront conflicts, to foster interpersonal relationships between func-

[27] In contrast to Duncan (1976), Souder & Moenaert (1992) also argue that the intensity of the switch should depend on how efficient the uncertainty reduction during the planning stage has been. A high level of formalization (centralization) will only contribute to the success of the development stage, if the initial uncertainty reduction has been efficient. If there remains uncertainty during the development stage, the authors propose that medium levels of formalization (centralization) are more effective.

tional members, to apply the described switching rules, and to institutionalize, and communicate the process of shifting structures by means of top management support.[28]

3.5 Boundary Management As a Continuous Requirement for Successful Innovation Projects

As indicated in section 2.2.3.1, boundary management is the process by which teams initiate interactions with, and respond to communication from other parts of the organization (Gladstein 1984, Holland et al. 2000, p. 246). The underlying assumption for the effectiveness of boundary management is that groups are considered as open systems, which depend on diverse sources inside and outside the organization with respect to resources, information, and support (Aldrich & Herker 1977, Weinkauf et al. 2005, p. 99).

This notion relies on resource dependency theory which assumes that organizations are not internally self-sufficient with respect to their critical resources (Pfeffer 1982, Pfeffer & Salancik 1978, Stock 2006, p. 589). *"They require resources from the environment and, thus, become interdependent with those elements of the environment with which they transact" (Pfeffer 1982, p. 192-193).* From this perspective, a central challenge for teams and organizations is to manage their boundaries with focal sources inside and outside the organization. Thus, resource-dependence theory provides a theoretical explanation as to why boundary spanning activities may increase a cross-functional team's effectiveness (Weinkauf et al. 2005, p. 102).

Within the context of CFTs, intra-organizational dependencies exist in particular with respect to the top management and the functional departments (Ancona & Caldwell 1992a, Weinkauf et al. 2005, p. 100). Deadlines for inputs, outputs, and workflow procedures have to be negotiated between the team and functional departments, information regarding markets and technologies has to be obtained, and results have to be promoted (Ancona 1990, Ancona & Caldwell 1992a, p. 324, Ancona & Caldwell 1992b, p. 637, Gladstein 1984, p. 513). Top management support is important to surmount obstacles, and to help to integrate the newly developed product into the firm's regular operations without friction (Ancona & Caldwell 1990, Ancona & Caldwell 1992a, Ancona & Caldwell 1992b, Gladstein 1984, p. 513, Hitt et al. 1999, p. 148, Holland et al., 2000, McDonough 2000, p. 225, Weinkauf et al. 2005, p. 100). In addition, Duncan (1976) highlights top management's role to institutionalize, communicate,

---

[28] For instance, conflicts may occur due to an increased need for cross-functionality in the initiation stage or due to the reduction of authority in the implementation stage. Interpersonal relations between functions have to be fostered, because these functions are required to work together more intensively. Finally, top management's role is to institutionalize, communicate, and stand up for the dual structure in order for it to become accepted in the organization (Duncan 1976, p. 185).

and to stand up for a phase-specific management of innovation processes in order for it to become accepted in the organization (Duncan 1976, p. 185).

The described range of activities indicate that CFTs are *dependent* from the two described sources inside the organization *throughout the entire innovation process*. Therefore, boundary spanning appears to be *equally relevant and effective during the entire innovation process*. In the early stage, the information exchange between the team and functional departments serves to reduce market-, and technology related uncertainties, while during the late stage deadlines and workflow procedures regarding the development have to be negotiated. Early top management support is likely to result in greater resources and willingness to take risks, while late top management support may facilitate the new product's implementation by reducing resistance.

Furthermore, boundary management may not only be useful in facilitating the exchange of innovative and coordinative information, but it may also help the team to move forward at all (e.g. obtaining resources, reducing resistance). Hence, the beneficial effects of boundary spanning activities may not be entirely captured by team efficiency and creativity. By paving the road for the innovation to become accepted within the organization, boundary spanning may also have a direct effect on overall team performance, i.e. on the achievement of the team's goals and the overall quality of the results achieved by the team.

3.6 Interim Conclusion: Research Questions and Further Proceeding.

A theoretical framework has been presented to constitute the phase-specific effectiveness of organizational antecedents in product development projects. In order to evaluate the validity of the presented theories, several research questions will be derived. They condense the main statements and will serve as guidelines for the subsequent development of the conceptual models and its hypothesis:

1. *To what degree are creativity and efficiency related to the performance of cross-functional teams in the early and in the late stages of a NPD-project?*

   Is there empirical evidence that creativity, as a proxy for the successful transfer of innovative information among team members, is primarily relevant during the early stages of cross-functional projects? Is there empirical evidence that efficiency, as proxy for the successful transfer of coordinative information, is primarily relevant during the late stages of a project, and also (even if to a lesser extent) during the early project stages (Naveh 2005, Souder & Moenaert 1992, Cp. 3.3)?

The initial analysis of this question is necessary, because efficiency and creativity represent the main dependent variables, when the phase specific effectiveness of organizational infrastructures will be analyzed (Cp. research question 2 and 3). It is therefore advisable to begin with an assessment of the relevance of efficiency and creativity for other facets of new product development performance, i.e. financial success and product quality, before the associations between organizational context, efficiency and creativity are investigated. This ensures relevant models.

2. *What is the impact of organic and mechanistic structures during the course of a project, and how are they related to the creativity and efficiency of a team?*

   Are organic structures only beneficial during the early project stage? Are they detrimental to the late project stage? Are mechanistic structures only beneficial during the late project stage? Are they detrimental to the early project stage? (Duncan 1976, Souder & Moenaert 1992, Cp. section 3.4)*?*

3. *What is the impact of boundary spanning activities during the course of a project, and how are they related to the creativity, efficiency and overall performance of a team?*

   Are boundary spanning activities beneficial during the early and during the late project stage? (Ancona & Caldwell 1990, Ancona & Caldwell 1992a, Ancona & Caldwell 1992b, Gladstein 1984, p. 513, Hitt et al. 1999, p. 148, Holland et al. 2000, p. 242, McDonough 2000, p. 225, Weinkauf et al. 2005, p. 100, Cp. section 3.5).

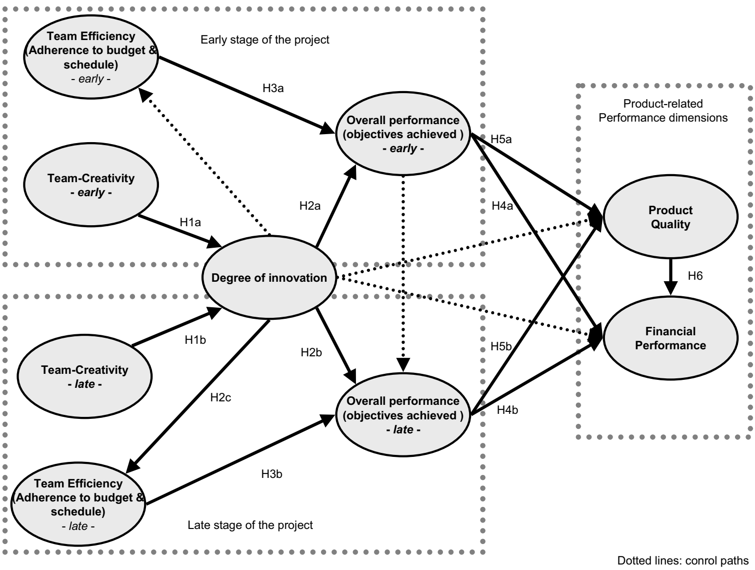
The presented questions will be broken down into three different models. This is necessary in order to reduce the high complexity and to generate models, which allow for empirical testing. Each model will deal with a different aspect of the presented questions. Model I addresses research question 1. It will investigate the effects and the relevance of creativity and efficiency during the early and during the late project stage for new product development success. Model II and III will deal with the question on how efficiency, creativity and overall team performance are affected by organizational infrastructures throughout the course of a project. Model II focuses on research question 2 a) and 3 a). It will address the effects of organic and mechanistic structures, and boundary spanning activities during the early stage. Model III focuses on research question 2 b) and 3 b), and addresses the effects of mechanistic and organic structures, and boundary spanning activities during the late project stage.

3.7 Conceptual Models and Hypothesis

3.7.1 The Phase-specific Effects of Creativity and Efficiency (Model I)

Duncan (1976) and Souder & Moenaert (1992) argue that the early and the late stage of an innovation project have different information requirements in order to be successful.[29] This section will outlay the hypothesis to test the phase-specific effects of team creativity and efficiency (Cp. section 3.3). Figure 3 displays the hypothesized relationships and control paths. Within an additional analysis (3.7.1.2), the relationships between early and late performance and product quality and financial performance will be hypothesized. Assessing the phase-specific relevance of efficiency and creativity for new product development success is important because efficiency and creativity represent the main dependent variables when the phase-specific effectiveness of organizational infrastructures is investigated within Model II and III.

Figure 3. Model I - The Phase-specific Effects of Creativity and Efficiency.



29 *Early stage* activities include idea generation, market research and technology assessments, feasibility checks, design and the development of a business plan. The *early stage ends* with the decision to transform an idea into a marketable product and/ or the acceptance of a business plan. *Late stage* activities include the development of prototypes, the actual development of the product, testing and market launch. *The late stage ends* typically with the market launch of a new product (Cp. section 3.2).

3.7.1.1 The Phase-specific Relationships Between Team Creativity, Team Efficiency, Degree of Innovation and Overall Performance

New product teams are facing a highly uncertain and complex task. There may be times of creativity alternating with periods when efficiency is the principal outcome of interest (Ancona & Caldwell 1992a, p. 636). During the *early* project stage the team is required to develop and generate alternative ideas in response to a perceived need for innovation. Customer requirements and creative ideas serving these requirements are translated into product specifications which define the new product. Teams have to reduce technological and market related uncertainties (Souder & Moenaert 1992). The *late* development stage is about translating the new product concept into a marketable product and integrating it into the firm's regular business processes (Duncan 1976, Schulze & Hoegl 2006, Cp. section 3.2).

West (2002, p. 356) argues that innovation represents a two-component process. Creativity is the development of ideas while innovation implementation is the application of new ideas. While creativity is an essential component of innovation, it can be rather conceptualized as a necessary first step or as a vital precondition for innovation (Naveh 2005, p. 2794, Shalley & Gilson 2004, p. 35). Similarly, Souder & Moenaert (1992) argue that it is the early transfer of innovative information (i.e. information that is helpful in problem solving, information on experimental, analytical and explanatory aspects) that reduces customer related, technology related or competitive uncertainties.

Because it is only the team's creative efforts during the early and not during the late project stage that define the new product concept, it is argued that it is only early team creativity that affects the degree of innovation.[30] As the new product concept and its characteristics are defined, there is less need for creativity (Souder & Moenaert 1992, Naveh 2005, p. 2794, West 2002, p. 358). If the late stage of an innovation project is mainly about translating an (already) elaborated concept into marketable product, then the degree of innovation is not affected by late team creativity.[31]

> *H1: a) There is a positive relationship between early team creativity and the degree of innovation. b) There is no significant relationship between late team creativity and the degree of innovation.*

---

[30] The degree of Innovation is the extent to which a product is new to the firm and/ or new to the customer (Cp. section 4.3.1).

[31] Even though it could be argued that creativity is essential throughout the entire innovation process, the general requirements for creativity are higher at the early project stage (Souder & Moenaert 1992, West 2002, p. 358). Hence, at the outset, creativity dominates, but it is superseded later by the innovation implementation process (West 2002, p. 356). Yet, it serves to assess the relevance of creativity and efficiency for other dimensions of product development performance.

The development and generation of alternative ideas in response to a perceived need for innovation represents the central task during the early project stage (Duncan 1976, Schulze & Hoegl 2006, Cp. section 3.2). Therefore, it is likely that the generation of an innovative concept (represented by the degree of innovation) will have a positive impact on overall early team performance.[32]

However, during the late project stage, this relationship is likely to be reversed. First, the higher the radicalness, and therefore, the organizational impact of an innovation, the more likely it is that there is ambiguity, conflict, and resistance during the implementation stage (Damanpour 1996, p. 154, Duncan 1976). Political sponsorships are more likely to erode, so that the project is rejected by the existing power structure (Dougherty & Hardy 1996, p. 1122).[33] Without any organizational support, the development and organizational adoption of highly innovative products is likely to fail (Duncan 1976, Taylor & McAdam 2005, p. 31). Second, new product ventures might fail because it results difficult to connect highly innovative solutions to the firm's ongoing operations. Highly innovative products require major changes in the existing technology, and manufacturing processes. They disturb the existing balance among products, technology, and manufacturing systems (Sethi 2000a, p. 4). Moreover, team members and the organization are more likely to be overwhelmed with the realization of unfamiliar issues.

A study conducted by Vandevelde & Van Dierdonk (2003, p. 1339) supports this notion. Their analysis reveals that the higher the complexity and uncertainty of a new product, the more difficult it is to realize a smooth production start-up. In addition, Naveh (2005) demonstrates that high levels of innovation lead to decreased levels of overall efficiency in NPD projects. However, the researcher does not differentiate between early and late efficiency.

> *H2: a) There is a positive relationship between the degree of innovation and early overall team performance. b) There is a negative relationship between the degree of innovation and overall late team performance. c) There is a negative relationship between the degree of innovation and late team efficiency.*

---

[32] *Overall Performance* measures the extent to which a team is rated as successful and the extent to which the project management is satisfied with the team performance relative to the results achieved in the particular stage of the project (Cp. 4.3.1).

[33] For instance, political sponsorships may erode because the new product innovation may cannibalize or replace existing products within a firm. The managers in charge for these existing products may try to avoid this by opposing the new product.

In contrast to creativity, which is supposed to have its main impact on team performance during the early project stage, researchers such as Souder & Moenaert (1992) and Lewis et al. (2002, p. 551) argue that exchanging coordinative information and operating efficiently is an important requirement throughout the entire innovation process.[34]

For instance, during the early project stage team members have to coordinate the directions of their search for alternative solutions. Intermediate conclusions have to be exchanged, feedback has to be obtained, and results have to be evaluated. In addition, team members have to be aware that they have to deliver a practicable concept within a given time span and that their resources are not unlimited. In this sense, their creative activities are embedded in the consciousness to deliver a feasible solution at the end of the early project stage. Therefore, it is likely that efficiency is a relevant performance dimension during the early project stage and will impact overall team performance.[35] During the development stage, the project team is "under the gun" to solve technical problems, develop, and test prototypes, while it is required to meet goals regarding schedule, budget, and quality specifications (Schulze & Hoegl 2006). The exchange of coordinative information is expected to be highest (Souder & Moenaert 1992). As this phase also tends to involve larger resource commitments than the concept phase, a strong emphasis is likely to be placed on efficient operations, i.e. on meeting time and cost objectives (Naveh 2005, p. 2791).

H3: a) There is a positive relationship between team efficiency and overall team performance during the early project stage. b) There is a positive relationship between team efficiency and team performance during the late project stage.

3.7.1.2 The Relationships Between Overall Performance, Product Quality and Financial Performance (Additional Analysis)[36]

Innovation involves the generation of a novel idea and its implementation (Shalley & Gillson 2004, Taylor & McAdam 2004, West 2002). The early project stage is expected to contribute to the financial success of a product by positioning and shaping the product's properties in

[34] For a different view, cp. Naveh (2005, p. 2794), stating that efficiency is mostly relevant during the late project stage.

[35] Note, that Model II will deal with the question on how to achieve efficiency during the early stages.

[36] This is an additional analysis, which is not central to the investigation of the main research questions (Cp. 3.6). The analysis of the relationships between overall team performance, product quality and financial performance was included because additional data was available. Therefore it is possible to determine the relevance of late/ early overall team performance for product related success dimensions like financial success and product quality. Although hypothesis will be presented, the research interest within this analysis is not theory-driven, but rather explorative.

order to fulfill emerging market needs; the later project stage is concerned with the cost- and time efficient translation of the concept into a marketable product, offering high quality and reliability. Therefore, it is assumed, that the overall level of performance achieved in both stages is likely to have an equal impact on the financial performance of a product.

H4: a) Overall team performance during the early stage has a positive impact on the financial success of the product. b) Overall team performance during the late stage has a positive impact on the financial success of the product.

The early project stage is characterized by the search for a solution, rather than by suggesting concrete technical solutions. During the development stage, the project team focuses more on solving concrete technical problems and on testing prototypes. The expertise to solve engineering and production problems will play a more important role in the later stages (Olson et al. 2001). Hence, meeting the specified quality specifications of the product will represent an essential element in the later project stage, while it will play a minor role during the early project stage (Naveh 2005, p. 2795, Schulze & Högl, 2006). Efficiency and standard procedures, which are assumed to dominate in the later stages of the innovation process, are also expressed in aspects of good quality (Naveh 2005, p. 2792).[37] Therefore, it is proposed, that product quality is mainly influenced by team performance in the second stage.

H5: a) Overall team performance during the early stage does not have a positive impact on product quality. b) Overall team performance during the late stage has a positive impact on product quality.

An important precondition of a new product's market success and profitability is its quality (Aaker & Jacobson 1994, Clark & Fujimoto 1991, Garvin 1988, Jacobson & Aaker 1987, Philips et al. 1983, Sethi 2000, p. 1). In addition, it is frequently the case that new product quality fluctuates, since such products have not had the chance to benefit from production experience and market feedback. Unmet quality expectations during the beginning of a product's lifecycle are one of the principal reasons for a product to fail (Lukas & Menon 2004, 1259).

H6: Product Quality has a positive impact on the financial success of the product.

---

[37] Quality is reflected in product dimensions such as appearance, performance, workmanship, and life/durability (Aaker & Jacobson 1994, Clark & Fujimoto 1991, Garvin 1988, Jacobson & Aaker 1987, Philips et al. 1983, Sethi 2000, p. 1).

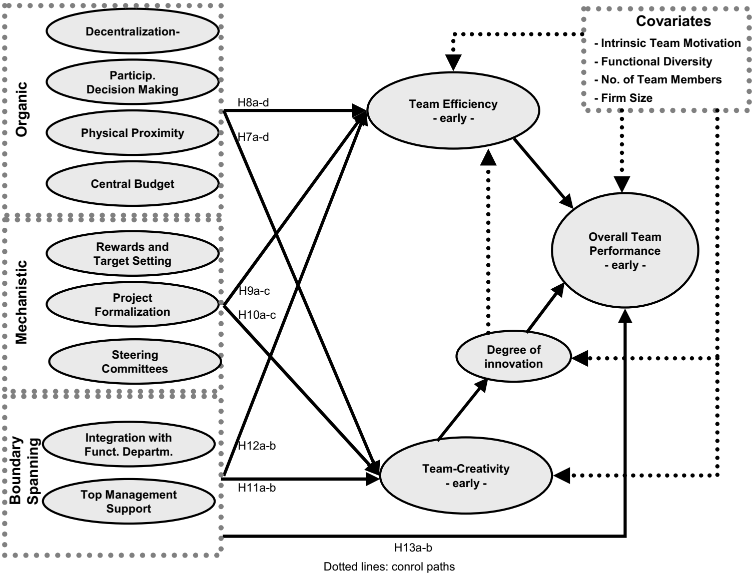
3.7.1.3 Other Potential Antecedents (Control Paths)

In addition, several control paths are considered. This is necessary in order to control for the effects of other variables that presumably affect the performance of a team and to better identify the unique effects of the investigated antecedents (Stock 2006). Since innovation is considered as a process, whose stages gradually build on each others results (Cp. 3.2), it is likely that *early overall performance* will have an impact on *late overall performance*. Hence a control path between these constructs is added. The association between the *degree of innovation and product quality* is likely to be negative (Sethi 2000a, Cp. H2b, c). In addition, control paths between *degree of innovation and early team efficiency* and between the *degree of innovation* and *financial performance* are integrated into the model. The first path is added, because the degree of innovation may have an impact on the early efficiency of a team (Cp. H2b-c). The identification of a truly novel solution tends to increase the requirements of a team in terms of budget and time. The second path is added due to presumably higher risks and slower diffusion patterns of highly innovative solutions.

3.7.2 The Effects of Organizational Antecedents in the Early Project Stage (Model II)

Within this section, it is argued that lower bureaucratic control (i.e. organic structures) facilitates the initiation of innovation, while higher bureaucratic control (i.e. mechanistic structures) is likely to have a negative impact on early team performance (Damanpour 1996, p. 154, Duncan 1976, Marino 1982, Tushman et al. 2002, p. 7). Furthermore, it is assumed that early boundary spanning activities have beneficial effects on early team creativity, efficiency, and overall performance (Ancona & Caldwell 1990, Ancona & Caldwell 1992a, Ancona & Caldwell 1992b, Gladstein 1984, p. 513, Hitt et al. 1999, p. 148, Holland et al. 2000, p. 242, McDonough 2000, p. 225, Weinkauf et al. 2005, p. 100). Figure 4 displays the hypothesized relationships and additional control paths.

Figure 4. Model II - Effects of Organizational Antecedents in the Early Project Stage.



3.7.2.1 The Effects of Organic and Mechanistic Structures on Team Efficiency and Creativity During the Early Project Stage

Duncan (1976) assumes that organic structures facilitate the initiation of innovation, while the use of mechanistic structures is detrimental to the early stage (Duncan 1976, Tushman et al. 2002, p. 7). However, although Duncan (1976) theorizes that organic structures enhance creativity, he does not particularly address the effects of mechanistic and organic structures on early efficiency. Some scholars (Lewis et al. 2002, Naveh 2005, Olson et al. 1995, pp. 51, 59) point out that organic structures are generally not positively associated with efficient operations, while this is generally the case for mechanistic structures. *"Efficiency demands standardization, control, and conformity to rules and procedures" (Naveh 2005, p. 2790).* Therefore, one could assume that mechanistic structures are at least not detrimental to early efficiency.

Yet, the key assumption within this section is that mechanistic structures will impede efficiency in the early project stages, because they require certainty in order to guarantee efficient operations (Burns & Stalker 1961, Daft & Lengel 1986, p. 562, Souder & Moenaert 1992, p. 4). For instance, Daft & Lengel (1986) argue, that while formal rules, regulations, information systems, and reporting procedures are capable of handling large quantities of factual information, these mechanisms will be inadequate under conditions of high equivocality. In such situations rich information media such as face-to face meetings and personal contact are required to provide opportunities for people to debate issues, develop consensus on problem definitions, and share understanding (Daft & Lengel 1986, Sicotte & Langley 2000, p. 4). On the other hand, organic structures will foster early efficiency, because they respond well to high levels of uncertainty. They facilitate the open exchange of innovative ideas and allow for broader latitudes. Hence, they enable the team members to proceed faster as they search for, and evaluate new ideas. Improvisation, flexibility, and frequent iterations offer more chances for a "hit" (Eisenhardt & Tabrizi, 1995). Such activities allow the developers to quickly abandon proposals, and shorten the development time by building up a better understanding about the product (Eisenhardt & Tabrizi 1995, p. 92).[38] Given the previous argument, that mechanistic structures only function under high levels of certainty (Burns & Stalker 1961, Daft & Lengel 1986, p. 562), *it will be argued that organic structures foster, and that mechanistic structures impede efficiency and creativity in the early project stage.* Moreover, each antecedent will be discussed individually to provide additional (more specific) arguments to underpin the hypothesis.

Decentralization - As indicated by Zaltman et al. (1973) a strict emphasis on a hierarchy of authority reduces the organizational innovativeness. The more centralized the decision-making, the more likely it is to filter or screen out proposals conceived at lower organizational levels (Duncan 1976, p. 177, Marino 1982, p. 77). Duncan (1976) argues that a strict emphasis on hierarchy of authority is more likely to cause decision-unit members to stick to specified communication channels; a behavior which does not support the search for new alternatives. In addition, by locating decision-making authority at the project level, firms are able to reduce the time it takes to make decisions, take actions, and solve problems (McDonough 2000, p. 224).

Central Budgets – Compared to operational budgets, central budgets tend to be less characterized by a rigid budgetary control style, and by a higher level of slack (Argyres & Silverman 2004, Birkinshaw & Fey 2000, Hoskisson et al. 1993). They provide more latitude, and the required flexibility to generate, evaluate, and abandon new product proposals. This offers more chances for a "hit". Furthermore, a less rigid control style and a higher level of slack reduces the risk that there will be an increased focus on short term performance while it al-

[38] There is also some empirical support for the beneficial effects for organic structures to boost efficiency, and at the same time, for mechanistic structures to impede efficiency. For instance, Lewis et al. (2002, p. 559, 562) find that participative management helps to increase a team's schedule adherence, while formal reviews negatively impact within budget adherence. Eisenhardt & Tabrizi (1995, p. 84) find that an experimental product development strategy that relies on improvisation, frequent iteration, and flexibility accelerates product development, while planning and rewarding for schedule are ineffective ways of accelerating pace.

lows for more freedom to experiment (Greve 2003, van der Stede 2000). Moreover, centralized budget governance offers the ability to pursue non-specific research (i.e. research whose fruits are applicable beyond the responsibilities of a specific business unit), and therefore facilitates the creation of knowledge across business units (Argyres & Silverman 2004, p. 933, Birkinshaw & Fey 2000, pp. 5, 9-10, Hoskisson et al. 1993).

Participative Decision-making – If team members see themselves as the primary decisions makers and implementers, they will be more involved in the technical, functional, and market challenges, the project is facing. Active participation increases the team members' ownership, accountability, and motivational commitment (Bonner et al. 2002, p. 237, Song et al. 2000). To the extent that information and decision-making authority are equally shared, and point of views are openly exchanged, the cross-fertilization of perspectives which can foster creativity and innovation is more likely to take place (Olson et al. 1995, p. 51, West 2002, Woodman et al. 1993, p. 313). Giving team members an active share in decision-making is also expected to help better identify emerging problems in advance, and thereby, to avoid time consuming redesigns. For instance, McDonough & Barczak (1991) find that development speed is significantly related to the amount of freedom and responsibility given to project team members by the project leader.

Team Member Proximity - Scholars propose several advantages to team member proximity due to the beneficial effects of media richness in uncertain situations (Daft & Lengel 1986, p. 560, Hoegl & Proserpio 2004). Rich media, such as frequent and spontaneous face to face interaction is best suited to efficiently clarify non routine and ambiguous issues; which are greatest at the outset of the project. Close proximity of team members allows for a better synchronization of task activities, the avoidance of gaps and task overlaps, real time observation of progress, and a better position to update work sequences as new information becomes available (Hoegl & Proserpio 2004, Pinto & Pinto 2003). In addition it is expected, that the exchange of innovative information is more likely to be facilitated by co-location. The possibility of spontaneous and informal face-to-face interaction, in form of so called hallway or kitchen talks becomes increased, and requires less effort as compared to situations where team members are geographically dispersed (Hoegl & Proserpio 2004, p. 1156).

> *H7: Organic structures are positively related to team creativity. In particular: a) Decentralization. b) Participative Decision-making. c) Team member proximity, and d) Central Budgets, are positively related to team creativity.*

H8: Organic structures are positively related to team efficiency. In particular: a) Decentralization. b) Participative Decision-making. c) Team member proximity, and d) Central Budgets, are positively related to team efficiency.

Formalization – Although some scholars argue, that some degree of formalization may have beneficial effects on efficiency (Lewis et al. 2002, Naveh 2005, Olson et al. 1995, pp. 51, 59), Daft & Lengel (1986, p. 562) point out that rules and regulations may be the weakest and least rich information device. As they are generally recognized to provide a response to well understood problems, they are not suited to handle information requirements in non routine situations. Instead of focusing on clarifying, understanding and feedback, they focus on the execution of programmable activities. Applying rules and regulations during the initiation stage may result in costly delays, misguidance and loss of flexibility. Formalization leads to ritualization and impedes the thoughtful reflection of current practices. Moreover, a strict emphasis on rigid rules and procedures prohibits the team from seeking new sources of information (Duncan 1976), and hence, from developing creative ideas (Andrews & Smith 1996, p. 177, Shalley et al. 2000, Vandevelde & Van Dierdonk 2003, Zaltman et al. 1973).

Rewards – Rewards represent formal control systems. Formal controls are written and management initiated mechanisms aiming at influencing the behavior of groups or employees (Jaworski 1988, pp. 26-27).[39] Much of the existing literature views formal controls as static processes (Ayers et al. 2001, Bonner 2002, p. 236) Organizational processes and outcomes are evaluated relative to a predetermined set of standards which are assumed to remain stable over the course of the control period. While this may be a reasonable assumption when the activities being controlled are well understood and the control period is relatively short, it may be a problematic assumption at the outset of a project, where uncertainty and ambiguity are particularly high. This makes it difficult to establish a clear link between efforts, performance and reward, representing an important precondition for rewards to be an effective control system (Sarin & Mahajan 2001, p. 46, Vroom 1964). Neither outcome nor process based reward systems appear to be suitable at the outset of a project. Both types of reward have potential disadvantages when it comes to creative behavior. Although output based rewards guarantee operational freedom and flexibility, they impose a high risk on the team members, which may negatively affect creative behavior (Sarin & Mahajan, 2001). On the other hand, although process based rewards offer a relatively lower risk exposure, they prescribe the proce-

39 In contrast, informal controls are unwritten and typically worker-initiated mechanisms that influence the behavior of individuals or groups (Jaworski 1988, p. 26-27).

dures and steps to be done for achieving a goal (Bonner et al. 2002, Sarin & Mahajan 2001).[40] Since rewards are more likely to lead to detrimental effects in non routine situations (Hennessey & Amabile 1998, p. 674), negative associations with early efficiency and creativity are assumed.

Review Boards - Steering committees or review boards consist of senior managers from different functional areas who evaluate new product business cases and monitor the progress of a project (Griffin & Hauser 1996, p. 210, Leenders & Wierenga 2002, p. 305). Fundamental to this formal management process is that it seeks to control the team behavior and its actions by setting predefined milestones and by specifying how the project should be completed (Eisenhardt 1989, p. 61). Behavior based control exerts a negative influence on creativity and market orientation since it predefines means end relationships, and keeps the team away from exploring new ways (Bonner et al. 2005). Besides, this mechanism may lower employee initiatives and cause some loss of flexibility (Leenders & Wierenga, 2000). Furthermore, early milestone reviews may lack data (Nihitila 1999). Consistently, Lewis et al. (2002) find that in successful innovation projects, managers exert less control and monitoring in the early stages. Since flexibility and team member initiative are particularly important factors during the early project stage, a negative relationship between steering committees and a team's efficiency and creativity is expected.[41]

> *H9: Mechanistic structures are negatively related to team efficiency. In particular: a) Steering Committees b) Team Rewards, and c) Project Formalization, are negatively related to team efficiency.*

> *H10: Mechanistic structures are negatively related to team creativity. In particular: a) Steering Committees b) Team Rewards, and c) Project Formalization, are negatively related to team creativity.*

3.7.2.2 The Effects of Boundary Spanning on Creativity, Efficiency, and Overall Performance during the Early Stage.

As indicated in section 3.5 the hypothesized effectiveness of boundary spanning relies on resource dependency theory (Pfeffer 1982, Pfeffer & Salancik 1978, Stock 2006, p. 589). The

---

[40] This dilemma is indicated by the study of Sarin & Mahajan (2001). The authors demonstrate a negative relationship between performance and process-based rewards for highly complex projects, and also a negative relationship between product quality and outcome based rewards for projects exhibiting a high level of risk.

[41] For a contrary position, where milestones are assumed to have a positive effect in uncertain situation, cp. Eisenhard & Tabrizi (1995).

study of Ancona & Caldwell (1992b, p. 637) provides good examples for the early dependence of a cross-functional team from external sources. For instance, "mapping activities" entail constructing a picture of the external environment and information gathering, including the prediction of future trouble spots or potential allies. They help the team to gain knowledge about details of what the product should look like. In addition, "molding activities" involve the group's attempt to suit its agenda by shaping the beliefs and behaviors of outsiders. It may imply to represent a team in an extremely positive light if resources are needed.

The described activities indicate that boundary spanning is not only useful in facilitating the exchange of innovative and coordinative information, but it may also help the team to move forward at all (e.g. by obtaining resources or by reducing resistance). Hence, the beneficial effects of boundary spanning may not be entirely captured by team efficiency and creativity. By "paving the road" for the innovation to become accepted within the organization, boundary spanning may have an additional direct effect on overall team performance, i.e. on the achievement of the team's goals and on the overall quality of the results.[42]

Top Management support – Several studies stress top management's positive impact on creativity, efficiency and overall team performance (McDonough 2000, Sethi et al. 2001, Shalley & Gillson 2004, Swink 2000, Tierney et al. 1999). A supportive top management provides resources for the generation of new ideas. It helps the team to surmount obstacles, encourages the team to take risks, and stresses the importance of collaborative behavior. Furthermore, Duncan (1976) underlines that top management support is necessary to institutionalize and support the shift of structures (p. 184). Therefore, early top management support is expected to have a positive impact on all dimensions of early team performance.

Integration with functional departments – Hoegl & Weinkauf (2005, p. 1294) state that structuring a team's relationship with other teams is essential in the first project phase, because it helps to create a more workable level of certainty as the team identifies technically related teams in order to exchange ideas and concepts, and as it integrates its concept with related modules. Their proposition (which initially rested in the area of multiteam-management) will be transferred to a team's boundary spanning activities with functional departments. This is because relevant information and useful know-how regarding concepts and ideas can be found within the entire organization (Ancona & Caldwell 1992b).

---

[42] In addition, previous research provides strong evidence that boundary-spanning activities in general, or particularly the integration with functional departments and top management support are positively associated with team efficiency, creativity, and overall team performance (Ancona & Caldwell, 1992b, Hoegl & Weinkauf 2005, Keller 2001, McDonough 2000, Millson & Wilemon 2002, Sethi et al. 2001, Shalley & Gillson 2004, Swink 2000, Tierney et al. 1999).

H11: Boundary spanning activities is positively related with team creativity. In particular, a) Top management, b) Integration with Functional Departments is positively related to team creativity

H12: Boundary spanning activities is positively related with team efficiency. In particular, a) Top management, b) Integration with Functional Departments is positively related to team efficiency.

H13: Boundary spanning activities is positively related with overall performance. In particular, a) Top management, b) Integration with Functional Departments is positively related to overall performance.

3.7.2.3 Other Potential Antecedents (Control Paths)

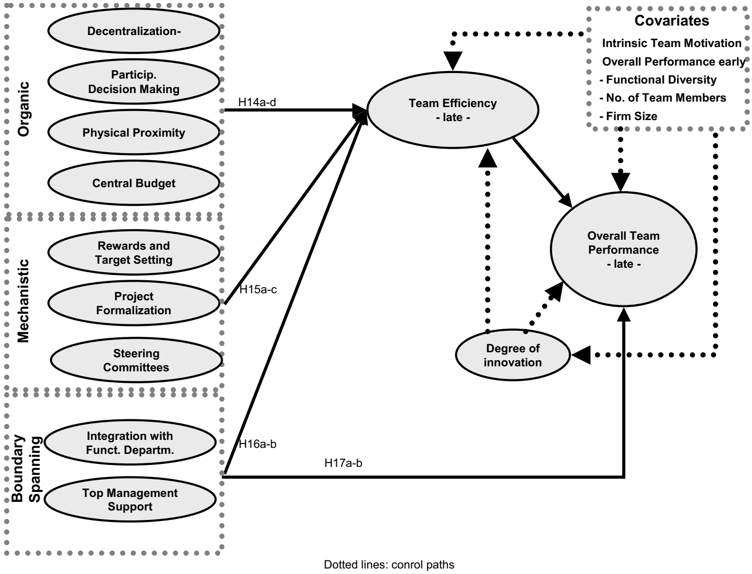
To control for the effects of other variables that presumably affect the performance of a team and to better identify the unique effects of the investigated antecedents, several control variables will be included.[43] Duncan (1976) explicitly points out that *functional diversity* at the project's outset will emphasize a variety of informational sources, which in turn may facilitate the awareness of new alternatives. This is expected to lead to higher levels of creativity and better reflects the information needs of the entire organization (Duncan 1976, p. 173, Shalley & Gilson 2004, p. 43, West 2002, p. 363). On the other hand, it has been argued that functional diversity may have a negative impact on team efficiency, as a result of cross-functional conflicts and more complex decision processes (Jansen et al. 2006, p. 15, Gebert et al. 2006). The *size of a team* represents another potential influence. Given the increase of potential links between team members as the team size grows, larger team sizes make it more difficult for the team members to interact with each other (Jansen et al. 2006, p. 14). Besides, team size might reflect the resources used in the project. *Firm size* may also serve as a proxy for the impact of a firm's resources on the success of a newly developed product (Subin & Workman 2004, p. 123). Finally, the team member's *intrinsic motivation* will be included because previous research suggests that intrinsic motivation is a key driver of creative behavior (Amabile 1988, pp. 132-134).

43 See Stock (2006, p. 591) for another example where similar control variables are included when team performance is the dependent variable.

3.7.3 The Effects of Organizational Antecedents in the Late Project Stage (Model III)

When the team members have successfully managed to reduce the majority of consumer, technology, and competitor related uncertainties, the new product concept and its related business plan have been approved, and it has been defined what specific resources are needed to proceed, then the actual development takes place (Cp. section 3.2). It is now better possible to specify tasks and responsibilities. Single problems and requirements can be broken down and distributed among specialists. Compared to the early project stage, the need to improvise and to continually redefine tasks becomes less critical. As Schulze & Hoegl (2006) point out, the project team is now “under the gun” to solve technical problems, develop, and test prototypes, while meeting goals regarding schedule, budget, output, and quality specifications. Hence, the *focus is now on efficient operations*, and the transfer of coordinative information will gain impact (Naveh 2005, Souder & Moenaert 1992, p. 488, 495-503). Since uncertainty is expected to be lower, a mechanistic structure, e.g. a tight project management with frequent milestones, budgetary controls, and clarified responsibilities, is expected to be the key driver to team performance in the implementation stage (Duncan 1976, p. 172, Naveh 2005, Souder & Moenaert 1992, p. 498, Tushman et al. 2004, Cp. section 3.4). Bureaucratic control will also reduce resistance to innovation. The switch is necessary, because organic structures may not create the necessary focus (Duncan 1976, p. 173, Troy et al. 2001, p. 97). Furthermore, it is assumed that boundary management continues to play an important role during the late project stage, because the new product has to be integrated into the firm’s ongoing operations (Ancona & Caldwell 1992b, Weinkauf et al. 2005), and hence, the team’s dependency from external sources inside the organization remains significant. As in the previous sections, each antecedent will additionally be discussed in isolation to provide further (more specific) arguments to underpin the hypothesis. Figure 5 displays the hypothesized relationships and additional control paths.

Figure 5. Model III - Effects of Organizational Antecedents in the Late Project Stage.



3.7.3.1 The Effects of Organic Structures and Mechanistic Structures on Team Efficiency during the Late Project Stage

Decentralization - After the project has reached the implementation stage, a higher level of authority and responsibility is required. While high levels of project leader power contributed to the flexibility and innovativeness of the team during the initial stage, centralized structures, i.e. higher levels of authority, facilitate the implementation by reducing resistance to change and bargaining (Duncan 1976, p. 178, Souder & Moenaert 1992, p. 501). More centralized decision-making structures provide unity of action, and facilitate control. Previous research also shows that decentralized decision-making structures are not qualified for implementation issues, because it is difficult to gather enough influence over the participants and set homogenous priorities (Duncan 1976, p. 178, Marino 1982, p. 77).

Participative decision-making – A similar argumentation holds for participative decision-making within the team. Since the team has gathered and exchanged the majority of relevant information, and it has been agreed upon a certain course of action, participative decision-making within the team is expected to become less critical. A clear authority of the project leader will reduce negotiation and serves to assign specific responsibilities regarding tasks and related goals (Duncan 1976, p. 178, Marino 1982, p. 77, Wilson 1966). Furthermore, it has to be considered that participative decision-making has a strong positive impact on creativity (Olson et al. 1995, p. 51, West 2002). However, a high level of innovative information transfer during the development stage might even restart the creative processes and lead to the identification of new product/ market/ technology combinations. Thereby, ongoing activities may be impeded (Souder & Monaert 1992, p. 497).

Team Member Proximity - Recently, research on inter-organizational proximity has put forward the concept of temporary geographical proximity (Knoben & Oerlemans 2006, p. 74). This idea implies that proximity is only essential in certain phases of innovative collaborations, such as during the generation of elementary and tacit knowledge, or during negotiations, but not during others, such as the commercialization phase. Hence, in the development stage a CFT does not need to be in constant proximity. Meetings, short visits and temporary co-location may be sufficient (Knoben & Oerlemans 2006, p. 74). This notion is also supported by Souder & Moenaert (1992, p. 502) and Duncan (1976) who argue that intensive cross-functional interactions are mainly required during the early stages of a project due to high levels of ambiguity. In routine situations, coordination can be better achieved through less rich media, such as rules, standard procedures, scheduled meetings, and telephone conferences because ambiguity is low (Daft & Lengel 1986, p. 566). As the development tasks can be better broken down in the development stage, they can also be better distributed among specialists. The execution of a particular task can then benefit from specialized know-how and from economies of scale. Hence, it appears to be more beneficial for the team members to return to their functions, and guide and execute particular development tasks on behalf of their team within their respective departments, or within other parts of the organization. Additionally, team members may be able to intensify boundary-spanning activities, which can further facilitate the implementation and contribute to the efficiency of the team.

Central Budgets – In comparison to divisional funding, central budgets are typically characterized by a relatively higher level of slack and a less rigid control style (Argyres & Silverman 2004, Birkinshaw & Fey 2000, Hoskisson et al. 1993). Slack fosters greater experimentation, but also diminishing discipline over innovative projects. Although slack leads to the pursuit of new projects, very few of these projects may actually translate into value added innovations, because loose controls allow decision makers to make choices that correspond better with their own preferences than with economic considerations (Child 1972, p. 11, Herold et al. 2006, Nohria & Gulati 1996, p. 1246). This notion is also in line with Birkinshaw & Fey (2000, pp. 5, 9-10) who argue that divisional funding relates negatively to the effectiveness of R&D activities due to its short term and commercial focus, but for the same reason, it is positively related to the efficiency of R&D activities. Accordingly, it is here proposed that central budgets will negatively affect efficiency during the development stage.

H14: Organic structures are negatively related to team efficiency. In particular: a) Decentralization. b) Participative Decision-making. c) Team Member Proximity, and d) Central Budgets are negatively related to team efficiency.

Formalization - Formalized procedures, such as planning, scheduling and reporting will provide concrete information on how the innovation will be implemented and define the roles of the individuals involved. Rules, regulations, standards, and planning procedures are also expected to reduce conflict, and to overcome resistance to change in the entire organization (Duncan 1976, p. 175). While a harmonious and informal climate fostered the exchange of innovative information between the team members during the early project, it is now expected that a reliance on rules and procedures will be the more effective framework for cross-functional interactions (Souder & Moenaert 1992, p. 503). This is because programmed means of co-ordination make greater contributions to organizational effectiveness, when uncertainty is low. The higher the analyzability of the task, the more the team can rely on a structured approach (Daft & Lengel 1986, Souder & Moenaert 1992, p. 500). Besides, Vandevelde & Van Dierdonck (2003, p. 1340) provide empirical support for this notion. They find that formalized procedures, such as clear technical guidelines and standardized manufacturing rules, help to smooth the productions start-up and increase efficiency.

Steering Committees – As the transfer of coordinative information becomes more critical during the development stage, the use of steering committees and periodical reviews is also expected to become a critical success factor. While early review sessions might have been less effective due to missing data (Nihitila 1999, p. 69), and due to detrimental effects on team creativity, the structured exchange of information about product tests, manufacturability problems, and planned procedures is now expected to contribute positively to the efficiency of the team (Nihitila 1999, p. 73). According to Eisenhard & Tabrizi (1995, p. 93) milestones provide a sense of routine and order that serve as a counterpoint to more freewheeling activities within the innovation process. Since review boards also move information from the project team to other involved functions, it is expected that frequent milestones facilitate the co-ordination of activities concerned with the development and the implementation of the product.

Rewards – While formal control systems were not considered an appropriate management instrument to influence the early behavior of the team, the use rewards now appears to be a suitable mechanism. Uncertainty is expected to be lower, and the activities that are being controlled, are expected to be well understood. As more information regarding the required efforts and expected outputs is available, it is now possible to establish a clear link between efforts, performance and rewards (Sarin & Mahajan 2001, p. 46, Vroom 1964). Consistently, Eisenhard & Tabrizi (1995, p. 91) suggest that rewards can have important effects on product development speed, particularly when the development process is predictable. In such situations an explicit schedule can be created, and rewards can be tied to meeting this schedule. Rewards will focus the attention of developers on the particular project at hand. This will increase speed because those efforts that are not central to the task are constrained. In addition, rewarding the developers for clear deadlines better synchronizes the energies and attention of the team.[44]

H15: Mechanistic structures are positively related to team efficiency. In particular: a) Steering Committees b) Team Rewards, and c) Project Formalization, are positively related to team efficiency.

3.7.3.2 The Effects of Boundary Spanning on Team Efficiency and Overall Performance During the Late Project Stage

The study of Ancona & Caldwell (1992b, pp. 637-638) also provides good examples for the late dependence of a cross-functional team from external sources. For instance, "coordinating and negotiating", which involves integrating work schedules. This may involve meetings with manufacturing where details about production procedures are discussed and negotiated. Another activity is "filtering" which consists of taking information from outsiders and delivering a smaller amount to the group. Filtering is done to buffer the team, or to absorb pressure by keeping troubling information or political maneuvering from the team. In addition, "molding" (a group's attempt to influence the external environment to suit its agenda by shaping the beliefs and behaviors of outsiders) may continue to remain relevant. Again, the described activities indicate that boundary spanning is not only useful in facilitating the exchange of coordinative information, but it may also help the team to move forward at all (e.g. by obtaining resources or by reducing resistance). Therefore, a positive and direct relationship between boundary spanning activities and overall team performance is assumed.

Top Management Support - Various researchers point out, that a supportive top management helps the team to surmount obstacles and implement ideas (Hitt et al. 1997, p. 147, Jasswalla

[44] It should be noted that the literature review indicates that a variety of additional factors such as project risk, project length, and personality type might additionally influence the effectiveness of rewards. In addition, rewards did not appear to be an essential driver of project performance (Cp. 2.2.3.5).

& Sashittal 1998, p. 245, Sethi et al. 2001, Xie et al. 2003, p. 236). From this perspective CFTs are dependent from top management support. Moreover, Duncan (1976, p. 184) underlines that top management support is especially necessary to institutionalize and support the shift of structures.

Integration with functional departments - Previous research provides strong evidence that boundary-spanning activities, i.e. the integration with functional departments, are positively associated with budget and constraint adherence (Ancona & Caldwell 1992b, Keller 2001, Millson & Wilemon 2002) and with the implementation into the firm's ongoing operations. For instance, Naveh (2005, p. 2795) reports on Toyota applying an increased level of boundary spanning in the later innovation stages. Engineers work closely with the manufacturing plants to ensure that all operational and quality issues are recognized, and requirements are met. Hence, the integration with functional departments is expected to exert positive effects on efficiency and overall team performance.

> *H16: Boundary Spanning activities are positively related to team efficiency. In particular: a) Top management support b) Integration with functional departments is positively related to team efficiency.*

> *H17: Boundary Spanning activities are positively related to overall performance. In particular: a) Top management support b) Integration with functional departments is positively related to overall performance.*

3.7.3.3 Other Potential Antecedents (Control Paths)

To control for the effects of other variables that presumably affect the performance of a team and to better identify the unique effects of the investigated antecedents, several control variables will be included.[45] While *functional diversity* has been described as a critical element for a team's creativity during the early project stage, it has also been stated that functional diversity increases the difficulty to agree on which alternative or method should be adopted (Duncan 1976, p. 173, Troy et al. 2001, p. 97). Due to a greater potential for conflicts, it has been suggested to de-emphasize diversity and fall back on less diverse and more homogenous groups. The *size of a team* represents another potential influence. Team size might reflect the resources used in a project (Jansen et al. 2006, p. 14). *Firm size* may also serve as a proxy for the impact of a firm's resources on the success of a newly developed product (Subin &

[45] See Stock (2006, p. 591) for another example, where similar control variables are included, when team performance is the dependent variable.

Workman 2004, p. 123). Finally, the team member's *intrinsic motivation* will be included because it may affect team efficiency.

4 Research Methodology and Results

4.1 Survey Development and Data Collection

A cross sectional survey design using a fully standardized questionnaire was applied to test the hypothesis. The data was collected from key informants. Project managers were chosen as respondents, since they are most knowledgeable about management practices, team performance, and product performance (Sethi et al. 2001, p. 79). The criteria for participation were three. First, at least two internal functions had to be involved in the project. Second, the product was intended for the open, competitive market. Third, the product had been introduced to the market, or the project had been aborted, both within the past twelve months. These conditions were needed to ensure cross-functionality, meaningful indicators and to reduce problems associated with recall.[46]

Before mailing the questionnaires, a two-staged pre-test was conducted. First, the questionnaire was pre-tested with three doctoral students, and the measures that were identified as ambiguous or irrelevant were dropped, or modified. In the second stage, the draft was administered to 14 project managers and middle level executives working in R&D and innovation management of two German-DAX-100 companies operating within various fields of ICT. In telephone and face to face interviews, the managers pointed out items or instructions they found repetitive, irrelevant, or confusing, and so contributed to the improvement of the questionnaire.

With the final questionnaire, the respondents had to assess the use of project management mechanisms, boundary spanning activities, refer to organizational antecedents, and team and product performance in the early and late stage of the project. *The instructions provided information regarding the typical content of each stage:* Examples of early stage activities included idea generation, market research and technology assessments, feasibility checks, design and the development of a business plan. Late stage activities included the development of prototypes, the actual development of the product, testing and market launch. To indicate a reference point for the ending of the early stage, and respectively to indicate the beginning of the development stage, the instructions specified that the *early stage ends with the decision to transform an idea or a concept into a marketable product*, while the late stage ends typically with the market launch.

To avoid problems associated with single-informant and common-method bias, the question order was counterbalanced. Respondents had to assess the criterion variables (e.g. financial

[46] See Appendix II for the questionnaire and the instructions.

performance, quality, early and late efficiency, early and late creativity, early and late overall performance) *before* they evaluated predictor variables (e.g. degree of centralization, top management support, etc.). Furthermore, the survey allowed the respondents' answers to be anonymous, and the instructions to the questionnaire explicitly pointed out, that there were "no right and no wrong answers" due to the scientific nature of the study. Podsakoff et al. (2003, pp. 887-889) suggest that these procedures should reduce people's evaluation apprehension, and make them less likely to edit their responses to be more socially desirable, lenient, and/ or consistent with how the researcher wants them to respond. After closing the survey, Harman's single-factor test was performed to detect a possible common method bias (Podsakoff et al. 2003, p. 889). Multiple factors were found for each model, and the first factor of each model did not account for the majority of the variance, which gives less concern about problems associated with common method bias (See Appendix III for the results).

The sample for this investigation covers mostly companies from the ICT-sector as well as projects from other industries, e.g. logistics, automotive suppliers, home-appliances that involve ICT.[47] ICT-related innovations were chosen as the main research context for three reasons. First, as competitive and technological dynamics for ICT-related products are intense, the relevant companies are permanently innovating (Huizenga 2004, pp. 7-9). Second, in order to ensure a successful development and launch, cross-functional project teams are a popular organizational approach for the development of ICT-related products (Huizenga 2004, p. 134). Third, the product development cycle as compared to other goods, e.g. cars, drugs, is shorter. Since the research interest was to investigate the effects of organizational antecedents in the early and late stages of an innovation project, it was necessary to survey project leaders who were assigned to the project in both stages, and thus were able to assess the stage-specific-intensities of the employed mechanisms and performance dimensions in a comparative manner. Projects that are entirely managed by a single project leader are more likely to be found for products with shorter development cycles. Therefore ICT-related products are considered to be an appropriate domain for this research.

The survey took place between July and September 2006. As it was conducted in German language, the sample is restricted to companies operating in Austria, Germany, and Switzerland. Different sources were used for sampling. One sample was drawn from the members of the German Association for Information Technology, Telecommunications and New Media (BITKOM). After sorting out companies without an own product development function (e.g. consultancies, wholesalers, retailers, etc.), the BITKOM-Sample resulted in 325 eligible com-

[47] See section 4.2 for further details.

panies (out of a population of 770 member companies). A second sample was drawn from the list of exhibitors of the CeBIT Trade Fair 2006 in Hannover, Germany. CeBIT is the world's largest fair showcasing the latest digital IT and telecommunications solutions for home and work environments. Again, after sorting out BITKOM-Members and companies without a product development function, the CeBIT sample resulted in 182 qualified companies out of 270 exhibitors from German-speaking countries. The BITKOM and the CeBIT-Sample were then merged. This resulted in an effective sample size of 507.

The companies were contacted via telephone to identify the head of R&D, or high and middle level executives involved in product development and innovation management initiatives. The identified persons then received a questionnaire and cover letter by mail. The cover letter explained the purpose of the study, asked to forward the documents to up to three project managers of a recent product development initiative, and indicated that a management summary plus a benchmark report would be made available to the respondents. A reminder was sent by email to the companies who had not responded after three weeks. Out of the 82 responses received, all responses were usable resulting in a response rate of 16%. This rate is acceptable for a cross-national business survey (Jobber et al. 1985).

A third sample was drawn from a professional directory of business contacts (OpenBC). 252 potential candidates met the criteria described above after inspecting their profiles. The identified candidates were contacted by an email explaining the purpose of the study, the requirements, and were asked for participation. Out of those, 145 persons showed interest or were qualified to take part, and subsequently received the cover letter, the questionnaire, and a reminder in case they had not responded after three weeks. Out of the 51 responses received, again all responses were usable, resulting in a response rate of 35%. The overall average response rate is 20%, representing a total of 133 projects.

Because the difference between the sample specific return rates is striking and could indicate a possible sample-selection bias, t-tests were employed to compare the mean responses of independent, dependent and company related variables (0: CeBIT/ BITKOM, 1: OpenBC). Out of 36 tested variables, only four variables show significant differences ($p<0.5$) between the groups: "project length of time early stage" (0: 4.75; 1: 7.39), "market launch vs. project abortion" (0: 0.95; 1: 0.8), "participation late" (0: 0,19; 1: -0,22), "co-location early" (0: 0,19; 1: -0,20), (See Appendix V for the entire results).[48] No dependent variable is affected by the sample source. Since the test provides evidence that the vast majority of the variables is not affected by the underlying sampling sources, one can conclude that the samples are not very

48 Latent variables scores were standardized and based on a principal component analysis.

different from each other and can be jointly analyzed. The reason for the different return rates might be rooted in the targeting of the respondents in the samples. Potential respondents in the BITKOM/ CeBIT sample were only identified, but not personally contacted, and asked if they were interested in participating in the survey before they received the survey material. Within the OpenBC sample, only interested candidates received the survey material.

Although all participants were explicitly invited in the cover letter to also refer to unsuccessful or aborted projects, only 16 questionnaires (12%) referring to aborted projects were returned. Accordingly, there is a chance of non-response bias. To assess the degree of non-response bias, the procedure described in Swink (2000, p. 212) and Sethi (2000b, pp. 337) was applied. The responses were divided into two categories; responses received before and after reminder, and t-tests were performed using mean responses to dependent, independent and company specific variables. These calculations were conducted under the assumption that late respondents are more similar to non-respondents.[49]

Significant differences are found only for independent variables. The four variables that show different means ($p<0.05$) among early (0) and late respondents (1) were: "number of functions involved" (0: 3.79; 1: 4.57), "top management support early" (0: -0.20; 1: 0.28), "decentralization late" (0: 0.11; 1:-0.27) and "rewards" (0: -0.19; 1: 0.43).[50] The results show that late respondents' projects are more centralized in the late stage, more complex in terms of functional diversity, that early top management support is stronger, and that rewards are used more intensively throughout the entire course of the project. The more centralized decision processes might also partially explain why this group of respondents answered later. Higher level authorities may have been stronger involved in the decision whether to take part in this survey. Since the majority of the variables is not different, and moreover no dependent variables are affected, it can be concluded that non-response bias does not appear to be a major issue.

4.2 Sample Description

The participating companies mostly belong to the ICT-Sector[51] (81%), followed by Automotive (6%), Logistics and Transport; including Aviation and Shipping (6%), and Electro-

49 See Appendix IV for the entire results.

50 Latent variables scores are standardized and based on a principal component analysis.

51 Within the ICT-industry various subgroups can be found. Subgroups represented in the sample are: "Electronic Computer", "Computer Communications Equipment", "Computer Storage Devices", "Household Audio and Video Equipment", "Semiconductors and related Devices" and "Telephone Communications".

Mechanics (2%). The remaining 5% constitute of various industries, such as Media and Entertainment, Photographic Equipment, Household Appliances, and Medical Engineering. Table 3 gives further details about the participating companies. The sample contains a wide range of firm sizes, as indicated by number of employees, number of employees in R&D, and sales.

Table 3. Profile of the Participating Companies

	Sales (€Million)	Number of Employees	Number of Employees in R&D
Mean	€ 6 085	25 150	1 266
Minimum	€ 0.2	3	0
Maximum	€ 75 000	500 000	20 000
Standard Deviation	€ 13 388	81 302	3 481
Percentiles			
25	€ 18	210	12
50	€ 581	2 500	63
75	€ 5 714	24 000	400

The average degree of innovation across projects was 3.75 out of 5 (Std. dev. 0.8). A five point Likert-scale with the anchors "1: low/ incremental" and "5: high/ radical" was used.[52]

Figure 6. Project Distribution According to the Degree of Innovation.

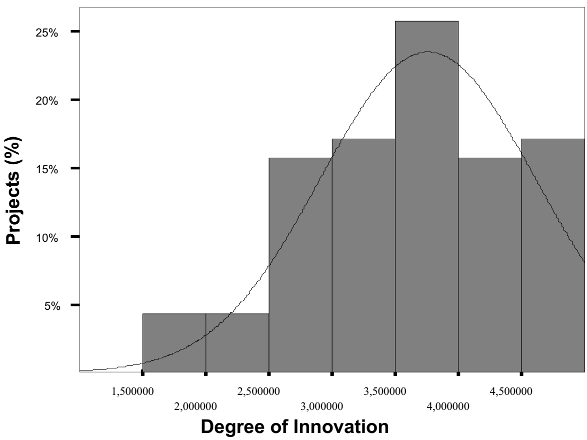


Figure 6 displays the distribution of the projects with respect to their degree of innovation. It shows that the majority of the projects range between medium innovative and radical. Table 4 and Table 5 report on project specific information like project length in months for the early

[52] The degree of innovation is determined by two items. Participants had to assess the degree of newness of the new product for the company and for the market (Cp. 4.3).

and late stage, size of budget, number of team-members (fulltime), and functions represented in the projects. The sample comprises a wide range of project lengths, functions involved, and budget sizes. R&D and IT, followed by Marketing/ Product Management and Delivery/ Operations/ Production, showed the highest means with respect to the amount of team members represented in the projects. The high amount of IT team members is not surprising since 81% of the projects took place in the ICT-sector.

Table 4. Project Characteristics

	Project Budget (€Million)	Number of Team Members (fulltime)	Number of Functions Involved	Project Length in months (Early Stage)	Project Length in months (Late Stage)
Mean	€ 56	11.1	4	6	12
Minimum	€ 0	0	*1	0.25	1
Maximum	€ 2 500	300	8	36	84
Standard Deviation	€ 339	31	1.7		
Percentiles					
25	€ 0.13	2	3	3	6
50	€ 0.67	5	4	4	10
75	€ 3.35	12	5	6	15

*: 11 questionnaires from project teams that only consisted of members from a single department[53]

53 11 were questionnaires were received from project teams that only consisted of members from a single department. These projects were not excluded because they accounted only for 8.2% of the sample size. The reason was to maintain the sample size (133 projects). Cross-functionality (i.e. the number of departments involved) was additionally included as a covariate to consider varying levels of cross-functionality.

Table 5. Project Characteristics (continued)

Members of Functions Involved (Full Time & Part Time)	Mean	Min	Max	SD	Percentiles		
					25	50	75
Marketing / Product Mgt.	3.1	0	90	11	1	1	2
Production/ Deliv./ Operations	3.2	0	130	12	0	1	2
IT	6.3	0	180	21	0	1	3
Sales	1.2	0	40	4	0	0	1
R&D	6.6	0	72.5	12	0	2	6
Finance / Controlling	0.5	0	5	1	0	0	1
Bus. Develop./ Innovation Mgt.	1.5	0	72.5	6	0	0.5	1

4.3 Measures

For most of the constructs the measures are derived from existing scales. Only a few constructs, e.g. top management support and steering committees, are newly developed by means of field interviews with R&D project managers. Participants were asked to indicate the extent to which they agree to the different statements. For all indicators, except stated differently, a five point Likert-scale with the anchors "strongly disagree" and "strongly agree" was used.

4.3.1 Performance Measures

Product quality is measured as the degree to which the product met quality control standards laid out for it by the organization, to which quality problems occurred, and how the product's quality is assessed in comparison to the product quality of competitors. The scale consists of three items and leans on the constructs developed by Hoegl et al. (2004) and Sarin & Mahajan (2001).

Financial performance is assessed as the extent to which the developed product met or will meet the objectives regarding sales and profitability. A third item measures the overall financial success of the product. The scales are derived from the constructs of new product success/ performance by Subin & Workman (2004) and Atuahene-Gima et al. (2005), and adapted to the context of this study.

Team efficiency consists of three items, which refer to the degree to which the team met its deadlines, stayed within the budget and to which the team operated in a cost efficient manner. The construct relies on measures developed by Sarin & Mahajan (2001).

A 4-item measure asked respondents to indicate the *creativity of the team.* Team creativity refers to the extent of the production of new, unique, and outcome oriented ideas by the team members. The items are adopted from Tierney et al. (1999) and adapted to the team context.

Degree of innovation is operationalized as the extent to which the product is new to the firm and new to the customers. The new scale consists of two items. Project managers had to rate the degree of newness of the product to the firm using a 5-point Likert-type scale where (1) represented a low and (5) a high degree of newness. The degree of newness to the market was assessed by a five point scale, where (1) represented an incremental and (5) a radical innovation.

Overall performance of the team measures the extent to which the project manager rated the team as successful and was satisfied with the team performance relative to the results achieved in the particular stage of the project. The scale consists of two items and partially relies on Hoegl & Gemuenden's (2001) construct of team performance.

4.3.2 Organizational Antecedents

(De-) centralization is defined as the extent to which decision-making power is concentrated within instances other than the project manager or the team members. A two-item measure asked respondents to indicate the degree of decision-making and empowerment that could be undertaken, without referring to upper management levels or other escalation instances. The measures lean on the work of Ayers et al. (2001).

Central budget refers to the source of the budget for the project. A dichotomous variable indicates if the budget is provided by a central or by an operational function. This measure was newly developed.

Project formalization refers to the emphasis on detailed guidelines and on a structured approach within the particular project stage. The scale consists of two items measuring the degree of guidelines employed when planning the particular project stage and the degree of structuring during the execution. Moenaert et al.'s (1994) formalization construct served as a sample for the development of this scale.

Three items provide measures for *team member participative decision-making.* The construct captures the extent to which team members take part in, and have influence over project related decisions. The measures are derived from DeDreu & West (2001) and Sethi et al. (2001), and are adapted to the context of this study.

Proximity of team members consists of two items, measuring the degree to which team members are accessible without much effort and if it is unproblematic to call for spontaneous face-to-face meetings. The construct relies on items developed by Hoegl & Proserpio (2004).

Team rewards (overall) measures the extent to which team members' participation in the project is fixed in target agreements, and/ or to the extent to which team members are rewarded for their participation in the project. A single item was used to measure this construct. The measure was newly developed.

The use of *steering committees* is measured by two indicators; (1) the degree of relevance of this mechanism for steering the project, and (2) the number of reviews per month. "Steering Committees" is defined as a formative construct. The literature does not provide an elaborate pool of indicators, and interviews with practitioners indicate, that both frequency and relevance are necessary to capture the involvement of this mechanism in a project. The number of meetings does not fully reveal if steering committees are applied to actively influence the project, or if it is rather employed as a passive information tool. On the other hand, the number of meetings indicates the general attention towards the project and the information flows to and between board members. Therefore, an assessment of both relevance and frequency based on a formative construct was considered adequate.

Top management support is defined as the degree to which the top management is engaged in the success of the particular project, as the extent to which resources are provided for cross-functional teamwork, as degree to which the top management is informed and provides feedback about the project. Four items assess this newly developed construct.

Integration with functional departments measures the degree of teamwork between the project team and the functional departments involved in the NPD-process. Three items measure the amount of cooperation, the quality of coordination, and the information exchange between the team and internal functional departments. The items of this construct are derived from the studies of Millson & Wilemon (2002) and Hoegl et al. (2004).

4.3.3 Control Variables

Team size refers to the number of fulltime-team-members involved in the project. The size of a team might have an impact on the relations between team members. Large team sizes make it more difficult for the team members to interact with each other (Hoegl & Proserpio, 2004). Besides, team size can serve as an indicator of the resources used in the project (Jansen et al. 2006).

Firm size is measured as the natural logarithm of the total employees of the participating company. The inclusion of firm size as a covariate can serve as a proxy for the impact of a firm's resources on the success of a newly developed product (Subin & Workman 2004).

Functional diversity is measured as the number of functions represented in the new product development project. Diversity may affect creativity and efficiency, depending on the particular stage (Duncan 1976, Jansen et al. 2006).

Team intrinsic motivation refers to the extent, to which the team members recognize their project as an interesting challenge, to which the team members immerse themselves in the project, and to the level of interest showed for the project. Griffiths-Hemans & Grover's (2006) construct of intrinsic motivation served as a sample for this scale. The items were modified to fit to the team context.

As the majority of the participating companies operates within the ICT-Sector, or produces ICT-related products, a similar market environment for all projects is assumed. Therefore, no measures of competitive intensity or industry dynamics are added. All constructs applied and the corresponding items are displayed in Table 6, Table 7, and Table 8.

Table 6. Construct Definitions, Measures and Sources

Construct	Operational Measures of construct	Sources
Degree of Innovation	1. Please rate the degree of newness of the product developed for your company (1: low, 5:high). 2. Please rate the degree of innovation for the market (1: incremental, 5: radical).	New scale
Product Quality	1. The prototypes and the product test results met our requirements. 2. The product is of a higher quality than competing products. 3. We have received information regarding quality problems (R).	Hoegl et al. (2004) Sarin & Mahajan (2001)
Financial Performance	1. The objectives regarding sales were / will be met. 2. The objectives regarding profitability were / will be met. 3. Altogether the project / the product is / will be financially successful.	Subin & Workman (2004) Atuahene-Gima et al. (2005)
Team Efficiency ***(early & late)***	1. The original size of the budget was adequate. 2. The team operated in a cost-efficient manner. 3. The team was fully within schedule when accomplishing its tasks.	Sarin & Mahajan (2001)
Team Creativity ***(early & late)***	1. The team found new uses for existing methods and equipment. 2. The team found novel and operable methods of resolution within the assignment. 3. The team generated ideas and methods of resolution, which do not exist within our competitive envi ronment. 4. The team can be regarded as creative.	Tierney et al. (1999)
Overall Performance ***(early & late)***	1. Going by the results of this stage, the team can be considered successful. 2. From the project manager's standpoint, one can be fully satisfied with the project.	Hoegl & Gemuenden (2001)

Table 7. Construct Definitions, Measures and Sources (continued)

Construct	Operational Measures of construct	Sources
Steering Committees *(early & late)*	1. How often did a steering committee meet in this stage (per month)? 2. Steering Committees were a substantial part of the of project management.	New scale
Top Management Support *(early & late)*	1. The management provided resources for cross-functional teamwork. 2. The management was continuously informed about the project's progress. 3. The management gave visible feedback about the project's progress. 4. The management was involved with the success of the project.	New scale
Decentralization *(early & late)*	1. Most of the decisions could be made, without contacting higher-level management / escalation levels. 2. The empowerment regarding the decision-making process was in the hands of the project manager / in the hands of the team and not with higher-level instances.	Ayers et al. (1997)
Integration with Functional Departments *(early & late)*	1. Important information between the team and the functional groups (e.g. R&D, Marketing, Operations, Business Development) was shared in an open manner. 2. There was a cooperative atmosphere between the team and the functional groups. 3. We had no problems in coordinating with functional groups.	Millson & Wilemon (2002) Hoegl et al. (2004)
Formalization / Structuring *(early & late)*	1. The project was planned by means of clear and detailed specifications. 2. The project proceeded in a structured manner.	Moenaert et al. (1994)
Team-member Participative decision-making *(early & late)*	1. Team members were encouraged to make suggestions. 2. Team members were actively involved in decision-making. 3. Team members had a stake in how the project was carried out.	DeDreu & West (2001) Sethi et al. (2001)

Table 8. Construct Definitions, Measures and Sources (continued)

Construct	Operational Measures of construct	Sources
Proximity of Team Members *(early & late)*	1. Most team members were easily reachable on foot. 2. It was no problem to get the team members together on one place for spontaneous meetings.	Hoegl & Proserpio (2004)
Team Rewards	1. The team members´ participation in the project was fixed in their target agreements and/or team mem bers were rewarded for their participation in this project.	New scale
Origin of Project Budget	1. The budget was provided by a central function (dichotomous)	New scale
Intrinsic Motivation of Team Members	1. The team members recognized the project as an interesting challenge to develop a method of resolu tion. 2. The team members immersed themselves in the project. 3. The interest of the team members for the project was high.	Griffiths-Hemans & Grover (2006) Tierney et al. (1999)
Team Size	1. Number of fulltime-team-members.	Hoegl & Weinkauf (2005)
Functional Diversity	1. Number of functions involved in the project.	Sethi et al. (2001)
Firm Size	1. Natural logarithm of the employees of the firm / the business unit.	Subin & Workman (2004) Jansen et al. (2006)

4.4 Choice of PLS as Research Method

The structural models were tested by using the partial least square technique (PLS). For this purpose the software SmartPLS V.2.0.M3 was used. Recently PLS path-modeling has become a popular alternative to covariance based structural equation modeling. Some recent examples are the studies of Eom et al. (2006), Sosik et al. (2002), Vazquez-Carrasco & Foxall (2006), and White et al. (2003).

Like covariance based structural equation modeling (SEM), PLS allows the empirical assessment of a structural model together with its measurement model. The measurement model links each construct with a selection of indicators while the structural model represents a network of causal relationships between the constructs (Keil et al. 2000, p. 309, Wold 1982). PLS estimates the measurement model within the context of the structural model by estimating the loadings of indicators on the constructs and the estimation of causal relationships among the constructs in an iterative manner (Fornell 1982, Keil et al. 2000, p. 309). The path coefficients measuring the causal relationships between latent variables are standardized regression coefficients (Henseler 2005, p. 73, Scholderer & Balderjahn 2006, p. 88). The factor loadings of the indicators, which are used to evaluate the quality of the measurement model, are interpretable within the context of a principal component analysis (Bookstein 1986, Scholderer & Balderjahn 2006, p. 90, Sosik et al. 2002, p. 221, Wold 1985). By estimating individual item loadings in the context of a specified structural model rather than in isolation, PLS enables the researcher to avoid inconsistent and biased estimations for the parameters (White et al. 2003, p. 71). Because PLS considers all path coefficients simultaneously, it also allows the analysis of direct, indirect, and spurious relationships (White et al. 2003, p. 71).

While covariance-based SEM-modeling involves parameter estimation procedures, which seek to reproduce the observed covariance matrix of the indicators as closely as possible, PLS-modeling has as its primary objective the minimization of error (or consistently, the maximization of variance explained) in all endogenous constructs. PLS seeks to reproduce the empirical data matrix (Fassot 2006, p. 26, Scholderer & Balderjahn 2006, p. 92).The extent to which a PLS model accomplishes this aim can be determined by examining the R^2 values for the endogenous constructs (Hulland 1999, p. 202).

Various researchers describe PLS as suitable to the investigation of complex relationships, such as causal-predictive analysis in situations where low theoretical information is available (Chin & Newsted 1999, p. 336, Fornell et al. 1990, Fornell & Bookstein 1982, Joreskog & Wold 1982, Webster 2006). PLS is applicable for the purpose of confirming theoretical relationships, as well as for the development of propositions for further testing (Chin & Newsted 1999, Fassott 2006, p. 29, Webster 2006).

There are several reasons for choosing the PLS-modeling-technique, and not covariance based SEM within the context of this study. One reason is that PLS does not make assumptions about the underlying data distribution when estimating the model parameters, whereas covariance-based structural modeling approaches like LISREL or AMOS require multivariate normality (Joereskog & Soerborn 1993, Wold 1985). To find out whether the data was normally distributed, Kolmogorov-Smirnov tests were performed. The test results suggest that the distribution of the constructs, except for "team creativity late" differs significantly from a normal distribution (See Appendix VI for the entire results). Therefore, covariance-based approaches are not considered appropriate for testing the hypothesis of the conceptual models. A second reason is that PLS qualifies for the investigation of both formative and reflective constructs (Tenenhaus et al. 2005). A third reason is that a PLS-analysis is appropriate when sample sizes are small (Tenenhaus et al. 2005, p. 160, White et al. 2003, p. 71). Although the recommended minimum sample size requirements for an application of covariance based SEM vary, they are generally considered to be higher as compared to PLS. Two popular rules of thumb for covariance based SEM are $n>200$ or $n>5*q$; where q is the number of parameters to be estimated, and n is the sample size (Bentler & Chou 1987, Backhaus et al. 2000). Sample size requirements become even elevated ($n>300$) when the data is not normally distributed (Schermelleh-Engel et al. 2003, pp. 27, 49-50).[54] These requirements are not met for the sample size for this investigation (133 returned questionnaires). With respect to PLS, Chin & Newsted (1999) recommend -as a general rule of thumb- that the minimum sample size of a PLS-path model should be ten times the maximum number of paths aiming at any construct in the model (including the paths of formative indicators). Bahli & Büyükkurt (2005, p. 104) even consider the fivefold amount of observations as sufficient.

The recommendation regarding minimum sample size according to Chin & Newsted (1999) is met for Model I. A ratio of 17.5 observations per path for the construct with the maximum number of paths aiming at is observed. For the more complex models II (III), this ratio results in 5.1 (5.4) observations per path (including covariates). Since the purpose of this study is to investigate a comprehensive and representative mixture of organizational antecedents on team performance, an a priori reduction of the models in order to fit sample size requirements ac-

[54] Moreover, Schermelleh-Engel et al. (2003), pp. 27, 49-50, underline that the required minimum sample size for covariance-based structural modeling cannot be generalized, because it is always model specific, depending on parameters such as the estimation method, degrees of freedom and distributional characteristics of the data. See also Boomsma/Hoogland (2001).

cording to Chin & Newsted (1999) would have alienated the original research aim. On the other hand, one has to be aware that an insufficient sample size might result in imprecise estimates. For this reason, the original (full) models were first estimated, and then re-estimated by only considering significant paths. By applying this heuristic, it was possible to estimate the reduced models in accordance with the sample size recommendation given by Chin & Newsted (1999). For model II (reduced) the ratio of observations is 12.5 and for model 3 (reduced) the ratio is 15. Subsequently, the path coefficients of the full and the reduced models were compared, and it was checked whether there are great variations in the estimates to detect potential imprecise estimates.

The analysis shows that the path estimates of the reduced models are similar to the estimates of the full models. Therefore, it can be concluded that sample size does not substantially influence the quality of the full model estimates. Details on the outcome of this procedure are reported in the sections 4.7.2 and 4.8.2, where the results of model II and III are addressed.

4.5 General Steps in the Assessment of PLS-models

A PLS model is usually interpreted in two stages: (1) The assessment of the reliability and the validity of the measurement model and (2) the assessment of the structural model. This approach makes sure that the researcher has reliable and valid measures of the constructs before conclusions about the nature of the construct relationships are drawn (Carmines & Zeller 1979, Hulland 1999, p. 198).

4.5.1 Assessment of Validity and Reliability of the Measurement Model

The adequacy of a reflective measurement model is assessed by evaluating, (1) the reliability of single items, (2) the convergent validity (also referred to as internal consistency) between items that are expected to measure the same construct, and (3) the discriminant validity between constructs (Hulland 1999, p. 198, White et al. 2003, p. 71).[55]

For the assessment of individual item reliability the loadings (or simple correlations) of the measures on their corresponding constructs are inspected. A rule of thumb recommends accepting items with loadings of at least 0.7. This implies that there is more shared variance between the construct and its measure than error variance, or stated differently, it indicates that more than 50% of the variance in the item (i.e. the square of the loading) is due to the construct (Hulland 1999, p. 198). However, a reliability score of at least 0.5 might be acceptable if other items related to the construct have higher reliability scores (Chin 1998, Keil et al. 2000, p. 310). In practice, single loadings between 0.5 and 0.7 can be particularly found when new items or newly developed scales are employed (Hulland 1999, p. 198).

Convergent validity (also referred to as internal consistency) measures the degree of association between items pertaining to the same construct. If items belong to the domain of one construct they are assumed to have an equal amount of common core. Consequently responses to those items should be highly inter-correlated (Berghman 2006, p. 212, Churchill 1979). Convergent validity assures relevant and appropriate measures, and the unidimensionality of a construct (Benamati & Lederer 2000, p. 350, Hulland 1999, p. 199). Researchers using PLS generally report Cronbach's alpha and/ or the Composite Reliability measure developed by Fornell & Larcker (1981) as measures for convergent validity (Fornell & Larcker 1981, p. 45, Hulland 1999, p. 199). Fornell & Larcker (1981) argue that the composite reliability measure

[55] A measure is *reliable* to the extent that independent but comparable attempts to capture the same attribute or construct agree. A measure is *valid* on the condition that the indicators or the construct accurately measures what they are supposed to measure (Berghman 2006, p. 205).

is superior to Cronbach's alpha since it is estimated within the context of the causal model (Cp. also Hulland 1999, p. 199). Moreover, Cronbach's alpha a priori presumes that the indicators of a construct contribute equally (i.e. the loadings are set to unity). Therefore, Eom et al. (2006, p. 223) consider Cronbach's alpha as a lower bound of convergent validity. Nevertheless, the minimum requirements for both measures are similar. Convergent validity is considered acceptable when the values of both measures exceed the threshold of 0.6 recommended by Bagozzi & Yi (1988), or respectively 0.7 as suggested by Nunnally (1978).

A third measure, AVE (average variance extracted), is recommended by Fornell & Larcker (1981). AVE measures the amount of variance captured by the construct, relative to the amount of variance due to measurement error. If AVE shows values less than 0.5, this means that the variance due to measurement error exceeds the variance captured by the construct, making the validity of the indicators and the validity of the entire construct questionable. For this reason, AVE should exceed values greater than 0.5 (Fornell & Larcker 1981, p. 46).

Discriminant validity represents the extent to which measures of a specific construct differ from measures of other constructs. A criterion for discriminant validity is that a construct should share more variance with its indicators than it shares with other constructs in a given model (Hulland et al. 1999). To assure discriminant validity, Fornell & Larcker (1981, p. 46) suggest that the average variance shared (AVE) between a construct and its measures should be greater than the variance shared (i.e. the squared correlation) between the construct and other constructs (Cp. also Hulland 1999, pp. 199-200). Discriminant validity implies that the constructs can be adequately discriminated and that it is appropriate to view them as separate theoretical entities.

The procedures described above are only related to reflective constructs where indicators are supposed to be correlated. For formative constructs where the latent variable is rather seen as an effect than a cause, the indicators are supposed to be independent. This is because they are considered different causes influencing the construct (Hulland 1999). In this case individual indicator weights pertaining to the same construct can be either positive or negative.[56] Consequently, discussions about the reliability and the validity of the indicators are not relevant (Hulland 1999, p. 202). In the absence of classical measures, which are used to assess reflective constructs, the use of formative constructs requires the researcher to employ strong arguments for the selection of formative indicators. A failure to include all relevant dimensions of

[56] Formative indicator weights are standardized regression weights with the latent variable as independent variable. They can be interpreted as the relative importance of the indicators in the formation of the construct (Berghman 2006, p. 226).

the construct will lead to an incomplete measurement, and thus the entire scope of the formative construct cannot be captured (Berghman 2006, p. 143, Hulland 1999, p. 201).

In contrast to the assessment procedure for reflective specifications, formative indicators with non-significant or low weights need not/ should not be eliminated. First, since the estimation of formative construct values in PLS is based on a standard OLS-regression, the inclusion of non-significant indicators does not bias the estimates of significant indicators. Second, as each formative indicator represents a unique dimension of the construct, the exclusion of indicators will alter the content and meaning of the formative construct (Berghman 2006, p. 228, Rossiter 2002, p. 315, Williams et al. 2003, p. 908). An exception to this rule can be made if high levels of multicollinearity between formative indicators are present. In case of high multicollinearity, some formative indicators may be redundant because they might capture an identical dimension of the construct. Since indicator weights are determined by a multiple regression, precise indicator weights cannot be obtained under high levels of multicollinearity due to inflated standard errors of the ß-coefficients (Berghman 2006, p. 154). Removing these redundant indicators will not lead to a substantial decrease in R^2, and will give unbiased indicator weights.

4.5.2 Evaluation of the Structural Relationships

To evaluate the specified structural model, the standardized ß-coefficients and t-values along with the R^2, and occasionally the Stone-Geyser Q^2 for predictive relevance for each endogenous construct are reported (Eom et al. 2006, Sosik et al. 2002, Vazquez-Carrasco & Foxall 2006, White et al. 2003).

The standardized ß-coefficients are a measure of the strength of a relationship between the independent and the dependent variable while holding constant the effects of the remaining independent variables. R^2 represents the squared multiple correlation coefficient, showing the proportion of variance on a dependent variable explained by all variables jointly (Allison 1999, Berghman 2006, p. 229). Because PLS makes no distributional assumptions, parametric methods (e.g. confidence intervals) are not appropriate. Therefore the non-parametric bootstrap-resampling technique (i.e. sampling with replacement) is used to ascertain the significance of the parameter estimates. T-values are computed on a basis of 500 bootstrapping runs.[57]

[57] On the basis of 500 bootstrap runs the critical levels for t-values are as follows (one tailed t-test): †p<0,10 (t> 1,283); *p<0,05 (t> 1,648); **p<0,01, (t> 2,334), ***p<0,001 (t> 3,107).

The predictive relevance of a PLS model can additionally be evaluated by inspecting the Q^2-values for the endogenous model constructs. Q^2 measures how well the manifest variables (i.e. the indicators) of an endogenous construct are reproduced by the model. The measure is estimated using a blindfolding procedure that omits a part of the data for a particular block of indicators during parameter estimation. The omitted data points are then predicted by using the estimated parameters of the constructs that are antecedents of the investigated blindfolded (endogenous) construct. The procedure is repeated until every data point has been omitted and estimated. A Q^2-value >0 implies that the model has predictive relevance (Chin 1998, Eom et al. 2006, pp. 226-227, Tenenhaus et al. 2005, p. 174-176).

In the following sections, the described procedures to assess and analyze PLS-Models (Assessment of Validity and Reliability, Evaluation of the structural relationships) will be applied on the conceptual models I, II, and III.

4.6 The Phase-specific Effects of Creativity and Efficiency (Model I)

Only projects that resulted in a market introduction are considered for the PLS-analysis of this model. The reason for the exclusion of aborted projects (n: 16) is that effects on financial performance and product quality are estimated. Hence, for aborted projects this information is not available.

4.6.1 Assessments of Validity and Reliability of the Measurement Variables

As presented in Table 9, in the majority of the cases the factor loadings exceed the recommended threshold of 0.7. Three cases (CreatQ1P2, CreatQ2P2, QualQ2) show loadings between 0.5 and 0.7. These values are acceptable because other items related to the same constructs have reliability scores exceeding the 0.7 thresholds. With one exception all loadings are significant at $p<0.001$ ($t>3.107$). One item (CreatQ2P2) is significant at $p<0.01$ ($t>2.334$). Therefore, the overall reliability of the items is considered acceptable.

Table 9. Model I - Indicator Reliability and Convergent Validity

Construct / Indicator	Factor Loading	T Values	AVE	Composite Reliability	Cronbach's Alpha
Creativity early			0.61	0.86	0.79
CreatQ1P1	0.71	6.18			
CreatQ2P1	0.78	11.26			
CreatQ3P1	0.75	7.84			
CreatQ4P1	0.86	22.73			
Creativity late			0.54	0.82	0.74
CreatQ1P2	0.67	3.75			
CreatQ2P2	0.56	2.79			
CreatQ3P2	0.81	5.70			
CreatQ4P2	0.85	9.43			
Efficiency early			0.69	0.87	0.77
Efficiency Q1P1	0.80	7.07			
Efficiency Q2P1	0.85	12.85			
Efficiency Q3P1	0.84	11.72			
Efficiency late			0.70	0.87	0.78
Efficiency Q1P2	0.87	20.99			
Efficiency Q2P2	0.83	16.11			
Efficiency Q3P2	0.80	13.35			
Financial Performance			0.75	0.90	0.84
FinSuccess Q1	0.89	11.75			
FinSuccess Q2	0.89	14.84			
FinSuccess Q3	0.81	9.21			
Degree of Innovation			0.73	0.85	0.63
InnovQ1	0.87	13.99			
InnovQ2	0.84	13.65			

Table 10. Model I - Indicator Reliability and Convergent Validity (continued)

Construct / Indicator	Factor Loading	T Values	AVE	Composite Reliability	Cronbach's Alpha
Overall Performance early			0.85	0.92	0.83
Overall Perf Q1P1	0.91	18.28			
Overall Perf Q2P1	0.94	67.61			
Overall Performance late			0.87	0.93	0.85
Overall Perf Q1P2	0.92	38.61			
Overall Perf Q2P2	0.95	87.76			
Product Quality			0.53	0.77	0.56
QualQ1	0.77	8.66			
QualLQ2	0.65	3.96			
QualQ3inv	0.76	7.34			

The values of Cronbach's alpha, composite reliability, and AVE for the constructs are displayed in Table 10 and Table 10. All constructs show acceptable levels with respect to composite reliability and AVE. For two constructs (degree of innovation, product quality), Cronbach's alpha results in values of 0.63, and 0.56. These values are acceptable since the other two criteria demonstrate adequate levels of convergent validity.[58]

Table 11. Model I - Correlations among Constructs and Discriminant Validity

Construct	1	2	3	4	5	6	7	8	9
1. Efficiency late	*0.84*								
2. Efficiency early	0.40	*0.83*							
3. Degree of Innovation	-0.21	-0.16	*0.86*						
4. Creativity late	0.08	0.07	0.39	*0.73*					
5. Overall Performance early	0.24	0.55	0.18	0.15	*0.92*				
6. Product Quality	0.36	0.24	0.01	0.02	0.45	*0.73*			
7. Financial Success	0.04	0.13	-0.12	0.24	0.28	0.30	*0.87*		
8. Creativity early	-0.17	0.01	0.53	0.59	0.29	0.07	0.06	*0.78*	
9. Overall Performance late	0.56	0.34	0.04	0.23	0.56	0.48	0.18	0.03	*0.93*

Note: The principal diagonal elements correspond to the square root of the average variance extracted of each construct. The other figures correspond to the correlations between constructs.

As shown in Table 11, the square root of the average variance extracted is greater than all corresponding correlations. Additionally, an examination of the cross-loadings confirms that

58 Additionally, an exploratory principal component analysis using the Kaiser-criterion was performed on each construct. For all constructs, the analysis resulted in a one-factor solution, thereby again confirming the unidimensionality of the constructs.

no item loads higher on another construct than it does on its associated construct. On the basis of these results, it can be concluded that there is an adequate level of discriminant validity.

4.6.2 Analysis and Results

Due to the directional nature of the hypothesized relationships and in line with other researchers (Atuahene-Gima 2005, Keil et al. 2000, Sethi 2000b), one-tailed t-tests are used in order to assess the significance levels. The entire results the structural model represented by ß-coefficients, t-values and corresponding significance levels are displayed in Table 12 and in Figure 7.

Table 12. Model I - Results of the Structural Model

Hypothesis/ Control Paths	From	To	Std. Path coefficient	T-Value
H1a	Creativity early	Degree of Innovation	0.463	3.189***
H1b	Creativity late	Degree of Innovation	0.114	0.919
H2a	Degree of Innovation	Overall Performance early	0.278	2.697***
H2b	Degree of Innovation	Overall Performance late	0.059	0.609
H2c	Degree of Innovation	Efficiency late	-0.209	1.775*
H3a	Efficiency early	Overall Performance early	0.592	5.996***
H3b	Efficiency late	Overall Performance late	0.469	4.566***
H4a	Overall Performance early	Financial Success	0.242	1.315†
H4b	Overall Performance late	Financial Success	-0.060	0.325
H5a	Overall Performance early	Product Quality	0.279	1.855*
H5b	Overall Performance late	Product Quality	0.331	2.304*
H6	Product Quality	Financial Success	0.224	1.434†
Control	Overall Performance early	Overall Performance late	0.436	4.363***
Control	Degree of Innovation	Efficiency early	-0.162	1.029
Control	Degree of Innovation	Financial Success	-0.159	1.059
Control	Degree of Innovation	Product Quality	-0.058	0.506

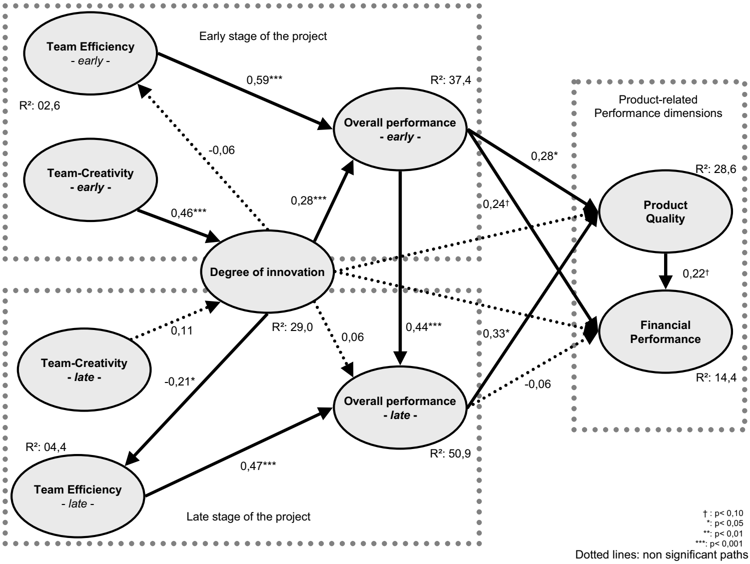
Notes: One tailed t-test for the hypothesis. Significance levels: †p<0.10 t: 1.283, *p<0.05 t: 1.648, **p<0,01 t: 2.334, ***p<0.001 t: 3.107.

H1a-b are supported. The results indicate that the degree of innovation is positively affected by early creativity (.463, t: 3.189***) while no significant relationship between late creativity and degree of innovation is found (.114, t: 0.919). Consistent with hypothesis *H2a*, the degree of innovation positively affects early overall performance (.278, t: 2.697**). No negative relationship is found for the degree of innovation and late overall performance (.059, t: 0.609), lending no support to *H2b*. *H2c* states that the degree of innovation exerts a negative influence on efficiency in late stages. This hypothesis is supported (-.209, t: 1.775*). With respect to *H3a-b*, early efficiency is positively related to early overall performance (.592, t:

5.996***), and also late efficiency is positively associated with late overall performance (.469, t: 4.566***), thereby supporting *H3a-b*.

The adjusted R^2 related to the endogenous constructs attest explanatory relevance to the model. The adjusted R^2 for the constructs were as follows: Degree of innovation: .290, efficiency late: .044, overall performance early: .374, and overall performance late: .509.

Figure 7. Model I – Structural Model.



Within the additional analysis, *H4a-b* is partially supported. While early overall performance has a (weak) positive and significant effect on financial success (.242, t: 1.315†), no significant association is found for late overall performance and financial success (.059, t: 0.325).[59]. The ß-coefficients between overall performance early (late) and product quality are both positive and significant (early: .279, t: 1.855*, late: .331, t: 2.304*). This finding does not lend support to *H5a*, but to *H5b*. Comparing the size of the path coefficients indicates that product quality is slightly stronger affected by overall performance late. As stated in *H6*, product quality positively influences financial success (.224, t: 1.434†). Although the significance level is low, *H6* is supported. The adjusted R^2 for the constructs were as follows: Product quality .286, financial success .144.

[59] It has to be noted that in some bootstrapping-runs the t-value for the ß-coefficient between overall performance early and financial success displayed values slightly underneath the p> .10 level. This issue was still existent, when the bootstrapping runs were increased from 500 to 2000, indicating a borderline value.

The Q^2 estimates from the blindfolding procedure are displayed in Table 13. As seen in the table, using different omission distances of 3, 7, 11 and 19 produced $Q^2>0$ for the vast majority of the constructs, indicating that the estimates are stable and predictive. With one exception (financial success) and only for the case, when omission distance = 7 was used, the model lacks predictive power as indicated by a $Q^2<0$.

Table 13. Model I - Blindfolding Results.

	Q^2 (omission distances underneath)			
Endogenous Constructs	**3**	**7**	**11**	**19**
Efficiency early	0.022	0.000	0.323	0.022
Efficiency late	0.035	0.007	0.027	0.030
Financial success	0.056	-0.036	0.115	0.108
Degree of innovation	0.180	0.158	0.215	0.208
Overall perf early	0.303	0.244	0.296	0.312
Overall perf late	0.421	0.376	0.433	0.439
Product quality	0.148	0.130	0.160	0.148

4.7 The Effects of Organizational Antecedents in the Early Project Stage (Model II)

For the interpretation of the following model the same procedures are applied as described in detail in the sections 4.5.1 and 4.5.2. First, the reliability and the validity of the measurement model are assessed by evaluating the reliability of single items, convergent validity, and discriminant validity. Second, the structural model is evaluated on the basis of path coefficients, t-values, R^2 and Q^2.

4.7.1 Measurement and Validation of Constructs

As shown in Table 14, all reflective indicators displayed factor loadings between 0.7 and 0.97, thereby suggesting adequate reliability of the measures. In addition, all loadings are significant at $p<0.001$ (t-values > 3.107). Therefore, it can be concluded that the items show adequate levels of individual reliability. Composite reliability for all reflective constructs exceeds the recommended cutoff value of 0.7. The scores range between 0.84 and 0.94. For project formalization (0.64) and innovativeness (0.69), Cronbach's alpha falls short of the suggested cutoff limit (0.7). However, these values are acceptable, because they are close to the recommended threshold. Moreover, AVE for all constructs exceed 0.5. Therefore, the constructs show adequate levels of convergent validity.[60] Details on all measures are displayed in Table 14 and in Table 15.

[60] Additionally, an exploratory principal component analysis using the Kaiser-criterion was performed on each construct. For all constructs, the analysis resulted in a one-factor solution, thereby again confirming the unidimensionality of the constructs.

Table 14. Model II - Indicator Reliability and Convergent Validity.

Construct / Indicator	Loadings/ Weights	T Value	AVE	Composite Reliability	Cronbach's Alpha
Efficiency (early)			0.63	0.84	0.71
CostQ1P1	0.70	6.74			
CostQ2P1	0.80	15.15			
TimeQ1P1	0.83	16.92			
Creativity (early)			0.63	0.87	0.80
CreatQ1P1	0.70	6.74			
CreatQ2P1	0.84	18.54			
CreatQ3P1	0.81	16.68			
CreatQ4P1	0.82	16.78			
Overall Performance (early)			0.83	0.91	0.81
OverallPerfQ1P1	0.94	51.53			
OverallPerfQ2P1	0.88	14.53			
Degree of Innovation			0.76	0.86	0.69
InnovQ1	0.85	19.21			
InnovQ2	0.90	27.41			
Decentralization (early)			0.87	0.93	0.85
DecentQ1P1	0.93	39.04			
DecentQ2P1	0.93	35.21			
Participation (early)			0.72	0.88	0.80
ParticipQ1P1	0.82	14.65			
ParticipQ2P1	0.87	20.39			
ParticipQ3P1	0.85	22.60			
Proximity of team members (early)			0.86	0.92	0.84
ProxQ2P1	0.88	3.98			
ProxQ3P1	0.97	4.60			
Central Budget	1.00				
Project Formalization (early)			0.73	0.85	0.64
FormalQ1P1	0.90	18.60			
FormalQ2P1	0.81	9.25			
Steering Committees (early) *formative*					
SteerQ2P1	0.67	1.68			
SteerQ1P1mon	-0.57	1.01			
Rewards	1.00				
Integration with functional groups (early)			0.78	0.91	0.86
IntegratFuncGroupsQ1P1	0.91	33.12			
Integrat FuncGroupsQ2P1	0.86	17.60			
Integrat FuncGroupsQ3P1	0.87	17.11			
Top Management Support (early)			0.64	0.87	0.82
TopMgtQ1P1	0.78	7.89			
TopMgt2P1	0.79	6.46			
TopMgt3P1	0.84	9.38			
TopMgt4P1	0.78	6.96			

Table 15. Model II - Indicator Reliability and Convergent Validity (continued).

Construct / Indicator	Loadings	T Value	AVE	Composite Reliability	Cronbach's Alpha
Covariates					
Intrinsic Team Motivation			0.84	0.94	0.90
MotivaQ1	0.92	31.22			
MotivaQ2	0.92	34.98			
MotivaQ3	0.91	27.13			
Functional Diversity	1.00				
No. of team members	1.00				
Firm Size	1.00				

Applying the procedure suggested by Fornell & Larcker (1981) to assess discriminant validity, it shows that the square root of the average variance extracted is greater than all corresponding correlations of the particular construct with other latent variables (Table 16). Moreover, an examination of the cross-loadings confirms that no item loads higher on another construct than it does on its associated construct. On the basis of these results, it can be concluded that the reflective constructs display adequate levels of indicator reliability, composite reliability, and discriminant validity.

With respect to the formative construct steering committees, the level of multicollinearity between the two indicators was investigated. The variance inflation factor (VIF) does not indicate a critical level of multicollinearity (VIF: 1.049). It is far below the recommended threshold (VIF>10), suggested by Belsley et al. (1980). Although the weight of the item "Steer Q1p1mon" is not significant (-.57, t: 1.01), it is not removed because an exclusion alters the meaning of the construct (Hulland 1999).

Table 16. Model II - Correlations among Constructs and Discriminant Validity.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Central Budget	1.00																
2. Creativity early	0.22	*0.79*															
3. Decentralization early	0.07	0.29	*0.93*														
4. Efficiency early	0.21	0.01	0.41	*0.79*													
5. Firm Size	0.10	0.18	0.23	-0.05	1.00												
6. Functional Diversity	0.27	0.06	0.07	0.06	0.17	1.00											
7. Degree of Innovation	0.13	0.45	0.07	0.01	0.21	-0.18	*0.87*										
8. Integrat w. func. dep. early	0.11	0.20	0.14	0.32	-0.13	-0.07	-0.04	*0.88*									
9. Intrinsic Motivation	0.00	0.33	0.09	0.13	-0.11	-0.03	0.32	0.50	*0.92*								
10. No. of team members	-0.07	-0.23	-0.33	-0.20	0.15	0.09	0.16	-0.27	0.08	1.00							
11. Overall Performance early	0.19	0.20	0.41	0.45	0.17	0.13	0.30	0.27	0.30	0.00	*0.91*						
12. Participation early	0.04	0.41	0.40	0.39	-0.14	-0.01	0.20	0.41	0.40	-0.27	0.41	*0.85*					
13. Project Formalization early	0.19	0.08	0.29	0.42	0.00	0.04	0.19	0.37	0.36	0.00	0.47	0.42	*0.86*				
14. Rewards	0.00	0.14	-0.02	-0.20	0.20	0.04	0.08	-0.26	0.02	0.22	-0.13	-0.09	-0.17	1.00			
15. Steering Committees early	0.13	-0.06	-0.06	-0.16	0.19	0.11	0.06	-0.07	0.04	0.18	0.04	-0.06	0.12	0.12	1.00		
16. Team Member Proximity early	0.04	0.15	0.00	0.01	-0.08	-0.01	0.02	0.00	0.09	-0.03	0.00	-0.10	0.09	0.08	-0.13	*0.93*	
17. Top Management Support early	0.15	0.20	0.00	0.27	-0.06	0.20	0.13	0.32	0.29	0.04	0.36	0.36	0.31	-0.04	0.19	0.04	*0.80*

Note: The cursive principal diagonal elements correspond to the square root of the average variance extracted of each construct. The other figures correspond to the correlations between constructs.

4.7.2 Analysis and Results

H7, stating that the early use of organic structures is positively related with early team creativity, is partially supported. The relationship between decentralization and creativity is not significant (.048, t: 0.374), thereby not supporting *H7a*. Next, a positive relationship between participation in the early stage and creativity (.362, t: 2.445**) is found, supporting. *H7b*. *H7c* assumes a positive effect of physical proximity on team creativity. No support is found for this hypothesis (.158, t: 1.178). Finally, central budgets are found to have a positive effect on creativity (.206, t: 1.564†), which gives support to *H7d.*

Within H8, which assumes that organic structures will foster early efficiency, only *H8a* receives empirical support. Decentralization displays a strong positive effect on early efficiency (.310, t: 2.977**), while the associations between participation (.075, t: 0.481), team member proximity (-.037, t: 0.235), central budgets (.150, t: 1.207), and team efficiency shows to be non-significant. Thereby *H8b*, *H8c*, and *H8d* are not supported.

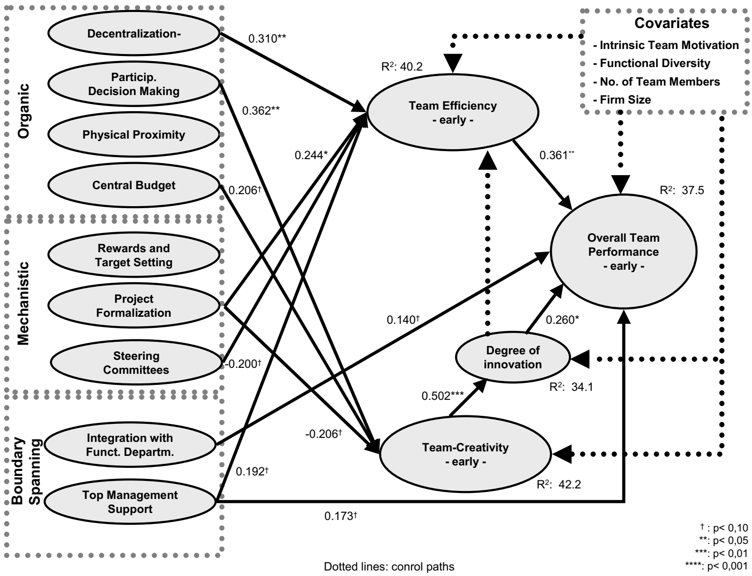
H9 states that the early use of mechanistic structures will be negatively related to team efficiency during the early stage. Mixed results are obtained for this hypothesis. *H9a,* stating that steering committees have a negative effect on efficiency, is supported (-.200, t: 1.470†). A non significant association between rewards and team efficiency is found (-.082, t: 0.793), giving no support to *H9b.* Contrary to what was assumed within *H9c,* project formalization has a positive impact on team efficiency (.244, t: 1.778*).

H10 assumes negative relationships between mechanistic structures and team creativity. Neither *H10a* assuming a negative effect of steering committees (-.073, t: 0.455), nor *H10b* stating that rewards will have a negative influence (.107, t: 0.969) is supported. However, *H10c* was supported. Formalization was negatively associated with creativity (-.206, t: 0.969).

As far as the relationships between creativity and early boundary spanning activities, i.e. top management support (.075, t: 0.599), and the integration with functional departments (-.075, t: 0.420) are concerned, *H11a-b* are not supported. *H12a* assuming a positive impact of top management (.192, t: 1.418†) on early efficiency, is supported, while such a relationship is not observed for the integration with functional departments (.073, t: 0.532), consequently rejecting *H12b.* Finally*, H13a-b* assuming positive relationships with early overall team performance are supported. H13a is related to the impact of top management support (.173, t: 1.399†), while H13b is associated with the integration with functional departments (.140, t: 1306†). Figure 8 and Table 17 summarize the results of the structural model.

To investigate potential biases in the estimates due to the shortcoming in sample size (Cp. section 4.4), the model was re-estimated leaving out non-significant predictors. Then the path coefficients were compared. Apart from an insignificant association between integration with functional groups and overall performance (.11, t: 1.209), the results of the "full model" are confirmed.[61] This implies that the shortfall in sample size does not lead to major biases in the estimations. However, the relationship between overall performance and the integration with functional departments should be viewed with caution.

Figure 8. Model II - Structural Model.



61 For the paths aiming at creativity, the following estimated are received: central budget (.19, t: 1.940), participation (.35, t: 3.253), project formalization (-.20, t: 1.566), *covariates:* firm size (.29, t: 2.882), intrinsic motivation (.33, t: 3.145), no. of team members (-.19, t: 2.045). For the paths aiming at efficiency, the following estimates are received: decentralization (.33, t: 3.159), project formalization (.29, t: 2.814), steering committees (-.20, t: 1.573), top management support (.23, t: 1.932). For the paths aiming at overall performance, the following estimates are received: efficiency (.0.37, t: 3.224), degree of innovation (.27, t: 2.382), integration with functional groups (.11, t: .1.209), top management support (.18, t: 1.613). For the paths aiming at degree of innovation, the following estimated are received: creativity (.53, t: 6.112), functional diversity (-0.23, t: 2.450), no. of team members (.335, t: 3.145). Adj. R²: efficiency (.353), creativity (.375), overall performance (.353) and innovativeness (.331).

Table 17. Model II - Path Coefficients and T-values

Predictor / Covariate	Team Efficiency early		Team Creativity early		Overall Team Performance early		Degree of Innovation	
	Std. Path coefficient	T Value	Std. Path coefficient	T Value	Std. Path coefficient	T Value	Std. Path coefficient	T Value
Efficiency early					0.361	2.716**		
Degree of Innovation	-0.072	0.505			0.260	2.147*		
Creativity early							0.502	4.981***
Decentralization early	0.310	2.977**	0.048	0.374				
Participation early	0.075	0.481	0.362	2.445**				
Team Member Proximity early	-0.037	0.235	0.158	1.178				
Central Budget	0.150	1.207	0.206	1.564†				
Rewards	-0.082	0.793	0.107	0.969				
Project Formalization early	0.244	1.778*	-0.206	1.423†				
Steering Committees early	-0.200	1.470†	-0.073	0.455				
Integr. w. functional dep. early	0.073	0.532	-0.075	0.420	0.140	1.306†		
Top Management Support early	0.192	1.418†	0.075	0.599	0.173	1.399†		
Covariates								
Intrinsic Motivation	-0.079	0.445	0.301	1.863*				
Functional Diversity	0.029	0.226	-0.025	0.222	0.105	1.170	-0.255	2.769**
No. of team members	0.022	0.171	-0.190	1.469†	0.034	0.317	0.281	3.020**
Firm Size	-0.045	0.393	0.270	2.490**	0.138	1.176	0.122	1.145
Adjusted R^2	.402		.422		.375		.341	

Notes: One tailed t-test for the hypothesis. Significance levels: †p<0.10 t: 1.283, *p<0.05 t: 1.648, **p<0.01 t: 2.334, ***p<0.001 t: 3.107

In a final step, the predictive relevance of the model was evaluated by inspecting the Q^2-values for the endogenous constructs. As described above, Q^2 measures how well the manifest variables (i.e. the indicators) of an endogenous construct are reproduced by the model.

Table 18. Model II - Blindfolding Results.

	Q^2 (omission distances underneath)			
Endogenous Constructs	**3**	**7**	**11**	**19**
Efficiency early	-0.060	0.219	0.244	0.248
Creativity early	0.094	0.268	0.266	0.266
Degree of Innovation	0.175	0.252	0.203	0.261
Overall Perform. early	0.148	0.343	0.316	0.315

The estimates of the blindfolding procedure are displayed in Table 18. As shown, using different omission distances (od) produced $Q^2 > 0$ for the vast majority of the constructs, indicating that the estimates are stable and predictive. Looking at the Q^2 (od: 3) for efficiency early, the model lacks predictive power as indicated by $Q^2 < 0$. However, as the omission distances 7, 11 and 19 result in $Q^2 > 0$, it can be concluded that the estimated model shows good predictive relevance.

4.8 The Effects of Organizational Antecedents in the Late Project Stage (Model III)

For the interpretation of the following model the same procedures are applied as described in detail in the sections 4.5.1 and 4.5.2. First, the reliability and the validity of the measurement model are assessed by evaluating the reliability of single items, convergent validity and discriminate validity. Second the structural model is evaluated on the basis of path coefficients, t-values, R^2, and Q^2.

4.8.1 Measurement and Validation of Constructs

Looking at Table 19 and Table 20, the majority of the reflective indicators display factor loadings greater than 0.7. For three cases (MotivaQ1, TopMgtQ1P2, SteerQ2P2), the factor loadings result in values of 0.51, 0.64, and 0.59 respectively. However, these values are acceptable because the loadings are greater than 0.5, and other items related to the same constructs have reliability scores exceeding the 0.7 thresholds. The majority of the loadings are significant at $p<0.001$ (t-value > 3.107). Four items (Particip Q1-3P2, ProxQ1P2) are significant at $p<0.01$ (t-value > 2.334), one item (MotivaQ1) displays a significance level at $p<0.05$ (t-value > 1.648), and one item (SteerQ2P2) is significant at $p<0.10$.

All values for the composite reliability measure of the constructs exceed the cutoff value of 0.7; ranging between 0.78 and 0.95. For "project formalization late" and "degree of innovation", Cronbach's alpha is 0.68, and 0.67 respectively. These values are tolerable because they are close to the recommended threshold (0.7). Therefore, the constructs show adequate levels of convergent validity.[62]

[62] Additionally, an exploratory principal component analysis using the Kaiser-criterion was performed on each construct. For all constructs, the analysis results in a one-factor solution, thereby again confirming the unidimensionality of the constructs.

Table 19. Model III - Indicator Reliability and Convergent Validity

Constructs / Indicators	Loadings / Weights	T Value	AVE	Composite Reliability	Cronbach's Alpha
Integration with functional groups (late)			0.70	0.87	0.79
IntegratFuncGroupsQ1P2	0.77	7.89			
IntegratFuncGroupsQ2P2	0.89	26.23			
IntegratFuncGroupsQ3P2	0.83	10.92			
Decentralization (late)			0.80	0.89	0.79
DecentQ1P2	0.82	3.21			
DecentQ2P2	0.97	6.33			
Project Formalization (late)			0.76	0.86	0.68
FormalQ1P2	0.87	11.50			
FormalQ2P2	0.87	9.67			
Overall Performance (late)			0.90	0.95	0.89
OverallPerfQ1P2	0.94	45.74			
Overall PerfQ2P2	0.96	84.26			
Degree of Innovation			0.75	0.86	0.67
InnovQ1	0.83	3.47			
InnovQ2	0.90	4.03			
Efficiency (late)			0.63	0.84	0.70
CostQ1P2	0.83	15.29			
CostQ2P2	0.77	7.36			
TimeQ1P2	0.78	11.04			
Steering Committees (late) *formative*					
SteerQ2P2	0.59	1.58			
Steer Q1P2mon	0.94	3.37			
Participation (late)			0.64	0.84	0.72
ParticipQ1P2	0.84	2.88			
ParticipQ2P2	0.77	2.74			
ParticipQ3P2	0.78	2.69			
Proximity of team members (late)			0.75	0.86	0.81
ProxQ1P2	0.71	2.78			
ProxQ2P2	1.00	3.61			
Top Management Support (late)			0.69	0.90	0.85
TopMgtQ1P2	0.64	4.84			
TopMgtQ2P2	0.81	13.96			
TopMgtQ3P2	0.91	31.79			
TopMgtQ4P2	0.93	48.23			
Central Budget	1.00				
Rewards	1.00				

Table 20. Model III - Indicator Reliability and Convergent Validity

Constructs / Indicators	Loadings	T Value	AVE	Composite Reliability	Cronbach's Alpha
Covariates					
Overall Performance (early)			0.82	0.90	0.80
OverallPerfQ1P1	0.86	4.64			
OverallPerfQ2P1	0.95	8.42			
Intrinsic Team Motivation			0.56	0.78	0.90
MotivaQ1	0.51	2.03			
MotivaQ2	0.85	3.66			
MotivaQ3	0.90	3.71			
Functional Diversity	1.00				
No. Of Team Members (LN)	1.00				
Firm Size	1.00				

When applying Fornell & Larckers' (1981) method to evaluate discriminant validity, it shows that the square root of the average variance extracted is greater than all related correlations of the particular construct with other latent variables (Table 21). An inspection of the cross-loadings confirms that no item loads higher on another construct than it does on its associated construct. On the basis of these results, it can be concluded that the reflective constructs of model III display adequate levels of indicator reliability, composite reliability, and discriminant validity.

With respect to the construct "steering committees", which is specified as formative, the level of multicollinearity between the two indicators was investigated. The variance inflation factor (VIF) does not indicate a critical level of multicollinearity between the two indicators (VIF: 2.130). It is far below the recommended threshold (VIF > 10), as suggested by Belsley et al. (1980).

Table 21. Model III - Correlations among Constructs and Discriminant Validity

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. No of. Team Members	1.00																
2. Central Budget	0.00	1.00															
3. Company Size	0.18	0.10	1.00														
4. Decentralization late	-0.11	-0.04	0.16	*0.90*													
5. Efficiency late	-0.06	-0.19	0.01	0.21	*0.79*												
6. Functions Involved	0.16	0.30	0.21	-0.05	0.02	1.00											
7. Innovativeness	0.19	0.10	0.25	0.03	-0.05	-0.15	*0.87*										
8. Integration w functional groups late	-0.18	0.05	-0.28	0.14	0.20	-0.10	-0.23	*0.84*									
9. Intrinsic Motivation	0.13	-0.05	-0.13	-0.04	-0.11	-0.08	0.24	0.18	*0.77*								
10. Overall Performance early	-0.03	0.12	0.12	0.33	0.21	0.04	0.27	0.13	0.21	*0.90*							
11. Overall Performance late	0.04	0.01	-0.02	0.24	0.45	0.01	-0.15	0.38	0.08	0.27	*0.95*						
12. Participation late	-0.14	0.18	-0.16	0.28	0.14	-0.03	0.22	0.21	0.29	0.33	0.15	*0.80*					
13. Project Formalization late	0.01	0.07	0.06	0.20	0.32	0.03	0.06	0.29	0.09	0.31	0.39	0.12	*0.87*				
14. Rewards	0.16	0.07	0.22	0.01	-0.05	-0.01	0.05	-0.16	0.13	-0.13	0.03	0.01	-0.14	1.00			
15. Steering Committees late	0.31	0.07	-0.05	0.01	0.22	0.11	0.00	0.01	-0.02	0.13	0.13	-0.12	0.19	0.02	1.00		
16. Team Member Proximity late	-0.06	0.12	-0.19	0.02	0.08	-0.06	-0.04	0.14	0.04	-0.02	0.20	-0.01	0.18	-0.02	0.12	0.87	
17. Top Mgt Support late	0.04	0.07	-0.09	0.01	0.25	0.13	-0.02	0.32	0.04	0.11	0.39	0.03	0.37	0.01	0.14	0.11	*0.83*

Note: The cursive principal diagonal elements correspond to the square root of the average variance extracted of each construct. The other figures correspond to the correlations between construct.

4.8.2 Analysis and Results

H14a-d states that the late use of organic infrastructures is negatively related to team efficiency. The results of the structural model are mixed. No significant effects are found for decentralization (.020, t: 0.163), lending no support to *H14a.* Contrary to what was assumed in *H14b,* late participation is positively associated with late efficiency (.210, t: 1.333†), while the impact of team member proximity remains insignificant (.065, t: 0.478), lending no support to *H14c. H14d* is supported. Central budgets are negatively related to late efficiency (-.325, t: 2.705**).

Regarding the relationship between mechanistic structures and late efficiency, which is assumed to be positive, a positive and significant impact for steering committees (.0209, t: 1.340†) and for formalization (.170, t: 1.320†) is found, lending support to *H15a* and *H15c.* With respect to *H15b*, no positive and significant relationship is detected for rewards and late efficiency (.0.048, t: 0.355). Therefore, this hypothesis is not supported.

As far as early boundary spanning activities are concerned, *H16a-b* are not supported. Neither top management (.133, t: 1.082), nor the integration with functional departments shows to be positively associated with late team efficiency. On the other hand, *H17a-b* are supported. Top Management (.231, t: 2.239**), and the integration with functional departments (.212, t: 1.842*) contributes positively to overall team performance late. Table 22 and Figure 9 summarize the results of the structural model.

Table 22. Model III - Path Coefficients and T-values.

Predictor / Covariate	Efficiency late		Overall Performance late	
	Std. Path coefficient	T Value	Std. Path coefficient	T Value
Efficiency late			0.303	3.081**
Degree of Innovation	-0.012	0.084	-0.191	1.791*
Decentralization late	0.020	0.163		
Participation late	0.210	1.333†		
Team Member Proximity late	0.065	0.478		
Central Budget	-0.325	2.705**		
Rewards	0.048	0.355		
Project Formalization late	0.170	1.320†		
Steering Committees late	0.209	1.340†		
Integration with functional groups late	0.117	0.839	0.212	1.842*
Top Management Support late	0.133	1.082	0.231	2.239**
Covariates				
Intrinsic Motivation	-0.230	1.394†		
Overall Performance early	0.109	0.712	0.207	1.689*
Functional Diversity	0.062	0.485	-0.080	0.733
No. of team members	-0.069	0.548	0.132	1.521†
Firm Size	0.078	0.520	0.073	0.772
Adjusted R²	.311		.396	

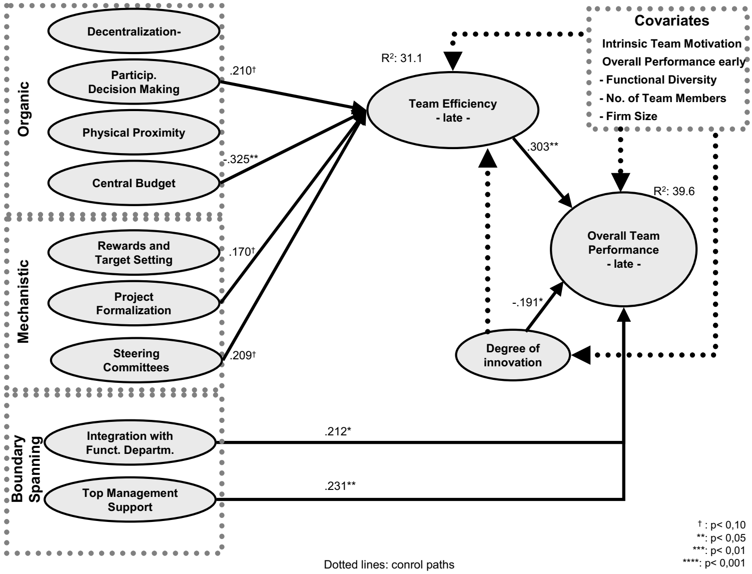
Notes: One tailed t-test for the hypothesis. Significance levels: †p<0.10 t: 1.283, *p<0.05 t: 1.648, **p<0.01 t: 2.334, ***p<0.001 t: 3.107.

To investigate potential biases in the estimates due to the shortcoming in sample size, non-significant predictors were excluded and the model was re-estimated in the reduced form.[63] Two variations are observed. The association between degree of innovation and overall performance (-.11, t: 1.258) is found to be not significant anymore, although the directional impact remains negative and is close to the p<.10 threshold. In addition, the negative association between intrinsic motivation (covariate) and efficiency (-.058; t: 0.485) results in a non-significant relationship. The vast majority of the results of the full model are confirmed by

[63] For the paths aiming at efficiency the following estimated are received: central budget (-.21, t: 2.090), participation late (.27, t: 2.194), project formalization (.22, t: 2.525), steering committees (.29, t: 2.970), *covariates:* intrinsic motivation (-.058, t: 0.485), For the paths aiming at overall performance the following estimated are received: efficiency (.34, t: 4.027), degree of innovation (-.11, t: 1.258), integration with functional groups (.22, t: 2.511), top management support (.23, t: 2.595), *covariates:* no. of team members (.14, t: 1.806), overall performance early (.25, t: 2.854). Adj. R²: efficiency (.233), overall performance (.478).

applying this procedure, indicating that the shortfall in sample size does not lead to major biases in the estimations.

Figure 9. Model III – Structural model.



Ultimately, the predictive relevance of the model is evaluated by inspecting the Q²-values for the endogenous model constructs. As described above, Q² measures how well the manifest variables (i.e. the indicators) of an endogenous construct are reproduced by the model.

Table 23. Model III - Blindfolding Results.

	Q² (omission distances underneath)			
Endogenous Constructs	**3**	**7**	**11**	**19**
Efficiency late	0.182	-0.049	-0.068	0.204
Overall Perform. late	0.285	0.224	0.204	0.359

The estimates from the blindfolding procedure are displayed in Table 23. Using different omission distances of 3, 7, 11 and 19 produces mixed results for team efficiency late. For the omission distances 7 and 11, Q² is negative, while it shows positive values for the omission distances 3 and 19. To clarify these results, two additional blindfolding procedures with the omission distances 5 (13) were performed, resulting in Q² of 0.220 (0.108), which gives less concern about a lack of predictive relevance. However, the results should be viewed with caution. Looking at the positive Q² for overall performance late, the estimated model shows good predictive relevance.

4.9 Summary of the Results

Within the course of this investigation 17 Hypothesis were tested. Table 24 displays a summary of the results. The next section will refer to the main findings, before the theoretical and managerial implications along with the limitations of this study are discussed.

Table 24. Summary of the Tested Hypothesis and Results (Model I, II, III).

	Hypothesis	Result[64]
	Model I – The Phase-specific Effects of Creativity and Efficiency	
	Team Creativity, Degree of Innovation and Overall Team Performance	
H1a	There is a positive relationship between early team creativity and the degree of innovation.	Supported
H1b	There is no significant relationship between late team creativity and the degree of innovation.	Supported
H2a	There is a positive relationship between the degree of innovation and early team performance.	Supported
H2b	There is a negative relationship between the degree of innovation and late team performance.	No support
H2c	There is a negative relationship between the degree of innovation and late team efficiency.	Supported
	Team Efficiency and Overall Team Performance	
H3a	There is a positive relationship between team efficiency and overall team performance during the early project stage.	Supported
H3b	There is a positive relationship between team efficiency and overall team performance during the late project stage.	Supported
	Additional Analysis: Overall Team Performance and Product Performance	
H4a	Overall team performance during the early stage has a positive impact on the financial success of the product.	Supported
H4b	Overall team performance during the late stage has a positive impact on the financial success of the product.	No support
H5a	Overall team performance during the early stage has no impact on product quality.	No Support (+)
H5b	Overall team performance during the late stage has a positive impact on product quality.	Supported
H6	Product quality has a positive impact on the financial success of the product.	Supported
	Model II: Effects of Organizational Antecedents in the Early Project Stage	
	Organic Structures and Creativity	
H7a	Decentralization is positively related to team creativity.	No Support
H7b	Participative decision-making is positively related to team creativity	Supported
H7c	Team member proximity is positively related to team creativity	No Support
H7d	Central budgets are positively related to team creativity.	Supported

64 Unsupported hypothesis with parenthesis (+/ -) indicate significant but reversed relationships.

Table 25. Summary of the Tested Hypothesis and Results (Model I, II, III) (continued).

	Hypothesis	Result[65]
	Organic Structures and Efficiency	
H8a	Decentralization is positively related to team efficiency.	Supported
H8b	Participative decision-making is positively related to team efficiency.	No Support
H8c	Team member proximity is positively related to team efficiency.	No Support
H8d	Central budgets are positively related to team efficiency.	No Support
	Mechanistic Structures and Efficiency	
H9a	Steering committees are negatively related to team efficiency.	Supported
H9b	Team rewards are negatively related to team efficiency.	No Support
H9c	Project formalization is negatively related to team efficiency.	No Support (+)
	Mechanistic Structures and Creativity	
H10a	Steering committees are negatively related to team creativity.	No support
H10b	Team rewards are negatively related to team creativity.	No support
H10c	Project formalization is negatively related to team creativity.	Supported
	Boundary Spanning Activities	
H11a	Top management support is positively related to team creativity.	No Support
H11b	Integration with functional departments is positively related to team creativity.	No Support
H12a	Top management support is positively related to team efficiency.	Supported
H12b	Integration with functional departments is positively related to team efficiency.	No Support
H13a	Top management support is positively related to overall performance.	Supported
H13b	Integration with functional departments is positively related to overall performance	Supported
	Model III: Effects of Organizational Antecedents in the Late Project Stage	
	Organic Structures and Efficiency	
H14a	Decentralization is negatively related to team efficiency.	No Support
H14b	Participative decision-making is negatively related to team efficiency.	No Support (+)
H14c	Team member proximity is negatively related to team efficiency.	No Support
H14d	Central budgets are negatively related to team efficiency.	Supported
	Mechanistic Structures and Efficiency	
H15a	Steering committees are positively related to team efficiency	Supported
H15b	Team rewards are positively related to team efficiency.	No Support
H15c	Project formalization is positively related to team efficiency.	Supported
	Boundary Spanning Activities	
H16a	Top management support is positively related to team efficiency.	No Support
H16b	Integration with functional departments is positively related to team efficiency.	No Support
H17a	Top management support is positively related to overall performance.	Supported
H17b	Integration with functional departments is positively related to overall performance.	Supported

[65] Unsupported hypothesis with parenthesis (+/ -) indicate significant but reversed relationships.

4.9.1 Model I - The Phase-specific Effects of Creativity and Efficiency.

Model I is related to research question I (Cp. section 3.6), which asks: *"To what degrees are creativity and efficiency related to the performance of cross-functional teams in the early and in the late stages of a NPD-project?"* It was investigated, whether there is empirical evidence that a cross-functional team's creativity is primarily relevant during the early project stages (H1, H2), and whether a cross-functional team's efficiency is relevant both during the early and late stages of a project (H3), (Cp. section 3.3).

> *Finding: Creativity is only relevant at the outset of a project. Efficiency is relevant throughout the entire project. (H1, H3)*

The empirical results confirm that the degree of innovation is influenced by early creativity but not by late creativity. This finding supports the theoretical notion that creativity is particularly relevant during the early stage of an innovation project where ideas are generated and innovative information is exchanged among team members (Souder & Moenaert 1992). It also has implications for the selection of appropriate organizational infrastructures to promote creative behavior at the outset of a project. Furthermore, the analysis confirms that team efficiency is positively associated with team performance in *both* the early and late stage of a project (Cp. section 3.3, Souder & Moenaert 1992, p. 497). However, one has to bear in mind that the results of Model II and III are suggesting that early and late efficiency are to a great extent driven or impeded by different organizational infrastructures and project management mechanisms.

> *Finding: The higher the degree of innovation, the poorer the performance during the late project stage. (H2)*

While the generation of an innovative concept, represented by a high degree of innovation, is found to be positively associated with early team performance, a negative association between the degree of innovation and late efficiency is detected. This result implies that it becomes more difficult for a team, or even for the entire organization, to efficiently perform the development stage when the innovativeness of the new product concept is high. Practical reasons for this observation may be rooted in low levels of expertise, premature production processes, insufficient planning, resistance to change, and the employment of an inappropriate project management style or infrastructures during the late stage (Duncan 1976, Sethi 2000a, p. 4, Vandevelde & Van Dierdonk 2003).

The degree of innovation is identified as an additional and important determinant that has to be considered for the success of the development stage. The finding illustrates that the project team is not only required to think *what* the new product should be like, but also *how* the new product should be developed and integrated into the organization.[66] The latter becomes more important with increasing levels of innovativeness. In such cases it may be even worth to extend *early* project tasks by further efforts to reduce *later* performance problems associated with a high degree of innovation.[67]

> *Finding: Early stage overall team performance has a positive impact on product quality and financial performance, late stage overall team performance has a positive impact on product quality (only). (H4, H5, H6)*

In an additional analysis, the relationship between early and late team performance and product performance dimensions (product quality, financial performance) was investigated. A non-significant relationship between early overall performance and product quality, and a positive relationship between late performance and product quality was expected. The rationale was that the expertise to solve concrete engineering and production problems plays an important role during the development stage, but not during the concept phase (Naveh 2005, Olson et al. 2001, Schulze & Hoegl 2006, cp. section 3.2). Contrary to what was assumed, both early and late team performance are positively associated with product quality, with late performance displaying a slightly stronger impact. A possible reason for the (unexpected) positive effect of the early stage on product quality may be the existence of important "up-front" decisions, which may determine the latitude and options to manage product quality during the late project stage. Examples may be the choice of product/ production technology, suppliers, and plant location. Moreover, financial performance is found to be associated with early team performance, but not with late team performance.[68] This surprising result suggests, that it is only the early project stage that has a direct and positive impact on the financial success of a product, while late team performance may only have an indirect (mediated) effect on financial performance across product quality (Cp. Figure 7).[69] During the early stage, important strategic decisions are being made regarding target markets and competitive positioning. Besides, the financial potential (sales and profit) of the new product initiative is estimated.

---

66 Within this context, Souder & Moenaert (1992, p. 505) state: *"Successful product innovation task groups will have made a much more profound analysis of the development activities before the development activities have been started."*

67 Examples of such activities may be a well-elaborated implementation agenda or in-depth feasibility checks.

68 In order to check this surprising result, an additional simple regression was performed using early and late performance as predictors, and financial performance as the dependent variable. The results of the simple regression confirm the PLS-estimates. There are no indications of multicollinearity (VIF: 1.433) or autocorrelation (Durbin-Watson statistic: 1.587; critical values for two predictors with n: 70, α=0.01, d_l: 1.43, d_u: 1.49). Therefore, it can be concluded that the estimates were correct (See Appendix VII for details).

69 A positive and significant relationship between product quality and financial performance is found. Since late team performance is related to product quality, one can assume an indirect effect.

The pivotal role of the early project stage for successful innovation has also been highlighted by Moenaert & Souder (1992, p. 505). Early stage analysis and decisions are essential to the project because they determine further actions and have consequences for all following steps. Moreover, they are hardly reversible ("concept freeze"). This may also explain, why no direct association between overall team performance late and financial performance is observed. The development stage is "only" about translating an already elaborated concept into a product. Hence, there may be *no additional* positive effects on financial performance that can be attributed exclusively to the late project stage - apart from accomplishing and assuring the required level of product quality. Therefore, the results suggest that each phase contributes differently to a new product's financial success. The early stage influences financial performance across its strategic relevance for the product and for the entire innovation process. In contrast, the late stage is determined with putting the strategy into practice. It may influence financial performance "only" indirectly across product quality.

In summary, the results of this model support the notion that early and late project performance are driven by different performance-facets, and that the two stages vary in their responsibilities to generate successful innovations (Duncan 1976, Souder & Moenaert 1992). In the early stage, team creativity and efficiency are identified as drivers to overall team performance. Therefore, teams require appropriate infrastructures to exchange innovative and coordinative information. The strategic importance of early stage performance is also underlined by the additional analysis where significant and positive relationships with financial performance and product quality are observed. In contrast, during the late stage, overall performance is mainly driven by team efficiency. Team members are required to exchange coordinative information. The importance of late stage team performance is underlined by a positive association with product quality. However, altogether the results suggest that the early stage has a greater influence for innovation success than the late project stage.

4.9.2 Model II/ III – The Phase-specific Effects of Organizational Antecedents

Research question II asks *"What is the impact of organic and mechanistic structures during the course of a project, and how are they related to a team's creativity and efficiency?"*. Model II addresses this question for the early stage (H7-10), and Model III refers to the late stage (H14-15). Research question III asks *"What is the impact of boundary spanning activities during the course of a project, and how are they related to the creativity, efficiency and overall performance of a team?"* The effects of early and late boundary spanning activities (integration with functional departments, top management support) are investigated through Model II (H11-13) and Model III (H16-H17). Table 26 summarizes the findings regarding the effects of organizational antecedents across project stages.

Table 26. Identified Effects of Organizational Antecedents Across Project Stages.

Organizational Antecedents	Early Stage	Late Stage
Organic Structures		
Decentralized decision-making structures	Efficiency (+)	No significant effects
Participative decision-making within the team	Creativity (+)	Efficiency (+)
Central budget	Creativity (+)	Efficiency (-)
Physical proximity	No significant effects	No significant effects
Mechanistic Structures		
Rewards	No significant effects	No significant effects
Project formalization / structuring	Creativity (-), Efficiency (+)	Efficiency (+)
Steering committees	Efficiency (-)	Efficiency (+)
Boundary Management		
Integration with functional departments	Overall Performance (+)	Overall Performance (+)
Top management support	Overall Performance (+), Efficiency (+)	Overall Performance (+)

Finding: Two out of four investigated organic structures (participative decision-making, central budgets) foster early creativity, while creativity is either not (rewards, steering committees) or negatively (formalization) affected by mechanistic structures (H7, H10)

Out of the four tested organic structures, participative decision-making and central budgets are positively related to team creativity, and out of the three mechanistic structures, only formalization is negatively associated with team creativity. Rewards and steering committees do not show any significant impacts with respect to creativity. The results indicate that some organic structures (participative decision-making, central budgets) foster innovative behavior, while creativity is either not (rewards, steering committees) or negatively (formalization) affected by mechanistic structures. Hence, there is some consistency with the presented theory stating that creativity during the early stage is fostered by organic- and impeded by mechanistic structures (Cp. sections 3.4 and 3.7.2.1).

Participative decision-making is expected to increase the involvement of all team members and lead to an equal consideration of diverse know-how, backgrounds, and skills. Central budgets may support creativity because they are assumed to stimulate a team's eagerness to experiment, and to try out new ways. When controlling for a variety potential antecedents, no effects are found for decentralization and team member proximity. This indicates that initiatives to foster creativity should not rely on these organic antecedents since they are (relatively) ineffective. The negative impact of formalization may be explained by its emphasis on rules and controls, which in turn restrain team members from trying out new ways. Furthermore, when controlling for formalization, rewards and steering committees are not found to harm creativity.[70]

Looking at the relative effectiveness of the identified antecedents to foster creativity, participative decision-making has the strongest positive influence, followed by intrinsic motivation (covariate), firm size (covariate), and central budgets. With respect to the antecedents, which impede creativity, the effect of formalization is slightly stronger than the negative effect of

[70] With respect to the covariates, *intrinsic motivation* is found to be positively related to team creativity. Being excited by the work itself, and being attracted by the challenge of a problem has been highlighted as a key motivational factor for the development of new solutions (Amabile 1988). Besides, *firm size* is positively associated with team creativity. Firm size is sometimes used as an indicator of a firm's resource strength (Jansen et al. 2006, p. 14). It may enable teams in larger companies to experiment to a greater extent than in smaller firms. Moreover, large companies may be able to attract more creative individuals from the outset since they may offer more opportunities to pursue innovative efforts. *Team size* is negatively related to creativity. Given the increase of potential links between team members as the team size is growing, larger team sizes make it more difficult for the team members to interact with each other (Jansen et al. 2006, p. 14) and hence, to jointly develop and agree on a new concept. *Cross-functionality* is not found to be significantly related to efficiency, creativity, and overall team performance. However it is negatively related to the degree of innovation, supporting the notion that the potentially beneficial effects of cross-functional diversity might be offset by task disagreements, reduced communication, and value conflicts (Ancona & Caldwell 1992b, Gebert et al. 2006, Lovelace et al. 2001).

team size (covariate). The standardized path coefficient of the most potent antecedent (formalization) to impede creativity is lower than the least potent antecedent to foster creativity (central budgets). This indicates that negative effects of formalization may be easily compensated if for instance, central budgets and participative decision-making are simultaneously applied.

> *Finding: Out of four investigated organic structures, only decentralization has a positive impact on early efficiency. The relationships between mechanistic structures and early efficiency are mixed. While formalization has a positive impact, steering committees are found to obstruct early efficiency. The effect of rewards is non-significant. (H8, H9)*

The presented theory stated that early efficiency would be impeded by mechanistic structures, because these structures are assumed to be not effective under conditions of high uncertainty. In contrast, organic structures were expected to function well when uncertainty is high and therefore, foster efficiency during the early project stage (Cp. sections 3.4 and 3.7.2.1). The empirical analysis yields that decentralization is the only organic antecedent fostering early efficiency. However, the path coefficient is the greatest among all other significant antecedents of early efficiency. As far as the effects of mechanistic structures are concerned, the results are mixed. As assumed, early steering committees are negatively related to early efficiency, and, contrary to our assumptions, formalization has a positive effect on efficiency. Hence, the empirical analysis hardly confirms the theoretical assumptions. The findings rather suggest a selective strategy when using the investigated mechanisms to foster early efficiency.

As expected, decentralized decision-making authority may be beneficial for the early efficiency of a team as it allows for the necessary flexibility within uncertain situations. For instance, it allows the team to quickly overthrow concepts once new information is available. When controlling for decentralization, the remaining organic structures do not affect efficiency. Contrary to what was assumed, formalization is found to enhance early efficiency. It was expected that project planning and clear task responsibilities are counterproductive due to high levels of uncertainty during the initiation stage (Daft & Lengel 1986, Duncan 1976). However, the findings support the paradoxical claim that planning is most critical when a situation is not easy to plan (Devaux 1999, Lewis et al. 2002, p. 559). Yet, the negative association between formalization and early creativity should be taken into account when considering formalization as a mean to increase early team efficiency. Selecting the level of formalization should be dependent on the desired degree of innovation. The negative effect of the early use of steering committees indicates that this mechanism is not suited for the early stage. Reasons for its early ineffectiveness may be lack of data (Nihitila 1999), or loss of flexibility (Leenders & Wierenga, 2002). Looking at the relative effectiveness of the significant relationships, decentralization has the strongest positive impact, followed by formalization, and top management support. The negative effect of steering committees is slightly stronger than the positive effect of top management support, indicating that negative effects may be easily compensated.

Altogether, the results show that not all *organic structures* are significantly related to early creativity and efficiency, but those that are, display positive associations. With respect to *mechanistic structures*, the results rather indicate that a selective strategy is recommended. Steering committees exert negative effects on early efficiency. Formalization impedes creativity, but at the same time fosters efficiency. The fact that not all of the tested mechanisms display significant effects may be rooted in the large amount of dependent variables used for the estimations. The strong statistical control represents a strength of this study.[71]

> *Finding: Apart from top management's positive effect on early efficiency, boundary-spanning activities do not affect early team efficiency and creativity. However, top management support and the integration with functional teams have direct effects on early overall team performance. (H11)*

Top management support and the integration with functional teams have direct effects on early overall performance[72], and apart from top management's positive effect on early efficiency, boundary-spanning activities do not affect team efficiency and creativity. This finding implies that the beneficial effects of boundary spanning activities may not be entirely captured by team internal performance dimensions such as efficiency and creativity. The results rather indicate that boundary spanning activities increase performance by reducing resistance, by preparing and clearing the way for the innovation to become accepted and integrated within the organization, and thus, help the project to move forward at all (Ancona 1990, Ancona & Caldwell 1992a, Ancona & Caldwell 1992b, Gladstein 1984). These benefits are not captured by team efficiency and creativity, and may explain why only a direct effect was observed. When compared with organic and mechanistic structures, the findings suggest that boundary spanning has a different but an additional and equally relevant function to foster team performance.

---

[71] For the estimations, up two thirteen potential predictors were included to control for the effects of other variables that presumably also affect the performance of a team. The high number of covariates serves to better identify the unique effects of the investigated antecedents (Cp. sections 4.7 and 4.8)

[72] Note that the effect of the integration with functional departments was not significant anymore when the reduced model was estimated. Therefore, this result should be viewed with caution.

Finding: Out of three investigated mechanistic structures, formalization and steering committees are found to be positively related to <u>*late team efficiency*</u>*. The results for organic structures are mixed. While the use of central budgets appears to be detrimental to team efficiency, participative decision-making displays a positive association with late efficiency. No effects are observed for decentralization and physical proximity. (H14-H15)*

When comparing the effects of the early and late use of mechanistic structures, the effects during the late stage are less ambiguous and mostly positive. Hence, the empirical findings largely confirm the presented theory stating that mechanistic structures should be employed during the late project stage because uncertainty is low (Cp. sections 3.4 and 3.7.2.1). In contrast, the results for the late use of organic structures are ambiguous and suggest a selective strategy.

As assumed, project formalization and the revision of the project's progress by means of steering committees results in positive relationships with team efficiency. Since uncertainty is presumably lower during the late project stage, it may now also be better possible to specify tasks and responsibilities. Milestones provide a sense of routine and order (Eisenhard & Tabrizi 1995, p. 93), and single problems and requirements can be broken down and distributed among specialists (Daft & Lengel 1986, Souder & Moenaert 1992, p. 500). While the early use of central budgets is found to stimulate creativity, this mechanism exerts a negative influence on team efficiency in the late stage. This observation may be rooted in the fact that central budgets tend to be less detailed and specified in terms of the task, as well as less strict in the revision of the project's progress. Ultimately this can lead to problems not being identified as early as possible and result in costly delays. Another potential reason may be a less well developed sense of responsibility for central budgets leading to greater spending than actually necessary. Contrary to what was assumed, participative decision-making does not exert a negative, but a positive influence on late team efficiency. This finding does not indicate that participative decision-making is so complex and time-consuming that late efficiency will suffer. Rather it can be assumed that participative decision-making leads to a proper consideration of the team member's know-how regarding operational aspects concerning the development, and the launch of the product. This may ultimately enhance late team efficiency.[73]

[73] With respect to the covariates, only *intrinsic motivation* displays a negative association with late team efficiency. A high level of intrinsic motivation may be detrimental when the concept is being translated into a product. It may result difficult for highly intrinsically motivated individuals to restrict their innovative thinking and ultimately lead to conflicts and a reduced commitment to the implementation after the "concept freeze". Contrary to Duncan's (1976) assumption, the level of *cross-functional diversity* is not negatively related to late team efficiency and late overall performance. The results suggest that organizational antecedents play a greater role in fostering or impeding late team performance than cross-functionality.

Finding: Boundary spanning (integration with functional groups and top management support) is found to be directly and positively related to late overall team performance. However, it is not found to be related to late team efficiency. (H16-H17)

Similar to the early project stage, late boundary spanning activities are found to be directly related to overall team performance during the late stage, but not to late team efficiency. Again, this supports the notion that the beneficial effects of boundary spanning activities may not be entirely captured by team efficiency. This finding indicates that the true value of boundary spanning may lie in preparing and clearing the way for the innovation to become accepted and integrated within the organization (Ancona 1990, Ancona & Caldwell 1992a, Ancona & Caldwell 1992b, Gladstein 1984). However, the results confirm the notion that boundary spanning is equally relevant throughout the entire innovation process. CFTs appear to face external dependencies in terms of information, protection, capital and implementation support from external sources during the entire innovation process, making boundary spanning a permanent organizational requirement.

5 Discussion

5.1 Theoretical Implications

In accordance with the propositions of other researchers (Gladstein 1984, p. 512, Guzzo & Shea 1992, McDonough 2000), the results of this study confirm the critical role of organizational context to support the use of cross-functional teams for new product development. CFTs are embedded in an organizational context, to which they strongly respond, interact with, and are dependent from. They require certain organizational infrastructures, work conditions and integration mechanisms in order to function well. Moreover, the effectiveness of these infrastructures appears to dependent of the particular stage of the innovation process. Cross-functionality alone does not guarantee successful innovation, as indicated by the non-significant or negative effects across the early and the late project stage (Model II, III).

It was confirmed that creativity is primarily relevant at the outset of a project and that efficiency is relevant during both the early and late stage of a project (Cp. section 3.3, Souder & Moenaert 1992, p. 497). As the new product concept and its characteristics are defined, there is less need for creativity (Naveh 2005, p. 2794, West 2002, p. 358). Efficiency represents a constant requirement throughout the entire innovation process. During the early stage, CFTs have to deliver a creative and practicable concept within a given time span and with a given amount of resources. Therefore, teams need to exchange innovative and coordinative information. During the late stage, CFTs have to translate their concept into a marketable product. This involves distributing coordinative information concerning tasks, time schedules, and outputs expected (Souder & Moenaert 1992, p. 497). These findings have important implications for the selection of appropriate organizational infrastructures to promote creative behavior at the outset of a project, and to promote efficiency throughout the entire project. For this reason, the employment of a decompositional approach, i.e. an analysis of the success drivers at the different stages of the innovation process represents a promising path for further insights.

The analysis of the *early stage* reveals that *not all* organic structures are positively related to early team performance (creativity and efficiency), but those that are, display positive associations.[74] With respect to mechanistic structures, the results rather indicate that a selective strategy is recommended.[75] There is some consistency with the presented theory stating that early

[74] Creativity is fostered by participative decision-making and central budgets. Early efficiency is fostered by decentralization. Physical proximity displays no significant effects.

[75] Creativity is either not (rewards, steering committees) or negatively (formalization) affected by mechanistic structures. Early efficiency is hampered by steering committees, but fostered by formalization.

creativity is fostered by organic- and impeded by mechanistic structures (Cp. sections 3.4 and 3.7.2.1). However, with respect to early efficiency, the results hardly confirm the theoretical assumptions.[76] Only one organic structure (decentralization) fosters early efficiency. Moreover the associations between mechanistic structures and early efficiency are mixed (formalization (+), steering committees (-)). These findings rather suggest a selective and mixed strategy to foster early efficiency.

For instance, a selective strategy appears to be appropriate for formalization, which has been identified as a mechanism that simultaneously fosters efficiency and hampers creativity. Because of this tradeoff, it appears advisable for managers to make the degree of early formalization dependent on the desired level of creativity for the project. If creativity is not central to the concept phase (e.g. in cases of product refinements, upgrades), early formalization may be a proper mechanism during the early stage, although it is actually a classic mechanistic structure. This example illustrates that strictly following the "either/ or" approach (Lewis et al. 2002) as suggested by Duncan (1976) may not always be a viable strategy for successful innovation projects. Managers may employ organic and mechanistic structures concurrently during the early stage to foster flexibility and discipline, and make tradeoffs between competing demands. This requires the use of a more flexible and more complex approach to the organizational design of cross-functional new product development projects.

The analysis of the *late project stage* shows that two out of three tested mechanistic structures are positively related to late efficiency.[77] With respect to organic structures, the results are mixed, and rather indicate that a selective strategy during the late stage is recommended.[78] With respect to mechanistic structures, the empirical findings largely confirm the presented theory stating that mechanistic structures should be employed during the late project stage because they suit better to situations where uncertainty is low (Cp. section 3.4). However, for the late use of organic structures, the results do not fully confirm the theoretical assumptions.[79] The identification of participative decision-making as a classic organic mechanism fostering late efficiency illustrates again that a mix of the right mechanisms may sometimes be more effective than strictly following an "either/ or" approach (Lewis et al. 2002). Effective managers may employ strong control (formalization, steering committees), while also

[76] The presented theory stated that early efficiency would be impeded by mechanistic structures, because these structures are assumed to be not effective under conditions of high uncertainty. In contrast, organic structures were expected to foster efficiency when uncertainty is high (Cp. sections 3.4 and 3.7.2.1).

[77] Late efficiency is fostered by formalization and steering committees.

[78] Late efficiency is fostered by participative decision-making and impeded by central budgets.

[79] The presented theory states that organic structures are not suited to the development stage, because they admit too much ambiguity, and are not assumed to be effective under conditions of certainty (Cp. section 3.4).

empowering team members to foster efficiency during the late project stage. This finding illustrates again that a more flexible and more complex approach to the organizational design of cross-functional new product development projects, where certain organic and mechanistic structures are employed concurrently, may be more beneficial.

In addition, this study suggests that general judgments in favor of mechanistic structures to foster efficiency should be reconsidered (*“Efficiency demands standardization, control, and conformity to rules and procedures”*, *Naveh 2005, p. 2790*, also cp. Olson et al. 1995, pp. 51, 59). The efficiency of a cross-functional team may be fostered by participative decision-making and decentralization (organic structures). It may also be hampered by steering committees (mechanistic structure). Efficiency may rather depend on *which* specific mechanism is applied and *when*. The relevance of a phase-specific and selective choice of organizational designs is also underlined by the finding that some antecedents show different directional impacts across project stages and across dimensions of team performance, i.e. efficiency and creativity. While a central budget is found to stimulate early creativity, it exerts a negative influence on team efficiency in the late project stage. Formalization positively affects early efficiency, but hampers creativity. The early use of steering committees is negatively associated with efficiency, but during the late project stage, this relationship becomes positive. These findings reveal the dynamism of organizational infrastructures and emphasize the need to incorporate time in organizational design.

Moreover, this study suggests that boundary-spanning is a permanent organizational requirement for CFTs. Teams appear to face external dependencies in terms of information, protection, capital and implementation support from external sources during the entire innovation process. The integration with functional departments and top management support are positively associated with overall team performance in both the early and the late project stage. However, apart from top management’s association with early efficiency, no further significant associations are found. This finding suggests that the beneficial effects of boundary spanning may not be entirely captured by team internal performance dimensions such as efficiency and creativity. Moreover, boundary spanning seems to affect performance in a different manner than organic and mechanistic antecedents. It may rather increase performance by preparing the way for the innovation to become integrated within the organization, and thus, help the project team to move forward at all (Ancona 1990, Ancona & Caldwell 1992a, Ancona & Caldwell 1992b, Gladstein 1984). Since boundary spanning appears to be a success factor that functions in a different way, but nevertheless appears to be equally relevant, an exclusive inside orientation of the team may not be sufficient to succeed.

In sum, the findings of this study emphasize the need to incorporate time in organizational design. The phase-specific use of organizational antecedents represents a crucial capability to the successful management of cross-functional teams. Duncan's (1976) and Souder & Moenaert's (1976) theories have been partially confirmed. However, strictly following an "either/ or" approach (Lewis et al. 2002) may not always be the viable strategy. Instead the successful management of cross-functional teams also appears to require "both/ and" approaches. Some organic and mechanistic structures may coexist, even though others should be managed dynamically. CFTs may become more successful when adopting a dynamic blend of flexibility and discipline while permanently interacting with external sources inside the organization. Consistent with Lewis (2002 p. 562) and Quinn (1988, p. 90), it may be sometimes advisable to break away from a preferred mode of thinking. This requires the use of a more flexible, complicated, and sometimes even paradoxical repertoire of antecedents for successful innovation. The ability to combine these antecedents and to incorporate time as a decision-making parameter appears to be a crucial capability for the successful management of cross-functional teams.

5.2 Managerial Implications

Several managerial implications can be derived from this study. The analysis of Model I yielded that the higher the degree of innovation, the poorer the performance during the late project stage. This finding implies that it becomes more difficult for a team to efficiently perform the late project stage when the innovativeness of the new product concept is high. Potential reasons may be low levels of expertise, premature production processes, insufficient planning, resistance to change and the employment of an inappropriate project management infrastructure during the late stage (Duncan 1976, Sethi 2000a, p. 4, Vandevelde & Van Dierdonk 2003). This requires the team not only to think *what* the new product should be like, but also *how* the new product should be developed and integrated into the organization. Therefore, *early* project tasks may have to be extended by further efforts to reduce *later* performance problems associated with a high degree of innovation. Examples of such activities may be a well-elaborated implementation agenda or in-depth feasibility checks.

Furthermore, this study underlines the pivotal role of the early project stage. Early stage overall team performance is found to be positively associated with product quality and financial performance, late stage overall team performance is positively associated with product quality (only). Product quality may already be influenced in the early project stage. Therefore, project managers have to bear in mind that early "upfront" decisions may already determine the latitude and options to manage product quality during the late project stage. Examples may be the choice of product/ production technology, suppliers, and plant location. Moreover, the results of this study show that financial performance is influenced by early overall team performance. Early stage activities and decisions are essential to the project because they determine further actions, have consequences for all following steps, and are hardly reversible. Since the development stage is "only" about translating an already elaborated concept into a product, project managers are advised not to underestimate the critical role of the early stage, and consequently, not to overestimate the impact late project stage.

Some antecedents show different directional impacts across project stages and across efficiency and creativity. This requires project managers to always reflect *when* and for *which purpose* an organizational antecedent is applied and to manage those dynamically and flexible. For instance, central budgets stimulate early creativity but hamper late team efficiency. This observation may be rooted in the fact that central budgets tend be less detailed in the revision of a project's progress, or that there exists a tendency to greater spending when a budget is provided by a central source. To avoid these negative effects, the full or partial responsibility for the budget may be handed over to a decentral function after the early stage is completed. Another example is formalization. Formalization positively affects early efficiency but at the same time hampers creativity. This finding suggests to formalize only in cases where creativity is not central to the concept phase (e.g. product refinements, upgrades). Thereby, negative effects on creativity may be ruled out. Finally, the early use of steering committees is negatively associated with efficiency, but during the late project stage, this relationship becomes positive. This result suggests that steering committees should only be used when enough information is available. This mechanism appears not to be suited to situations where uncertainty is high and where no concrete data is available.[80]

Finally, this study highlights boundary spanning as a permanent, i.e. non-phase-specific success factor. Boundary management may increase performance by preparing the way for the innovation to become integrated within the organization, and thus, help the project team to move forward at all (Ancona 1990, Ancona & Caldwell 1992a, Ancona & Caldwell 1992b, Gladstein 1984). As these potential benefits are not captured by team efficiency and creativity, boundary spanning appears to be a success factor that functions in a different way, but nevertheless appears to be equally relevant as the previously mentioned success factors. Therefore, decision makers are advised to simultaneously adopt an inward and outward orientation.

---

80 Compare Table 26 for further details on all tested mechanisms.

5.3 Future Research

This study raised a number of research questions. As the sample for this investigation consists mainly of medium innovative and highly innovative projects, a promising path for future research may be to examine the phase-specific effects of organizational antecedents for highly innovative vs. non innovative projects. The phase-specific relevance of certain antecedents may vary with the degree of innovation. For instance, it could be investigated whether the early use of central budgets or early decentralized decision-making remains effective for product refinements and upgrades. In addition, it would be interesting to incorporate the actual levels of initial and late uncertainty (technology, market, competition) in future studies. With this information it could be investigated, which project management infrastructures respond best to early and late uncertainty and if there are further differences. In addition, Duncan's model (1976) assumes a lack of ideas during the initiation phase, and therefore suggests to employ organic structures. This assumption should be critically validated. Investigations, which study the amount and the quality of ideas which exist at the very outset of an innovation project can evaluate whether this assumption is correct. This would also have implications for the amount of uncertainty assumed at the outset of an innovation project. Such studies may also investigate the influence of cross-functionality on the generation and evaluation of ideas. Since this study was not able to identify the potential benefits of cross-functionality, more research is needed to further clarify this important issue. A fruitful option may also be to investigate the effects of cross-functionality on a more strategic level, i.e. to study the effects of cross-functionality on the capability to simultaneously pursue market and technology orientation, or similarly, to concurrently pursue competence exploitation and exploration. Furthermore, the innovation process may be broken down into more than two stages when investigating phase-specific success drivers (opportunity identification, idea generation, concept development, product design, testing, process design, and commercialization). This may allow for a more detailed identification of phase-specific success driver effects, and if applicable, generate insights when and where cross-functionality may actually be beneficial. Finally, some of the results resulting in not supported hypothesis should be validated by further studies. In the presence of other antecedents, physical proximity and team rewards did not show any significant associations with early and late team performance. Thereby, future research should also focus on the relative effectiveness of success factors. This will generate more insights on how success factors can be ranked, and will ultimately result in clearer recommendations for practitioners. In addition, it is referred to section 2.2.5, where other research gaps are mentioned.

5.4 Limitations

This study has several limitations. First, the sample, although diverse in the firms represented, is relatively small. Replicating this study would assess the generalizability of the findings. The small sample size is in part a consequence of the decision to include only projects for which it was possible to obtain complete data, and by the decision to include several covariates for which the availability of data was limited as well. However, no major biases due to the small sample size were observed.[81]

The use of a cross-sectional methodology to examine a dynamic process is another obvious limitation, which also constrains the ability to infer the direction of causality. Likewise, asking project managers to provide retrospective evaluations introduces the possibility of information losses and post-hoc justification of project success or failure (Olson et al. 2001, p. 269).[82]

Even though, early and late respondents were compared to detect a possible non-response bias (survivorship bias) and there was no empirical evidence for such a bias, it cannot be completely ruled out that the sample for this investigation consists of rather successful projects. Accordingly, there is a chance that the estimated success factors rather explain what distinguishes medium successful from very successful projects, but not what really distinguishes between unsuccessful and successful projects. On the other hand, for this to be true, it must also be true that unsuccessful projects react very differently to the identified success factors. However, this precondition still remains to be demonstrated.

It should also be noted that for rewards, central budgets, functional diversity, intrinsic motivation, and number of team members, only non phase-specific data was available. However, an additional analysis yields that the majority of the success factors are not applied in different intensities across stages.[83] This gives less concern about biased results for these antecedents. Finally, the described project management activities and results rather apply to larger and mature organizations. Transferring the results to smaller companies or start-ups should be exercised with caution.

---

81 For further details, the reader is referred to the sections 4.6.2, 4.7.2, and 4.8.2.

82 However, we attempted to reduce the possibility of information losses by only allowing for participation if the respective project had been completed within the last 12 months. In addition, in order to reduce biases due to respondent's implicit theories, the question order was counterbalanced. In summary, a cross-sectional approach was considered beneficial because respondents were able to assess the stage-specific-intensities of the employed mechanisms and performance dimensions in a comparative manner. Cp. Olson et al. (2001) for another study that also measures dynamic aspects based on cross-sectional data.

83 See Appendix VIII.

5.5 Conclusion

This paper tested a contingency model for the design of cross-functional new product development projects by an analysis of the organizational success drivers at the early stage (idea generation and conception) and the late stage (development and market launch) of the innovation process. Using a sample of 133 new development projects, the influence of nine project management instruments and organizational antecedents on a cross-functional team's efficiency, creativity, and overall performance in the early and late stages of the innovation process was investigated.

The results show that cross-functionality alone does not guarantee successful innovation; instead CFTs require certain organizational infrastructures in order to perform well. Although there is some degree of consistency with the propositions of Duncan (1976) and Souder & Moenaert (1992), the results also suggest applying a selective strategy when using certain organic and mechanistic structures across the stages of innovation projects. The importance of a phase-specific and selective choice of organizational design is also underlined by the finding that some antecedents show differing directional impacts across stages and across efficiency and creativity. Furthermore, boundary spanning activities are found to be positively associated with team performance in both project stages, supporting the assumption that new product development performance does not solely depend on intra-team factors, and that boundary spanning represents a constant - non phase-specific - requirement for successful innovation projects.

The use of organizational antecedents represents an essential competence to the successful management of cross-functional teams. Even though certain antecedents should be managed dynamically, strictly following "either/or" approaches may not always be a viable strategy. Instead an effective management of cross-functional teams also requires "both/ and" approaches. Teams are advised to adopt both an inward and outward orientation, and the organizational infrastructure should depend on the particular stage, while incorporating both formal and informal elements. In view of the growing importance of new product development, an effective management of cross-functional teams represents a valuable asset for maintaining competitive advantage.

6 Appendix

I Boundary Management Activities, Organic and Mechanistic Structures within the Context of this Study

This section will briefly discuss the assignment of the antecedents to organic and mechanistic structures (Burns & Stalker 1961)[84] and boundary management activities (Ancona & Caldwell 1992a, Weinkauf et al. 2005, p. 100). Organic structures are represented by decentralized decision-making, participative-decision-making processes within the team, central budgets and physical proximity. Mechanistic structures are represented by rewards, formalization and steering committees. Boundary management activities are represented by top management support and integration with functional departments.

Mechanistic Structures - An emphasis on *formalization* was originally attributed to mechanistic designs by Burns & Stalker (1961). The literature review also indicates that *rewards* and *steering committees* can be classified as instruments applied in mechanistic systems. Ayers et al. (2001) and Bonner et al. (2002, p. 236) refer to rewards as "formal controls", recognized as essentially static processes, which are applied to well, understood activities. Rewards assume predictability and constancy, and are imposed by higher authorities. Support for steering committees (review boards) as a characteristic of mechanistic structures is found in the studies of Griffin & Hauser (1996), Eisenhard & Tabrizi (1995), Leenders & Wierenga (2002), and Lewis et al. (2002). Fundamental to review boards is that this mechanism controls the team's behavior and its actions across project stages by setting predefined milestones, which specify how the project should be completed (Eisenhardt 1989, p. 61, Griffin & Hauser 1996, p. 210). When referring to review boards, Eisenhardt & Tabrizi (1995, p. 93) state: *"Milestones also provide as sense of order and routine that serves as a counterpoint to the more freewheeling and even chaotic activities of iteration and testing."* In addition, Griffin & Hauser (1996, p. 209), Leenders & Wierenga (2002, p. 308), and Lewis et al. (2002, p. 550) explicitly refer to review boards as "formal processes".

Organic Structures - Decentralized decision-making structures and *participative decision-making* processes are originally defined as characteristics of organic systems by Burns & Stalker (1961). The studies of Argyres & Silverman (2004), Birkinshaw & Fey (2000), and Hoskisson et al. (1993) provide arguments, which qualify *central budgets* as a characteristic of organic structures. Central budgets are typically characterized by a higher level of slack and a less rigid control style, while divisional budgets are characterized by the opposite characteristics. Furthermore, Argyres & Silverman (2003, p. 933) note that centralized governance offers greater abilities to pursue non-specific research, while operational funding is rather

---

84 See 3.1 for a description of organic and mechanistic structures.

characterized by a short term and commercial focus (Birkinshaw & Fey 2000, pp. 5, 9-10). These characteristics qualify central budgets as a feature of organic systems. *Physical proximity* is attributed to organic structures, since co-location does not promote functional isolation, representing a substantial characteristic of mechanistic structures (Burns & Stalker 1961). Furthermore, the possibility of spontaneous and informal face-to-face interaction becomes facilitated (Hoegl & Proserpio 2004, p. 1156). This represents a second characteristic elementary to organic structures (Cp. 3.1).

Boundary Management - Both *top management* and *functional departments* represent external sources inside the organization. Various researchers have reported that the information and resource exchange with these sources and their support has a significant impact on new product development performance (Ancona & Caldwell 1992a, Gladstein 1984, Holland et al. 2000, p. 246, Weinkauf et al. 2005, p. 100).

II Questionnaire and Instructions

KATHOLISCHE UNIVERSITÄT EICHSTÄTT INGOLSTADT

Ingolstadt School of Management
LEHRSTUHL FÜR ABWL, ABSATZWIRTSCHAFT UND MARKETING

Auf der Schanz 49, 85049 Ingolstadt, Tel: +49 841 937 – 1979 oder 1976, Fax: +49 841 937 - 2976

Wissenschaftliche Studie: Management von interdisziplinären / cross-funktionalen (Neu-) Produktentwicklungsprojekten

Sehr geehrte Damen und Herren,

vielen Dank, dass Sie sich an dieser Untersuchung beteiligen. Bevor Sie den Fragebogen ausfüllen, möchten wir Sie auf folgende Punkte aufmerksam machen:

1. Der Fragebogen richtet sich an **Projektleiter von Neuproduktentwicklungsteams**. Die Bearbeitung des Fragebogens nimmt **ca. 30 Minuten** in Anspruch.
2. **Voraussetzungen zur Teilnahme:**
   - **„Interdisziplinarität" / „Cross-Funktionalität"**: An der Produktentwicklung waren mehr als zwei Funktionsbereiche beteiligt (z. B. F&E und Marketing), bzw. es handelt sich um ein sog. Simultaneous Engineering Team. (Produkt: Hardware, Software, Dienstleistung)
   - Das Projekt wurde innerhalb der letzten **zwölf Monate** abgeschlossen, bzw. abgebrochen.
   - Das Produkt / die Leistung befindet sich im **Markt oder ist in ein am Markt befindliches Produkt integriert oder das Projekt wurde abgebrochen.**
3. Die Auswertung erfolgt unter **absoluter Anonymität**. Hierzu können Sie auch ein Pseudonym für Ihr Projekt wählen. Die Umfrage ist ausschließlich für wissenschaftliche Zwecke bestimmt, d. h. es gibt keine „guten" und keine „schlechten" Antworten.

Wir bitten Sie, den ausgefüllten Fragebogen **bis Freitag, den 11. August 2006** an die folgende Adresse zurückzusenden / zu faxen:

Katholische Universität Eichstätt Ingolstadt, Lehrstuhl für Absatzwirtschaft und Marketing
Auf der Schanz 49, 85049 Ingolstadt, Fax: +49 841 937 – 2976.

Für Rückfragen steht Ihnen als Ansprechpartner gerne unser wissenschaftlicher Mitarbeiter Herr Tobias Huth (Tel: 0173 2851866, tobias.huth@kuei.de) zur Verfügung. Auf Wunsch erhalten Sie selbstverständlich die **Ergebnisse dieser Studie in Form eines Benchmark Reports und einer Management Summary**. Bitte hinterlassen Sie hierzu eine email-Adresse auf der letzten Seite des Fragebogens. Die Auswertung ist voraussichtlich im Winter 2006 abgeschlossen.

Vielen Dank für Ihre Mitarbeit und Ihr Engagement!

FRAGEBOGEN

Inhalt:

1. Allgemeine Angaben zum Projekt
2. Beurteilung des Projekterfolges anhand unterschiedlicher Dimensionen
3. Projektorganisation und Rahmenbedingungen
4. Nutzung von Kommunikationsmedien
5. Teamverhalten
6. Allgemeine Angaben zum Unternehmen und sonstige Bemerkungen

==> Dauer: ca. 30 Minuten

Zwei Anmerkungen:

1. Im Folgenden werden Ihnen Aussagen zu Ihrem Projekt präsentiert. Wir möchten Sie gerne bitten, anzugeben, inwiefern diese Aussagen zu Ihrem Projekt zutreffen. Den Grad Ihrer Zustimmung können Sie auf einer Skala von 1 –5 durch Ankreuzen kennzeichnen. Hierbei gilt:

1=	2=	3=	4=	5=
stimmt nicht	stimmt wenig	stimmt mittelmäßig	stimmt ziemlich	stimmt sehr

2. Wir möchten Sie bitten, bei einem Teil der Fragen auf **zwei spezifische Projektphasen** einzugehen. Vorab eine kurze **idealtypische Beschreibung** dieser Phasen:

   A. Die **„Konzeptionsphase“** steht für die **frühe Phase des Projektes**. Typische Aktivitäten dieser Phase im Rahmen einer (Neu-)Produktentwicklung können sein:

   - Ideengenerierung
   - Marktforschung / Technologiebewertung
   - Machbarkeitsprüfung
   - Design
   - Business Plan: Bewertung des wirtschaftlichen Potentials des Neuproduktes / Konzeptes / der Idee

   Die Konzeptionsphase endet idealtypisch mit dem Beschluss, die Idee zu einem marktfähigen Produkt zu entwickeln.

   B. Die Phase der **„Entwicklung und Markteinführung“** steht für die **späte Phase des Projektes**. Nachdem das Konzept oder die Idee in der vorherigen Phase als aussichtsreich bewertet worden ist, startet die Phase der Entwicklung, bzw. der Umsetzung des Konzeptes in ein marktfähiges Produkt. Typische Aktivitäten dieser Phase im Rahmen einer (Neu-)Produktentwicklung können sein:

   - Prototypenentwicklung
   - Produktentwicklung
   - Tests
   - Markteinführung / bzw. Integration in ein(e) Produkt / Dienstleistung

   Die Phase der Entwicklung und Markteinführung endet idealtypisch mit der Markteinführung. Da auch weniger, bzw. nicht erfolgreiche Projekte Bestandteil dieser Untersuchung sein sollen, ist eine Markteinführung nicht zwingend erforderlich.

Bitte berücksichtigen Sie diese Information, im Rahmen Ihrer Angaben!

1. Allgemeine Angaben zum Projekt

Projekt-Bezeichnung / Pseudonym:			
Art der (Neu-) Produktentwicklung:	☐ Hardware	☐ Software	☐ Dienstleistung
Frei verfügbares Projekt-Budget (in €):			

Anzahl der Teammitglieder (einschl. Projektleiter):	Vollzeit:	Teilzeit:	
Funktionale Herkunft der Teammitglieder (Anzahl): *(Bitte geben Sie an, **wieviele** Teammitglieder den folgenden Bereichen entstammen.)*			
___ Marketing / Produktmanagement	___ IT	___ F&E	___ Business Development Innovation Mgt.
___ Produktion / Delivery / Operations	___ Vertrieb	___ Finanzen / Controlling	___ _______________
In welchem der obigen Bereiche war das Projekt organisatorisch aufgehängt?			

Projektdauer:	
Anzahl der Monate für die Konzeptionsphase des Projektes: *(Ideengenerierung, Marktforschung, Technologiebewertung, Design, Business Plan)*	(Monate)
Anzahl der Monate ab Ende der Konzeptionsphase bis zum Abschluss des Projektes: *(Prototyp, Entwicklung, Tests, Markteinführung)*	(Monate)

Innovationsgrad:	1: Niedrig ◄► 5: Hoch	
Beurteilen Sie bitte...		
... den Neuigkeitsgrad dieser Produktentwicklung für Ihr Unternehmen.	①-②-③-④-⑤	weiss nicht
... den Innovationsgrad des Produktes am Markt. *(1= inkrementell, 5= radikal)*	①-②-③-④-⑤	weiss nicht

2. Dimensionen des Projekterfolges

Markteinführung oder Projektabbruch?		
Das Produkt / die Leistung wurde	☐ in den Markt eingeführt	☐ in ein am Markt befindliches Produkt integriert. ***oder:***
Das Projekt wurde abgebrochen	☐ in der Konzeptionsphase	☐ in der Phase der Entwicklung und Markteinführung.

Qualität des Produktes / Leistung:	1: Stimmt nicht ◄► 5: Stimmt sehr	
Die Prototypen und Testergebnisse entsprachen den Anforderungen.	①-②-③-④-⑤	weiss nicht
Die Qualität des Produktes ist höher als die von Wettbewerbsprodukten.	①-②-③-④-⑤	weiss nicht
Wir haben Informationen hinsichtlich Qualitätsproblemen erhalten.	①-②-③-④-⑤	weiss nicht
Finanzieller Erfolg:	1: Stimmt nicht ◄► 5: Stimmt sehr	
Die Ziele hinsichtlich Umsatz werden vorauss. / wurden erfüllt.	①-②-③-④-⑤	weiss nicht
Die Ziele hinsichtlich Rentabilität werden vorauss. / wurden erfüllt.	①-②-③-④-⑤	weiss nicht
Das Projekt / Produkt wird vorauss./ ist insgesamt finanziell erfolgreich.	①-②-③-④-⑤	weiss nicht

1 = stimmt nicht, 2 = stimmt wenig, 3 = stimmt mittelmäßig, 4= stimmt ziemlich, 5= stimmt sehr

**Phase 1: Konzeptionsphase:* Ideengenerierung, Marktforschung, Technologiebewertung, Machbarkeitsprüfung, Design, Business Plan
**Phase 2: Entwicklung und Markteinführung:* Prototypentwicklung, Produktentwicklung, Tests, Markteinführung

Projekt-Bezeichnung /Pseudonym:

	Konzeptionsphase* 1: Stimmt nicht ◄ ► 5: Stimmt sehr		Entwicklung und Markteinführung* 1: Stimmt nicht ◄ ► 5: Stimmt sehr	
Einhaltung der festgelegten Kosten:				
Der ursprüngliche Budgetrahmen war ausreichend.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Das Team arbeitete kosteneffizient.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Zeiteinhaltung / Time to Market:				
Das Team lag mit der Erfüllung seiner Aufgaben voll im Zeitplan.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Die Dauer der *gesamten* Produktentwicklung war voll zufriedenstellend.	①-②-③-④-⑤			weiss nicht
Das Produkt hätte in kürzerer Zeit am Markt eingeführt werden können.	①-②-③-④-⑤			weiss nicht
Team-Kreativität:				
Das Team fand neue Einsatzbereiche für existierende Methoden und Betriebsmittel.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Das Team entwickelte originelle und praktikable Lösungsansätze im Rahmen der Aufgabenstellung.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Das Team generierte neue Ideen und Lösungsansätze, welche innerhalb unseres Wettbewerbsumfeldes bisher nicht existieren.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Das Team kann als kreativ bezeichnet werden.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht

Wie bewerten Sie *insgesamt* die *phasenspezifische* Performance Ihres Teams?				
Am Phasenergebnis gemessen, kann man das Team als erfolgreich bezeichnen.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Aus Sicht der Projektleitung kann man mit dem Projekt voll zufrieden sein.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht

3. Projektorganisation und Projekt-Rahmenbedingungen

	Konzeptionsphase* 1: Stimmt nicht ◄ ► 5: Stimmt sehr		Entwicklung und Markteinführung* 1: Stimmt nicht ◄ ► 5: Stimmt sehr	
Einsatz von Lenkungsausschüssen / Steuerungskomitees:				
Wie oft erfolgte in dieser Phase die Einberufung eines Lenkungsausschusses / Steuerungskomitees?				
Lenkungsausschüsse / Steuerungskomitees waren ein wesentlicher Bestandteil der Projektsteuerung.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Unterstützung durch das (Top-)Management:				
Das Management stellte Ressourcen für cross-funktionale Teamarbeit bereit.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Das Management ließ sich regelmäßig über den Projektverlauf informieren.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Das Management gab sichtbar Feedback zum Projektverlauf.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Das Management engagierte sich für den Erfolg des Projektes.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
(De-)zentralisierte Entscheidungsgewalt:				
Die meisten Entscheidungen konnten getroffen werden, ohne sich vorher an die nächste(n) Managementebene / Eskalationsweg zu wenden.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Die Ermächtigung zum Treffen von Entscheidungen lag beim Projektleiter, bzw. beim Team und nicht bei nächsten Instanzen.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht

1 = stimmt nicht, 2 = stimmt wenig, 3 = stimmt mittelmäßig, 4= stimmt ziemlich, 5= stimmt sehr

Phase 1: Konzeptionsphase: Ideengenerierung, Marktforschung, Technologiebewertung, Machbarkeitsprüfung, Design, Business Plan
Phase 2: Entwicklung und Markteinführung: Prototypentwicklung, Produktentwicklung, Tests, Markteinführung

Projekt-Bezeichnung /Pseudonym:

	Konzeptionsphase* 1: Stimmt nicht ◄► 5: Stimmt sehr		Entwicklung und Markteinführung* 1: Stimmt nicht ◄► 5: Stimmt sehr	
Abstimmung mit den Fachbereichen:				
Wichtige Informationen zwischen dem Team und den Fachbereichen (z. B. F&E, Marketing, Produktion, Business Develop.) wurden offen geteilt.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Zwischen dem Team und den Fachbereichen herrschte eine kooperative Arbeitsatmosphäre.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Bei uns gab es keine Probleme bei der Abstimmung mit den Fachbereichen.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Formalisierung:				
Das Projekt wurde anhand von klaren und detaillierten Vorgaben geplant.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Das Projekt wurde strukturiert abgearbeitet.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Mitwirkung der Teammitglieder an Projektentscheidungen:				
Die Teammitglieder wurden ermutigt, Vorschläge zu machen.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Die Teammitglieder wirkten aktiv an Entscheidungen mit.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Die Teammitglieder hatten Einfluss auf die Art und Weise, wie das Projekt durchgeführt wurde.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Physische Nähe der Teammitglieder (Co-Location):				
Die meisten Teammitglieder konnten ohne Mühe persönlich aufgesucht werden.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht
Es war unproblematisch, die Teammitglieder an einem Ort für spontane Meetings zusammenzubringen.	①-②-③-④-⑤	weiss nicht	①-②-③-④-⑤	weiss nicht

Zielvereinbarungen / Belohnung der Teammitglieder:	1: Stimmt nicht ◄► 5: Stimmt sehr	
Die Mitarbeit im Projekt war in den Zielvereinbarungen der Teammitglieder festgehalten und/oder Teammitglieder wurden für Ihre Arbeit im Projekt extra belohnt.	①-②-③-④-⑤	weiss nicht

Herkunft des Projektbudgets:			
Das Budget wurde gestellt durch:	☐ einen Zentralbereich	☐ einen operativen Bereich	☐ Es gab kein direktes Budget.

Motivation / Persönliches Interesse der Teammitglieder:	1: Stimmt nicht ◄► 5: Stimmt sehr	
Die Teammitglieder verstanden das Projekt als interessante Herausforderung zur Entwicklung von Lösungsansätzen.	①-②-③-④-⑤	weiss nicht
Die Teammitglieder „gingen in dem Projekt auf".	①-②-③-④-⑤	weiss nicht
Das Interesse der Teammitglieder für das Projekt war groß.	①-②-③-④-⑤	weiss nicht

6. Allg. Angaben zum Unternehmen und sonstige Bemerkungen

Umsatz des Unternehmens:			
Anzahl der Mitarbeiter im Unternehmen:		**In F&E:**	
F&E-Anteil am Umsatz (%):			

3 / 5

1 = stimmt nicht, 2 = stimmt wenig, 3 = stimmt mittelmäßig, 4= stimmt ziemlich, 5= stimmt sehr

**Phase 1: Konzeptionsphase:* Ideengenerierung, Marktforschung, Technologiebewertung, Machbarkeitsprüfung, Design, Business Plan
**Phase 2: Entwicklung und Markteinführung:* Prototypentwicklung, Produktentwicklung, Tests, Markteinführung

Projekt-Bezeichnung /Pseudonym:

Sonstige Bemerkungen (z. B. weitere Herausforderungen und Problemfelder, Kritik, etc.)

☐ **Ich bitte um Zusendung eines Benchmark Reports und einer Management Summary an folgende email-Adresse:**

Vielen Dank, dass Sie an dieser Studie teilgenommen haben!

1 = stimmt nicht, 2 = stimmt wenig, 3 = stimmt mittelmäßig, 4= stimmt ziemlich, 5= stimmt sehr

**Phase 1: Konzeptionsphase:* Ideengenerierung, Marktforschung, Technologiebewertung, Machbarkeitsprüfung, Design, Business Plan

**Phase 2: Entwicklung und Markteinführung:* Prototypentwicklung, Produktentwicklung, Tests, Markteinführung

III Testing for Common Method Bias - Harman's Single-Factor Test

III.1 Model I

Factor	Initial Eigenvalues Total	% of Variance	Cumulative %
1	5,795	22,290	22,290
2	3,675	14,134	36,424
3	2,375	9,136	45,560
4	2,009	7,726	53,286
5	1,516	5,830	59,116
6	1,375	5,290	64,406
7	1,140	4,386	68,792
8	,896	3,446	72,238
9	,856	3,291	75,528
10	,780	2,999	78,527
11	,699	2,687	81,215
12	,661	2,542	83,757
13	,578	2,222	85,979
14	,502	1,929	87,907
15	,493	1,897	89,804
16	,415	1,596	91,400
17	,375	1,443	92,843
18	,332	1,279	94,122
19	,316	1,216	95,338
20	,253	,973	96,311
21	,224	,863	97,175
22	,196	,753	97,928
23	,167	,641	98,569
24	,162	,625	99,193
25	,120	,460	99,653
26	9,013E-02	,347	100,000

Extraction Method: Principal Axis Factoring

III.2 Model II

	Initial Eigenvalues		
Factor	Total	% of Variance	Cumulative %
1	7,218	21,230	21,230
2	3,044	8,952	30,181
3	2,841	8,357	38,538
4	2,205	6,484	45,022
5	1,789	5,263	50,285
6	1,564	4,600	54,884
7	1,435	4,221	59,106
8	1,252	3,684	62,790
9	1,163	3,420	66,210
10	1,087	3,197	69,407
11	1,062	3,122	72,529
12	,914	2,689	75,219
13	,878	2,582	77,801
14	,755	2,220	80,021
15	,669	1,967	81,988
16	,622	1,828	83,816
17	,594	1,748	85,563
18	,534	1,570	87,134
19	,453	1,334	88,467
20	,429	1,262	89,729
21	,401	1,179	90,908
22	,382	1,123	92,031
23	,344	1,011	93,041
24	,340	,999	94,041
25	,321	,945	94,986
26	,302	,889	95,875
27	,268	,789	96,665
28	,247	,726	97,390
29	,222	,652	98,042
30	,174	,511	98,553
31	,155	,456	99,008
32	,135	,398	99,407
33	,116	,342	99,749
34	8,547E-02	,251	100,000

Extraction Method: Principal Axis Factoring

III.3 Model III

Factor	Initial Eigenvalues Total	% of Variance	Cumulative %
1	6,485	19,073	19,073
2	3,491	10,267	29,341
3	2,594	7,629	36,970
4	1,943	5,714	42,684
5	1,832	5,389	48,074
6	1,629	4,792	52,865
7	1,591	4,678	57,544
8	1,529	4,498	62,041
9	1,287	3,786	65,827
10	1,088	3,200	69,028
11	1,036	3,049	72,076
12	,987	2,902	74,978
13	,893	2,626	77,605
14	,784	2,304	79,909
15	,755	2,220	82,129
16	,653	1,919	84,049
17	,574	1,689	85,737
18	,548	1,612	87,350
19	,513	1,510	88,860
20	,481	1,416	90,276
21	,405	1,191	91,467
22	,360	1,058	92,524
23	,351	1,033	93,557
24	,314	,924	94,481
25	,284	,837	95,318
26	,256	,753	96,071
27	,236	,693	96,764
28	,215	,632	97,396
29	,204	,601	97,997
30	,181	,533	98,530
31	,144	,425	98,955
32	,141	,416	99,370
33	,131	,385	99,755
34	8,333E-02	,245	100,000

Extraction Method: Principal Axis Factoring.

IV Testing for Non-Response-Bias - T-Tests; Early vs. Late Respondents

IV.1 Group Statistics

	Late = 1	N	Mean	Std. Deviation	Std. Error Mean
Project Budget	0	53	2190811,320	3922283,735	538767,106
	1	34	141649117,650	539660561,090	92551022,684
No. Team member Fulltime	0	77	7,560	8,218	0,937
	1	39	18,320	52,344	8,382
No. Functions Involved	0	81	3,790	1,633	0,181
	1	42	4,570	1,940	0,299
Length of Time Early Stage	0	83	5,280	4,019	0,441
	1	43	6,770	6,444	0,983
Length of Time Late Stage	0	81	11,720	7,662	0,851
	1	43	13,870	13,868	2,115
Length of Time Total	0	83	16,720	10,051	1,103
	1	44	20,170	19,361	2,919
Introduced = 1 vs. Aborted = 0	0	82	0,890	0,315	0,035
	1	43	0,860	0,351	0,053
Degree of Innovation	0	81	-0,079	1,045	0,116
	1	44	0,115	0,914	0,138
Product Quality	0	65	0,103	0,919	0,114
	1	38	-0,206	1,131	0,183
Financial Performance	0	63	0,087	0,984	0,124
	1	34	-0,090	1,048	0,180
Efficiency Early	0	76	-0,084	1,013	0,116
	1	41	0,113	0,947	0,148
Efficiency Late	0	78	0,111	0,949	0,107
	1	41	-0,108	1,059	0,165
Team Creativity Early	0	68	-0,033	1,076	0,130
	1	37	0,084	0,950	0,156
Team Creativity Late	0	70	0,069	1,054	0,126
	1	37	-0,241	0,936	0,154
Overall Team Performance Early	0	79	-0,029	1,072	0,121
	1	43	0,069	0,902	0,137
Overall Team Performance Late	0	78	0,067	0,994	0,113
	1	43	-0,132	1,034	0,158
Steering Committees Early	0	74	0,124	1,043	0,121
	1	41	-0,117	0,965	0,151
Steering Committees Late	0	76	0,025	1,015	0,116
	1	39	0,038	1,011	0,162
Top Mgt Support Early	0	78	-0,199	1,086	0,123
	1	42	0,277	0,759	0,117
Top Mgt Support Late FacScore	0	79	-0,067	1,021	0,115
	1	42	0,053	1,008	0,156
Decentralization Early	0	79	0,030	1,027	0,116
	1	40	-0,121	0,954	0,151
Decentralization Late	0	80	0,105	0,944	0,106
	1	42	-0,270	1,049	0,162
Integration with func Dep. Early	0	78	0,068	0,867	0,098
	1	42	-0,075	1,142	0,176
Integration with func Dep. Late	0	80	0,108	0,870	0,097
	1	40	-0,138	1,164	0,184
Formalization Early	0	81	-0,124	1,024	0,114
	1	43	0,196	0,935	0,143
Formalization Late	0	83	-0,079	1,011	0,111
	1	41	0,105	1,011	0,158

	Late = 1	N	Mean	Std. Deviation	Std. Error Mean
Participation Early	0	80	0,027	0,948	0,106
	1	41	-0,003	1,028	0,161
Participation Late	0	82	0,021	0,997	0,110
	1	40	-0,053	0,928	0,147
Co-Location Early	0	81	0,036	1,022	0,114
	1	42	-0,084	0,979	0,151
Co-Location Late	0	83	0,044	1,030	0,113
	1	42	-0,092	0,925	0,143
Rewards Overall	0	78	-0,195	1,010	0,114
	1	40	0,438	0,882	0,139
Intrinsic Team Motivation Overall	0	82	-0,038	1,018	0,112
	1	43	0,013	0,970	0,148
Sales	0	67	4924551492,540	11396173112,65	1392264136,961
	1	32	7712472187,500	15735175908,51	2781612397,017
Employees in R&D	0	51	867,490	2441,035	341,813
	1	23	1713,570	4416,570	920,918
Central Budget	0	81	0,380	0,489	0,054
	1	43	0,530	0,505	0,077

IV.2 Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Project Budget	Equal variances assumed	14,633	,000	-1,887	85	,063	-139458306,33	73887078,518	-286365613,321	-7449000,669
	Equal variances not assumed			-1,507	33,002	,141	-139458306,33	92552590,833	-327757483,408	-48840870,755
No. Team member Fulltime	Equal variances assumed	10,557	,002	-1,769	114	,080	-10,76	6,084	-22,815	1,291
	Equal variances not assumed			-1,276	38,952	,209	-10,76	8,434	-27,822	6,298
No. Functions Involved	Equal variances assumed	4,658	,033	-2,357	121	,020	-,78	,331	-1,438	-,125
	Equal variances not assumed			-2,232	71,718	,029	-,78	,350	-1,479	-,083
Length of Time Early Stage	Equal variances assumed	3,549	,062	-1,591	124	,114	-1,49	,935	-3,337	,363
	Equal variances not assumed			-1,381	59,397	,173	-1,49	1,077	-3,643	,668
Length of Time Late Stage	Equal variances assumed	3,328	,071	-1,114	122	,268	-2,15	1,931	-5,972	1,672
	Equal variances not assumed			-,943	55,942	,350	-2,15	2,280	-6,717	2,417
Length of Time Total	Equal variances assumed	4,155	,044	-1,324	125	,188	-3,45	2,606	-8,607	1,706
	Equal variances not assumed			-1,106	55,569	,274	-3,45	3,120	-9,702	2,801

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Introduced = 1 vs. Aborted = 0	Equal variances assumed	,917	,340	,483	123	,630	0,030	0,062	-0,092	0,152
	Equal variances not assumed			,467	77,746	,642	0,030	0,064	-0,097	0,157
Innovativeness	Equal variances assumed	,976	,325	-1,036	123	,302	-0,194	0,188	-0,565	0,177
	Equal variances not assumed			-1,078	98,939	,284	-0,194	0,180	-0,552	0,163
Product Quality	Equal variances assumed	1,696	,196	1,513	101	,133	0,310	0,205	-0,096	0,715
	Equal variances not assumed			1,433	65,457	,157	0,310	0,216	-0,122	0,741
Financial Performance	Equal variances assumed	,809	,371	,824	95	,412	0,176	0,214	-0,249	0,602
	Equal variances not assumed			,808	64,150	,422	0,176	0,218	-0,260	0,612
Efficiency Early	Equal variances assumed	2,286	,133	-1,028	115	,306	-0,197	0,192	-0,578	0,183
	Equal variances not assumed			-1,049	86,920	,297	-0,197	0,188	-0,571	0,177
Efficiency Late	Equal variances assumed	,452	,503	1,150	117	,253	0,219	0,191	-0,158	0,597
	Equal variances not assumed			1,111	74,022	,270	0,219	0,197	-0,174	0,612
Team Creativity Early	Equal variances assumed	1,015	,316	-,553	103	,582	-0,117	0,211	-0,536	0,302
	Equal variances not assumed			-,573	82,260	,568	-0,117	0,204	-0,522	0,288
Team Creativity Late	Equal variances assumed	1,730	,191	1,500	105	,137	0,309	0,206	-0,100	0,718
	Equal var. not as.			1,556	81,308	,124	0,309	0,199	-0,086	0,705

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Overall Team Performance Early	Equal variances assumed	1,259	,264	-,510	120	,611	-0,098	0,192	-0,479	0,283
	Equal variances not assumed			-,537	99,719	,593	-0,098	0,183	-0,461	0,265
Overall Team Performance Late	Equal variances assumed	,351	,554	1,034	119	,303	0,198	0,192	-0,181	0,577
	Equal variances not assumed			1,023	83,880	,309	0,198	0,194	-0,187	0,583
Steering Committees Early	Equal variances assumed	,213	,645	1,221	113	,225	0,241	0,198	-0,150	0,633
	Equal variances not assumed			1,249	88,279	,215	0,241	0,193	-0,143	0,626
Steering Committees Late	Equal variances assumed	,064	,801	-,063	113	,950	-0,013	0,200	-0,408	0,383
	Equal variances not assumed			-,063	77,083	,950	-0,013	0,199	-0,410	0,384
Top Mgt Support Early	Equal variances assumed	10,544	,002	-2,523	118	,013	-0,476	0,189	-0,849	-0,102
	Equal variances not assumed			-2,800	110,042	,006	-0,476	0,170	-0,812	-0,139
Top Mgt Support Late	Equal variances assumed	,026	,873	-,616	119	,539	-0,120	0,194	-0,504	0,265
	Equal variances not assumed			-,618	84,660	,538	-0,120	0,193	-0,504	0,265
Decentralization Early	Equal variances assumed	,162	,688	,777	117	,439	0,151	0,195	-0,234	0,537
	Equal variances not assumed			,796	83,779	,428	0,151	0,190	-0,226	0,529
Decentral. Late	Equal var. assum	1,123	,291	2,004	120	,047	0,375	0,187	0,005	0,745
	Equal variances not assumed			1,940	76,172	,056	0,375	0,193	-0,010	0,760

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Integration with Func Dep Early	Equal variances assumed	3,229	,075	,769	118	,444	0,143	0,186	-0,225	0,511
	Equal variances not assumed			,708	66,920	,481	0,143	0,202	-0,260	0,546
Integration with Func Dep. Late	Equal variances assumed	4,011	,047	1,299	118	,196	0,246	0,189	-0,129	0,621
	Equal variances not assumed			1,181	61,473	,242	0,246	0,208	-0,170	0,662
Formalization Early	Equal variances assumed	1,309	,255	-1,705	122	,091	-0,320	0,188	-0,691	0,052
	Equal variances not assumed			-1,754	92,806	,083	-0,320	0,182	-0,682	0,042
Formalization Late	Equal variances assumed	,060	,807	-,954	122	,342	-0,184	0,193	-0,566	0,198
	Equal variances not assumed			-,954	79,797	,343	-0,184	0,193	-0,568	0,200
Participation Early	Equal variances assumed	1,567	,213	,159	119	,874	0,030	0,187	-0,341	0,401
	Equal variances not assumed			,155	75,266	,877	0,030	0,192	-0,353	0,413
Participation Late	Equal variances assumed	,069	,793	,395	120	,694	0,074	0,188	-0,298	0,446
	Equal var. not as.			,405	82,677	,687	0,074	0,183	-0,291	0,439
Co-Location Early	Equal variances assumed	,377	,540	,630	121	,530	0,121	0,192	-0,259	0,500
	Equal variances not assumed			,638	86,311	,525	0,121	0,189	-0,255	0,496

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Co-Location Late	Equal variances assumed	1,531	,218	,723	123	,471	0,136	0,189	-0,237	0,510
	Equal variances not assumed			,749	90,721	,456	0,136	0,182	-0,225	0,498
Rewards Overall Z-Score	Equal variances assumed	4,065	,046	-3,357	116	,001	-0,633	0,188	-1,006	-0,259
	Equal variances not assumed			-3,508	88,793	,001	-0,633	0,180	-0,991	-0,274
Intrinsic Team Motivation Overall	Equal variances assumed	,378	,540	-,273	123	,785	-0,052	0,189	-0,425	0,322
	Equal variances not assumed			-,277	89,151	,782	-0,052	0,186	-0,421	0,318
Sales	Equal variances assumed	1,596	,209	-1,002	97	,319	-2787920694,960	2781037704,050	-8307510707,369	2731669317,444
	Equal variances not assumed			-,896	47,090	,375	-2787920694,960	3110589486,626	-9045304002,139	3469462612,214
Employees in R&D	Equal variances assumed	3,343	,072	-1,060	72	,293	-846,080	798,156	-2437,170	745,020
	Equal variances not assumed			-,861	28,243	,396	-846,080	982,307	-2857,459	1165,309
Central Budget	Equal variances assumed	1,950	,165	-1,631	122	,105	-0,150	0,093	-0,337	0,033
	Equal var. not as.			-1,615	83,430	,110	-0,150	0,094	-0,340	0,035
No. of employees	Equal variances assumed	8,462	,004	-1,700	110	,092	-130726,300	76894,621	-283113,390	21660,793
	Equal variances not assumed			-1,145	34,168	,260	-130726,300	114131,923	-362628,335	101175,737

V Testing for Sample Selection Bias - T-Tests; BITKOM/CEBIT vs. OpenBC

V.1 Group Statistics

	BITKOM /CeBit = 0 OpenBC =1	N	Mean	Std. Deviation	Std. Error Mean
No. of employees	0	72	88492,900	476132,537	56112,758
	1	44	21681,070	32631,267	4919,349
Project Budget	0	51	55265156,860	350294838,081	49051088,530
	1	37	57366486,490	328345102,864	53979602,398
No. Team members Fulltime	0	74	13,680	38,568	4,483
	1	46	7,150	7,418	1,094
No. Functions Involved	0	79	4,010	1,713	0,193
	1	49	4,040	1,837	0,262
Length of Time Early Stage	0	82	4,810	3,160	0,349
	1	49	7,310	6,697	0,957
Length of Time Late Stage	0	81	11,150	7,715	0,857
	1	48	14,730	12,971	1,872
Length of Time Total	0	82	15,820	9,610	1,061
	1	50	21,300	18,331	2,592
Introduced = 1 vs. Aborted = 0	0	82	0,950	0,217	0,024
	1	48	0,770	0,425	0,061
Central Budget	0	80	0,490	0,503	0,056
	1	49	0,370	0,487	0,070
Sales	0	67	6820269402,990	14889071252,580	1818989561,910
	1	36	4842528055,560	10305519755,470	1717586625,912
Employees in R&D	0	47	920,230	2596,425	378,727
	1	31	1788,970	4505,049	809,131
Degree of Innovation	0	80	-0,055	1,017	0,114
	1	50	0,106	0,977	0,138
Product Quality	0	64	-0,105	1,189	0,149
	1	44	0,068	0,717	0,108
Financial Performance	0	65	-0,131	1,038	0,129
	1	37	0,268	0,871	0,143
Efficiency Early	0	76	-0,020	1,016	0,117
	1	46	-0,012	1,005	0,148
Efficiency Late	0	77	0,033	1,020	0,116
	1	47	-0,044	0,991	0,145
Team Creativity Early	0	65	-0,024	1,017	0,126
	1	45	0,040	1,032	0,154
Team Creativity Late	0	68	0,025	1,030	0,125
	1	44	-0,041	1,037	0,156
Overall Team Performance Early	0	79	0,048	0,988	0,111
	1	48	-0,077	1,053	0,152
Overall Team Performance Late	0	79	0,133	0,915	0,103
	1	47	-0,181	1,109	0,162
Steering Committees Early	0	74	0,003	0,969	0,113
	1	46	0,014	1,080	0,159
Steering Committees Late	0	75	-0,004	1,023	0,118
	1	45	0,035	0,985	0,147
Top Mgt Support Early	0	75	0,087	0,978	0,113
	1	49	-0,138	1,049	0,150
Top Mgt Support Late	0	77	0,140	0,938	0,107
	1	48	-0,234	1,081	0,156
Decentralization Early	0	76	0,100	0,998	0,114
	1	48	-0,171	0,995	0,144
Decentralization Late	0	79	0,046	1,037	0,117
	1	48	-0,055	0,943	0,136

	BITKOM /CeBit = 0 OpenBC =1	N	Mean	Std. Deviation	Std. Error Mean
Integration w Func Dep. Early	0	77	0,114	0,901	0,103
	1	48	-0,145	1,066	0,154
Integration w Func Dep Late	0	78	0,148	0,862	0,098
	1	47	-0,157	1,102	0,161
Formalization Early	0	79	0,000	1,037	0,117
	1	50	-0,016	0,947	0,134
Formalization Late	0	81	-0,038	0,986	0,110
	1	48	0,033	1,020	0,147
Participation Early	0	77	-0,056	1,001	0,114
	1	49	0,112	0,887	0,127
Participation Late	0	80	0,144	0,916	0,102
	1	47	-0,190	1,023	0,149
Co-Location Early	0	78	0,150	0,953	0,108
	1	50	-0,213	1,038	0,147
Co-Location Late	0	81	0,110	0,990	0,110
	1	49	-0,192	1,007	0,144
Rewards Overall	0	75	-0,001	0,981	0,113
	1	47	0,009	1,050	0,153
Intrinsic Team Motivation Overall	0	82	0,001	1,091	0,120
	1	48	-0,002	0,853	0,123

V.2 Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
No. of employees	Equal variances assumed	2,763	,099	,928	114	,355	66811,83	72004,202	-75827,934	209451,603
	Equal variances not assumed			1,186	72,089	,239	66811,83	56327,982	-45473,589	179097,258
Project Budget	Equal variances assumed	,002	,961	-,029	86	,977	-2101329,62	73699441,981	-148610971,31	144408312,07
	Equal variances not assumed			-,029	80,486	,977	-2101329,62	72937005,429	-147237134,36	143034475,115
No. Team member Full-time	Equal variances assumed	3,136	,079	1,134	118	,259	6,53	5,760	-4,876	17,937
	Equal variances not assumed			1,415	81,478	,161	6,53	4,615	-2,651	15,712
No. Functions Involved	Equal variances assumed	,086	,769	-,088	126	,930	-,03	,320	-,662	,606
	Equal variances not assumed			-,086	96,503	,931	-,03	,326	-,674	,618
Length of Time Early Stage	Equal variances assumed	10,902	,001	-2,887	129	,005	-2,50	,865	-4,210	-,786
	Equal variances not assumed			-2,453	60,985	,017	-2,50	1,018	-4,535	-,462
Length of Time Late Stage	Equal variances assumed	4,345	,039	-1,968	127	,051	-3,58	1,819	-7,181	,019
	Equal variances not assumed			-1,739	67,042	,087	-3,58	2,059	-7,691	,529
Length of Time Total	Equal variances assumed	5,557	,020	-2,250	130	,026	-5,48	2,435	-10,298	-,662
	Equal variances not assumed			-1,956	65,681	,055	-5,48	2,801	-11,073	,113

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Introduced = 1 vs. Aborted = 0	Equal variances assumed	47,075	,000	3,204	128	,002	,18	0,056	0,069	0,292
	Equal variances not assumed			2,741	61,589	,008	,18	0,066	0,049	0,312
Central Budget	Equal variances assumed	5,768	,018	1,333	127	,185	,12	0,090	-0,058	0,299
	Equal variances not assumed			1,343	104,179	,182	,12	0,089	-0,057	0,298
Sales	Equal variances assumed	1,559	,215	,710	101	,479	1977741347,43	2785269590,880	-3547484291,588	7502966986,447
	Equal variances not ass			,791	94,499	,431	1977741347,43	2501764745,904	-2989229461,944	6944712156,803
Employees in R&D	Equal variances assumed	2,911	,092	-1,080	76	,284	-868,73	804,565	-2471,164	733,697
	Equal variances not assumed			-,972	43,232	,336	-868,73	893,379	-2670,126	932,658
Degree of Innovation	Equal variances assumed	,273	,602	-,891	128	,374	-,1609848	0,181	-0,518	0,196
	Equal variances not assumed			-,900	107,304	,370	-,1609848	0,179	-0,516	0,194
Product Quality	Equal variances assumed	12,494	,001	-,864	106	,390	-,1731742	0,201	-0,571	0,224
	Equal variances not assumed			-,942	104,469	,348	-,1731742	0,184	-0,538	0,191
Financial Performance	Equal variances assumed	1,285	,260	-1,973	100	,051	-,3986250	0,202	-0,799	0,002
	Equal variances not assumed			-2,070	86,079	,041	-,3986250	0,193	-0,781	-0,016

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Efficiency Early	Equal variances assumed	,414	,521	-,046	120	,963	-0,009	0,189	-0,383	0,366
	Equal variances not assumed			-,046	95,927	,963	-0,009	0,188	-0,383	0,365
Efficiency Late	Equal variances assumed	,396	,531	,414	122	,680	0,077	0,187	-0,293	0,447
	Equal variances not assumed			,417	99,541	,678	0,077	0,186	-0,291	0,445
Team Creativity Early	Equal variances assumed	,073	,787	-,323	108	,747	-0,064	0,198	-0,458	0,329
	Equal variances not assumed			-,322	93,888	,748	-0,064	0,199	-0,459	0,331
Team Creativity Late	Equal variances assumed	,062	,804	,332	110	,740	0,066	0,200	-0,330	0,462
	Equal variances not assumed			,332	91,453	,741	0,066	0,200	-0,331	0,464
Overall Team Performance Early	Equal variances assumed	,255	,614	,673	125	,502	0,125	0,185	-0,242	0,491
	Equal variances not assumed			,663	94,427	,509	0,125	0,188	-0,249	0,498
Overall Team Performance Late	Equal variances assumed	1,521	,220	1,723	124	,087	0,315	0,183	-0,047	0,676
	Eq.v.n.a.			1,641	82,762	,105	0,315	0,192	-0,067	0,696
Steering Committees Early	Equal variances assumed	,477	,491	-,060	118	,952	-0,011	0,190	-0,388	0,365
	Equal variances not assumed			-,059	87,781	,953	-0,011	0,195	-0,399	0,376

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Steering Committees Late	Equal variances assumed	,097	,756	-,208	118	,836	-0,040	0,190	-0,416	0,337
	Equal variances not assumed			-,210	95,567	,834	-0,040	0,188	-0,414	0,335
Top Mgt Support Early	Equal variances assumed	,818	,368	1,219	122	,225	0,225	0,185	-0,141	0,592
	Equal variances not assumed			1,201	97,613	,233	0,225	0,188	-0,147	0,598
Top Mgt Support Late	Equal variances assumed	2,922	,090	2,043	123	,043	0,374	0,183	0,012	0,736
	Equal variances not assumed			1,977	89,340	,051	0,374	0,189	-0,002	0,750
Decentralization Early	Equal variances assumed	,056	,813	1,474	122	,143	0,271	0,184	-0,093	0,635
	Equal variances not assumed			1,475	100,309	,143	0,271	0,184	-0,093	0,635
Decentralization Late	Equal variances assumed	,420	,518	,551	125	,583	0,101	0,183	-0,262	0,464
	Equal variances not assumed			,564	106,686	,574	0,101	0,179	-0,254	0,456
Integration between Team and Functions Early	Equal variances assumed	,256	,614	1,454	123	,148	0,259	0,178	-0,093	0,611
	Equal variances not assumed			1,398	87,423	,166	0,259	0,185	-0,109	0,626
Integration between Team and Functions Late	Equal variances assumed	1,400	,239	1,719	123	,088	0,304	0,177	-0,046	0,655
	Equal variances not assumed			1,618	79,689	,110	0,304	0,188	-0,070	0,679

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Formalization / Structured Approach Early	Equal variances assumed	1,053	,307	,088	127	,930	0,016	0,181	-0,343	0,375
	Equal variances not ass.			,090	111,314	,929	0,016	0,178	-0,336	0,368
Formalization / Structured Approach Late	Equal variances assumed	,033	,857	-,390	127	,697	-0,071	0,182	-0,431	0,289
	Equal variances not assumed			-,387	96,190	,700	-0,071	0,184	-0,435	0,293
Participation Early	Equal variances assumed	,138	,711	-,956	124	,341	-0,167	0,175	-0,514	0,179
	Equal variances not assumed			-,982	111,163	,328	-0,167	0,170	-0,505	0,170
Participation Late	Equal variances assumed	,156	,693	1,899	125	,060	0,334	0,176	-0,014	0,682
	Equal variances not assumed			1,845	88,139	,068	0,334	0,181	-0,026	0,693
Co-Location Early	Equal variances assumed	,962	,329	2,030	126	,044	0,363	0,179	0,009	0,717
	Equal variances not assumed			1,992	98,036	,049	0,363	0,182	0,001	0,725
Co-Location Late	Equal variances assumed	,002	,961	1,675	128	,096	0,302	0,180	-0,055	0,659
	Equal variances not assumed			1,668	100,005	,098	0,302	0,181	-0,057	0,661
Rewards Overall	Equal variances assumed	,388	,534	-,056	120	,956	-0,010	0,187	-0,382	0,361
	Equal variances not assumed			-,055	92,766	,956	-0,010	0,191	-0,389	0,368
Intrinsic Team Motivation Overall	Equal variances assumed	2,774	,098	,014	128	,989	0,003	0,184	-0,361	0,366
	Equal variances not assumed			,015	117,582	,988	0,003	0,172	-0,338	0,344

VI Tests of Normality

	Kolmogorov-Smirnov Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
Degree of Innovation	,137	131	,000	,948	131	,000
Financial Performance	,123	103	,001	,950	103	,001
Product Quality	,105	109	,005	,964	109	,005
Efficiency Early	,102	123	,003	,946	123	,000
Efficiency Late	,096	125	,007	,966	125	,003
Team Creativity Early	,113	111	,001	,961	111	,003
Team Creativity Late	,070	113	,200	,975	113	,031
Overall Team Performance Early	,189	128	,000	,910	128	,000
Overall Team Performance Late	,206	127	,000	,902	127	,000
Steering Committees Early	,116	121	,000	,918	121	,000
Steering Committees Late	,092	121	,013	,937	121	,000
Top Mgt Support Early	,117	125	,000	,943	125	,000
Top Mgt Support Late	,145	126	,000	,905	126	,000
Decentralization Early	,213	125	,000	,894	125	,000
Decentralization Late	,178	128	,000	,912	128	,000
Integration w Func Dep Early	,126	126	,000	,911	126	,000
Integration w Func Dep Late	,116	126	,000	,922	126	,000
Formalization Early	,145	130	,000	,963	130	,001
Formalization Late	,127	130	,000	,942	130	,000
Participation Early	,085	127	,026	,942	127	,000
Participation Late	,122	128	,000	,947	128	,000
Co-Location Early	,142	129	,000	,896	129	,000
Co-Location Late	,125	131	,000	,908	131	,000
Rewards Overall	,238	123	,000	,837	123	,000
Intrinsic Team Motivation Overall	,139	131	,000	,899	131	,000

* This is a lower bound of the true significance.
a Lilliefors Significance Correction

VII Simple Regression - Financial Performance (Model I)

Model Summary

Model	R	R Square	Adj. R Square	Std. Error of the Estimate	Durbin-Watson
1	,273	,074	,047	,852	1,587

a Predictors: (Constant), Overall Perf late, Overall Perf early
b Dependent Variable: Financial Success

Coefficients

	Unstd. Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	2,250	,551		4,086	,000					
Overall Perf early	,237	,141	,236	1,680	,098	,268	,201	,197	,698	1,433
Overall Perf late	6,073E-02	,147	,058	,413	,681	,188	,050	,049	,698	1,433

a Dependent Variable: Financial Success

VIII Early vs. Late Use of Antecedents, T-Tests

		Levene's Test for Equality of Variances		t-test for Equality of Means					
			Sig.	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Steering Committees per month	Equal var. ass.	0,01	0,92	-0,16	260,00	0,87	-0,03	-0,36	0,30
	Equal var. not ass.			-0,16	258,30	0,87	-0,03	-0,36	0,30
Relevance of Steering Committees	Equal var. ass.	1,14	0,29	-1,88	242,00	0,06	-0,34	-0,70	0,02
	Equal var. not ass.			-1,88	239,22	0,06	-0,34	-0,70	0,02
Decentralization	Equal var. ass.	0,38	0,54	0,27	147,00	0,79	0,04	-0,24	0,32
	Equal var. not ass.			0,27	143,34	0,79	0,04	-0,24	0,32
Participation	Equal var. ass.	0,74	0,39	-0,21	147,00	0,84	-0,02	-0,22	0,18
	Equal var. not ass.			-0,21	143,24	0,84	-0,02	-0,22	0,18
Team Member proximity	Equal var. ass.	0,02	0,89	0,77	147,00	0,44	0,15	-0,24	0,54
	Equal var. not ass.			0,77	146,18	0,44	0,15	-0,24	0,54
Project Formalization	Equal var. ass.	0,14	0,71	-2,07	147,00	0,04	-0,28	-0,55	-0,01
	Equal var. not ass.			-2,07	144,91	0,04	-0,28	-0,55	-0,01
Top Management Support	Equal var. ass.	0,02	0,88	-0,94	147,00	0,35	-0,14	-0,45	0,16
	Equal var. not ass.			-0,94	146,93	0,35	-0,14	-0,45	0,16
Integrat. with func. Dep.	Equal var. ass.	0,04	0,85	0,45	147,00	0,65	0,06	-0,19	0,31
	Equal var. not ass.			0,45	146,20	0,65	0,06	-0,19	0,31

7 References

Aaker, D.A./Jacobson, R. (1994): The Financial Information Content of Perceived Quality, Journal of Marketing Research, 31 (May), 191-201.

Adams, J.S. (1965): Inequity in social exchange, in: Bernkovitz, L. (ed.): Advance in experimental Social Psychology, Vol. 2, New York, 267-99.

Adler, P.S. (1995): Interdepartmental Interdependence and Coordination: The Case of the Design / Manufacturing Interface, Organization Science, Vol. 6, No. 2 (March-April 1995), 147-167.

Aldrich, H./Herker, D. (1977): Boundary Spanning Roles and Organization Structure, Academy of Management Review, 2 (2), 217-230.

Allen, T.J. (1986): Managing the Flow of Technology, Cambridge, 1986.

Allison, P.D. (1999): Multiple Regression – A primer, Thousand Oaks, 1986.

Alper, S./Tjosvold, D./Law, K.S. (1998): Interdependence and Controversy in Group Decision Making: Antecedents to Effective Self-Managing Teams, Organizational Behavior And Human Decision Processes, Vol. 74, No. 1, April, 33–52.

Amabile, T.M. (1988): A Model of Creativity and Innovation in Organizations, Research in Organizational Behavior, Vol. 10, 123-167.

Amabile, T.M. (1996). Creativity in context, Boulder,(1996).

Amabile, T.M./Hennessey, B.A./Grossman, B.S. (1986): Social influences on creativity: The effects of contracted-for reward, Journal of Personality and Social Psychology, 50, 14–23.

Amabile, T.M./Hill, K.G./Hennessey, B.A./Tighe, E.M. (1994): The work preference inventory: Assessing intrinsic and extrinsic motivational orientation, Journal of Personality and Social Psychology, 66, 950–967.

Amason, A.C. (1996): Distinguishing the effects of functional and dysfunctional conflict on strategic decision making: Resolving a paradox for top management groups, Academy of Management Journal, 39, 123–148.

Ancona, D.G. (1990): Outward Bound : Strategies for team survival in an organization, Academy of Management Journal, Vol. 33, No. 2, 334-365.

Ancona, D.G./Caldwell, D. (1990): Improving the performance of new product teams, Research Technology Management, March-April, 25-34.

Ancona, D.G./Caldwell, D. (1992a): Bridging the Boundary: External Activity and Performance in Organizational Teams, Administrative Science Quarterly, Dec '92, Vol. 37, 4, 634-661.

Ancona, D.G./Caldwell, D. (1992b): Demography and Design, Predictors of New Product Development Performance, Organization Science, 3, 321-341.

Andrews, J./Smith, D.C. (1996): In Search of Marketing Imagination: Factors Affecting the Creativity of Marketing Programs for Mature Products, Journal of Marketing Research, 33 (May), 174-187.

Argyres, N.S./Silverman, B.S (2004): R&D, Organization Structure, And The Development of Corporate Technological Knowledge, Strategic Management Journal, 25 (2004), 929-958.

Ashforth, B./Mael, F. (1989): Social Identity Theory and the Organization, Academy of Management Review, 14 (1), 20-39.

Atuahene-Gima, K. (2005): Resolving the Capability Rigidity Paradoxon in Product Innovation, Journal of Marketing, Vol. 69 (October 2005), 61-83.

Atuahene-Gima, K./Slater, S.F./Olson, E.M. (2005): The Contingent Value of Responsive and Proactive Market Orientations for New Product Program Performance, Journal of Product Innovation Management, 22, 464–482.

Ayers, D./Dahlstrom, R./Skinner, S.J. (1997): An Exploratory Investigation of Organizational Antecedents to New Product Success, Journal of Marketing Research, Vol. XXXIV (February 1997), 107-116.

Ayers, D.J./Gordon, G.L./Schoenbachler, D.D. (2001): Integration And New Product Development Success: The Role of Formal and Informal Controls, The Journal of Applied Business Research, 17 (2001), 2, 133-148.

Backhaus, K./Erichson, B./Plinke, W./Weiber, R. (2000): Multivariate Analysemethoden. Eine anwendungsorientierte Einführung, Berlin , 2000.

Baer, M./Oldham, G.R./Cummings, A. (2003): Rewarding creativity: when does it really matter?, The Leadership Quarterly, 14, 569-586.

Bagozzi, R./Yi, Y. (1988): On the Evaluation of Structural Equation Models, Journal of the Academy of Marketing Science, Vol. 16, No. 1, 74-94.

Bahli, B.; Büyükkurt, M.D. (2005): Group Performance in Information Systems Project Groups: An Empirical Study, Journal of Information Technology Education, Vol. 4, 97-113.

Baron, R.A./Byrne, D. (1997): Social Psychology, Boston (1997).

Bassett-Jones, N. (2005): The Paradox of Diversity Management, Creativity and Innovation, Creativity and Innovation Management, Vol. 14, No. 2, 169-175.

Belsley, D..A., Kuh, E./Welsch, R.E. (1980): Regression Diagnostics: Identifying Influential Data and Sources of Collinearity, New York (1980).

Benamati, J./Lederer, A.L. (2000): Rapid Change: Nine Information Technology Management Challenges, INFOR, Vol. 38, No. 4 (Nov), 336-358.

Bentler, P. M./Chou, C. P. (1987): Practical issues in structural modeling, Sociological Methods and Research, 16 (1), 78-117.

Berghman, L. (2006): Strategic Innovation Capacity – A Mixed Method Study on Deliberate Strategic Learning Mechanisms, ERIM Ph.D Series Research in Management, 87, Erasmus Research Institute of Management (ERIM), Erasmus University Rotterdam, online available under: <http://hdl.handle.net/1765/1> (10. Dec. 2006).

Bhuiyan, N./Thomson, V./Gerwin, D. (2006): Implementing concurrent engineering, Research Technology Management, Vol. 49 (1), p. 38-43.

Birkinshaw, J./Fey, C.F. (2000): Organizing for Innovation in large firms, Working Paper, London Business School & Stockholm School of Economic, SSE/EFI Working Paper Series in Business Administration, No. 2000:5, April 2000, 1-23.

Bonner, J.M./Ruekert, R.W./Walker, O.C. (2002): Upper management control of new product development projects and project performance, Journal of Product Innovation Management, 19, 233-245.

Bonner, J.M. (2005): The influence of formal controls on customer interactivity in new product development, Industrial Marketing Management, 34, 63-69.

Bookstein, F.L. (1986): The elements of latent variable models: A cautionary lecture, In: Lamb, M./Brown, A./Rogoff, B. (Eds.): Advances in developmental psychology, Hillsdale, 203-230.

Boomsma, A./Hoogland, J.J. (2001): The Robustness of LISREL Modeling Revisited, In: Cudeck, R./du Toit, S./Sörbom, D. (eds.): Structural equation models: Present and future. A Festschrift in honor of Karl Jöreskog, Chicago, 139–168.

Burns, T./Stalker, G. M. (1961): The management of innovation. London (1961).

Calder, B.J./Staw, B.M. (1975): The Self-Perception of Intrinsic and Extrinsic Motivation, Journal of Personality and Social Psychology, 31, 599-605.

Campion, M.A./Papper, E.M./Medsker, G.J. (1996): Relations Between Work Team Characteristics And Effectiveness: A Replication And Extension, Personnel Psychology, Summer 96, Vol. 49, Issue 2, 429-452.

Carmines,E.G. /Zeller, R.A.(1979): Reliability and Validity Assessment, Sage University Paper Series on Quantitative Applications in the Social Sciences, N. 07-017, Beverly Hills (1979).

Chen, G./Tjosvold, D. (2002): Cooperative Goals and Constructive Controversy for Promoting Innovation in Student Groups in China, Journal of Education for Business, September/October (2002), 46-50.

Chen, G./Liu, C./Tjosvold, D. (2005): Conflict Management for Effective Top Management Teams and Innovation in China, Journal of Management Studies, 42, 2 (March), 277-300.

Child, J. (1972): Organization structure, environment, and performance – The role of strategic choice, Sociology, 6, 1-22.

Chin, W.W. (1998): The Partial Least Squares Approach to Structural Equation Modelling, in: Marcoulides, G.A. (ed.) (1998): Modern Methods for Business Research, Lawrence Earlbaum Associates, 295-336.

Chin, W.W./Newsted, P.R. (1999): Structural Equation Modelling Analysis with Small Sample Sizes Using Partial Least Squares, in: Hoyle, R.H. (ed.): Strategies for Small Sample Research, Thousand Oaks, 307-341.

Churchill, G.A. (1979): A paradigm for developing better measures of marketing constructs. Journal of Marketing Research, 16 (1): 64-73.

Clark, K.B./Fujimoto, T. (1991): Product Development Performance, Boston (1991).

Clark, K.B./Wheelwright, S.C. (1992): Organizing and Leading "Heavyweight" Development Teams, California Management Review, Spring, 9-28.

Cohen, S. G./Bailey, D.E. (1997): What makes teams work: group effectiveness research from the shop floor to the executive suit, Journal of Management, 23 (3), 239-290.

Cooper, R.G (1995): Developing new products on time, in time, Research Technology Management, 38 (5), 49-57.

Cooper, R.G. (1996): Overhauling the new product process, Industrial Marketing Management, 25 (6), 465-482.

Courtright, J.A./Fairhurst, G.L./Rogers, E. (1989: Interaction Patterns in Organic and Mechanistic Systems, The Academy of Management Journal, Vol. 32, No. 4 (Dec), 773-802.

Cyert, R.M./March, J.G. (1963): A behavioral theory of the firm, Englewood Cliffs, (1963).

Damanpour, F. (1991): Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators, Academy of Management Journal, Vol. 14, No. 3, 555-590.

Damanpour, F. (1996): Bureaucracy and Innovation Revisited - Effects of Contingency Factors, Industrial Sectors, and Innovation Characteristics, Journal of High Technology Management Research, Vol. 7, 149-173.

Daft, R./Becker, S. (1978): Innovation in Organizations: Adoption in School Organization, New York (1978).

Daft, R.L./Lengel, R.L. (1986): Organizational information requirements, media richness and structural design, Management Science, 32 (5), 554-571.

De Dreu, C.K.W./West, M.A. (2001): Minority Dissent and Team Innovation: The Importance of Participation in Decision Making, Journal of Applied Psychology, Vol. 86, No. 6, 1191-1201.

De Dreu. C.K.W./Weingart, L.R. (2003): Task versus Relationship Conflict, Team Performance, and Team Member Satisfaction: A Meta-Analysis, Journal of Applied Psychology, Vol. 88, No. 4, 741-749.

Deci, E.L./Ryan, R.M. (1985): Intrinsic Motivation and Self-Determination in Human Behavior. New York, 1985.

Deci, E.L./Koestner R./Ryan, R.M. (1999): The Undermining Effect Is a Reality After All - Extrinsic Rewards, Task Interest, and Self-Determination: Reply to Eisenberger, Pierce, and Cameron (1999) and Lepper, Henderlong, and Gingras (1999), Psychological Bulletin, 1999, 125, 692-700.

Dension, D.R./Hart, S.L./Kahn, J.A. (1996): From Chimneys to cros-functional teams: Developing and Valdiating a Diagnostic Model, Academy of Management Journal, Vol. 39, No. 4, 1005-1023.

Deshpande, R. (1982): The Organizational Context of Market Research Use, Journal of Marketing, 46 (Fall), 91-101.

Deutsch, M. (1949): A theory of cooperation and competition, Human Relations, 2, 129–152.

Devaux, S.A. (1999): Total Project Control, New York (1999).

Donnellon, A. (1993): Crossfunctional teams in product development: Accommodating the structure to the process, Journal of Product Innovation Management, 10, 377–392.

Dougherty, D. (1992): Interpretive Barriers to Successful Product Innovation in Large Firms, Organization Science, Vol.3, No. 2 (May 1992), 179-202.

Dougherty, D./Hardy, C. (1996): Sustained Product Innovation in Large, Mature Organizations: Overcoming Innovation-to-Organization Problems, The Academy of Management Journal, 39, 5, 1120-1153.

Duncan, R.B. (1976): The Ambidextrous Organization: Designing Dual Structures for Innovation, in: Kilmann, R./Pondy, L./Slevin, D. (eds.), The Management of Organization Design: Volume I, Strategies and Implementation, New York, 1976, 167-188.

Dunk, A. S./Kilgore, A. (2004): Financial factors in R&D budget setting: the impact of inter-functional market coordination, strategic alliances, and the nature of competition, Accounting & Finance, 44, 2 (Jul), 123-138.

Eisenberger, R./Cameron, J. (1998): Reward, Intrinsic Interest, and Creativity: New Findings, American Psychologist, June, 676-678.

Eisenberger, R./Armeli, S./Pretz, J. (1998): Can the promise of reward increase creativity? Journal of Personality and Social Psychology, 74, 704–714.

Eisenberger, R./Rhoades, L. (2001): Incremental effects of reward on creativity. Journal of Personality and Social Psychology, 81, 728–741.

Eisenhardt, K.M. (1989): Agency Theory: An Assessment and Review, The Academy of Management Review, 14, 1, 57-74.

Eisenhardt, K.M./Tabrizi, B.N. (1995): Accelerating Adaptive Processes: Product Innovation in the Global Computer Industry, Administrative Science Quarterly, Vol. 40, Issue 1, 84-110.

Eom, S.B./Wen H.J./Ashill, N. (2006): The Determinants of Students' Perceived Learning Outcomes and Satisfaction in University Online Education: An Empirical Investigation, Decision Sciences Journal of Innovative Education, Vol. 4, No. 2 (July), 215-235.

Fassott, G. (2006): Die PLS-Pfadmodellierung: Entwicklungsrichtungen, Möglichkeiten und Grenzen, in: Bliemel, F./Eggert, A./Fassott, G./Henseler, J. (eds.): Handbuch PLS-Pfadmodellierung – Methode, Anwendung, Praxisbeispiele, Stuttgart (2006), 19-29.

Ford, R.C./Randolph, W.A. (1992): Cross-Functional Structures: A Review and Integration of Matrix Organization and Project Management, Journal of Management, Vol. 18, No. 2, 267-294.

Fornell, C. (1982): A Second Generation of Multivariate Analysis: Methods Volume 1, New York (1982).

Fornell, C./Bookstein, F.L. (1982): Two Structural Equation Models: LISREL and PLS Applied to Consumer Exit-Voice Theory, Journal of Marketing Research, Vol. XIX (November 1982), pp. 440-452.

Fornell, C. /Larcker, D.F.(1981): Evaluating Strucurual Equation Models with unobservable variables and measurement error, Journal of Marketing Research, Vol. 18, No. 1 (Feb., 1981), 39-50.

Fornell, C./Lorange, P./Roos, J. (1990): The Cooperative Venture Formation Process: A Latent Variable Structural Modeling Approach, Management Science, Vol. 36, No.10, 1246-1255.

Galbraith, J.R. (1973): Designing Complex Organizations, Reading (MA), (1973).

Galbraith, J.R. (1994): Competing with flexible lateral organizations (2nd ed.), Reading (MA), 1994.

Ganesan, S./Malter, A.J./Rindfleisch, A. (2005): Does Distance Still Matter? Geographic Proximity and New Product Development, Journal of Marketing, Vol. 69 (October 2005), 44-60.

Garrett, T.C./Buisson, D.H./Yap, C.M. (2006): National culture and R&D and marketing integration mechanisms in new product development: A cross-cultural study between Singapore and New Zealand, Industrial Marketing Management, 35 (2006), 293-307.

Garud, R./Van de Ven, A. (1992): An empirical evaluation of the internal corporate venturing process, Strategic Management Journal, 13, 93–109.

Garvin, D.A. (1988): Managing Quality, New York (1988).

Gebert, D./Boerner S./Kearney E. (2006): Cross-functionality and innovation in new product development teams: A dilemmatic structure and its consequences for the management of diversity, European Journal of Work and Organizational Psychology, 15 (4), 431-458.

Gladstein, D. L. (1984): Groups in context: a model of task group effectiveness, Administrative Science Quarterly, 29, 4, 499-517.

Gomez-Mejia, L.R./Balkan, D.R. (1989): Effectiveness of individual and aggregate compensation strategies, Industrial Relations, 28, 431-445.

Granovetter, M. (1973): The Strength of Weak Ties," American Journal of Sociology, 78 (6), 1360–80.

Greenberg, J. (1993): The Social Side of Fairness: Interpersonal and Informational Classes of Organizational Justice, in: Cropanzano, R. (ed.): Justice in the Workplace: Approaching Fairness in Human Resource Management, Hillsdale (NJ), 79-103.

Greve, H.R. (2003): A Behavioral Theory of R&D Expenditures And Innovations: Evidence from Shipbuilding, Academy of Management Journal, Vol. 46 (2003), No. 6, 685–702.

Griffin, A. (1997): PDMA research on new product development practices: updating trends and benchmarking best practices, Journal of Product Innovation Management, 4, 191-215.

Griffin, A./Hauser, J.R. (1996): Integrating R&D and Marketing: A Review and Analysis of the Literature, Journal of Product Innovation Management, 13, 191-215.

Grifftiths-Hemans, J./Grover, R. (2006): Setting the Stage for Creative New Products: Investigating the Idea Fruition Process, Journal of the Academy of Marketing Science, Vol. 34, No.1, 27-39.

Gupta, A.K./Raj, S.P./Wilemon, D. (1986): A Model for Studying R&D-Marketing Interface in the Product Innovation Process, Journal of Marketing, 50 (Apr), 7-17.

Guzzo, R.A./Shea, G.P. (1992): Group performance and intergroup relations in organizations, in Dunnette, M.D./Hough, L.M. (eds): Handbook of Industrial and Organizational Psychology, Vol. 3, Palo Alto (CA), 269-313.

Hackman, J. R. (1987): The design of work teams, in: Lorsch, J.W. (ed.): The Handbook of Organizational Behavior, Englewood Cliffs (NJ), 315–342.

Hage, J./Aiken, M. (1967): Program Change and Organizational Properties: A Comparative Analysis, American Journal of Sociology, 72 (March), 503-519.

Harackiewicz, J.M./Manderlink, G./Sansone, C. (1984): Rewarding pinball wizardry: Effects of evaluation and cue value on intrinsic interest, Journal of Personality and Social Psychology, 47, 287–300.

Hauptmann O./Hirji K.K. (1996). The influence of process concourrency of project outcomes in product development: an empirical study of cross-functional teams, IEEE Transactions on Engineering Management, 43, 153-164.

Henard, D.H./Szymanski, D. M. (2001): Why Some New Products Are More Succesful Than Others, Journal of Marketing Research, 38, 3 (2001), 362-375.

Henke, J.W./Krachenberg, A.R./Lyons, T.F. (1993):Cross-functional teams: Good concept, poor implementation, Journal of Product Innovation Management, 10, 216-229.

Hennessey, B.A./Amabile, T.M. (1998): Reward, Intrinsic, Motivation, and Creativity, American Psychologist, June 1998, 674-675.

Henseler, J. (2005): Einführung in die PLS-Pfadmodellierung, WiSt, No. 2 (February), 70-75.

Herold, D.M./Jayaraman, N./Narayanaswamy, C.R. (2006): What is the Relationship between Organizational Slack and Innovation?, Journal of Managerial Issues, Vol. XVIII, Number 3, Fall 2006, 372-392.

Hershock, R.J./Cowman, T.C.D./Peters, D. (1994): FROM EXPERIENCE: Action teams that work, Journal of Product Innovation Management, 11, 95-104.

Hertel, G./Konradt, U./Orlikowski, B. (2004): Managing distance by interdependence: Goal setting, task interdependence, and team-based rewards in virtual teams, European Journal of Work & Organizational Psychology, Vol. 13, 1 (Mar), 1-28.

Hitt, M.A./Nixon, R.D./Hoskisson, R.F./Kochhar, R. (1999): Corporate Entrepreneurship and Cross-Functional Fertilization: Activation, Process and Disintegration of a New Product Design Team, Entrepreneurship: Theory & Practice, Spring99, Vol. 23, Issue 3, 145-167.

Hoegl, M./Gemuenden, H.G. (2001): Teamwork Quality and the Success of Innovative Projects: A Theoretical Concept and Empirical Evidence, Organization Science, Vol. 12, No. 4, July-August 2001,435-449.

Hoegl, M./Parboteeah, K.P./Gemuenden, H.G. (2003): When teamwork really matters; task innovativeness as a moderator of the teamwork-performance relationship in software development projects, Journal of Engineering and Technology Management, 20, 281-302.

Hoegl, M./Proserpio, L. (2004): Team member proximity and teamwork in innovative projects, Research Policy, 33 (2004), 1153-1165.

Hoegl, M./Weinkauf, K. (2005): Managing Task Interdependencies in Multi-Team Projects: A Longitudinal Study, Journal of Management Studies, 42, 6 (Sep), 1287-1308.

Hoegl, M./Weinkauf, K./Gemuenden, H.G. (2004): Interteam Coordination, Project Commitment, and Teamwork in Multiteam R&D Projects: A Longitudinal Study, Organization Science, Vol. 15, No. 1 (Jan-Feb), 38-55.

Holland, S./Gaston, K./Gomes, J. (2000): Critical success factors for cross-functional teamwork in new product development, International Journal of Management Reviews, Vol. 2, Issue 3, 231-259.

Hoskisson, R.E./ Hitt, M.A./Hill, C.L. (1993): Managerial incentives and investment in R&D in large multiproduct firms, Organization Science, Vol. 4, No. 2 (May), 325-341.

Huizenga, E.I. (2004): Innovation Management in the ICT-Sector – How Frontrunners Stay Ahead, Northhampton (MA), 2004.

Hulland, J. (1999): Use of Partial Least Squares (PLS) in Strategic Management Research: A Review of Four Recent Studies, Strategic Management Journal, 20 (1999), 105-204.

Jackson, S.E./May, K.E./Whitney, K. (1995): Understanding the dynamics of diversity in decision making team, in: Guzzo, R.A./Salas, E. (eds): Team effectiveness and decision making in organizations, San Francisco (Ca), 204-261.

Jackson, S.E./Joshi, A./Erhardt, N.L. (2003): Recent Research on Team and Organizational Diversity: SWOT Analysis and Implications, Journal of Management, 29 (6), 2003, 801-830.

Jacobson, R./Aaker, D.A. (1987): The Strategic Role of Product Quality, Journal of Marketing, 51 (October), 31-44.

Janis, I.L. (1982): Victims of Group Think: A psychological Study of Foreign Policy Decisions and Fiascos, Boston (MA), (1982).

Jansen, J.P./Van den Bosch, F.A.J./Volberda, H.W. (2006): Exploratory Innovation, Exploitative Innovation, and Performance: Effects of Organizational Antecedents and Environmental Moderators, ERIM Report Series Research in Management, ERS-2006-038-STR (July 2006), Erasmus Research Institute of Management; Erasmus University Rotterdam (NL), pp. 1-32.

Jassawalla, A.R./Sashittal, H.C. (1998): An examination of Collaboration in High-Technology New Product Development Processes, Journal of Product Innovation Management, 15 (1998), 237-254.

Jaworski, B. (1988): Toward a Theory of Marketing Control: Environmental Context, Control Types, and Consequences, Journal of Marketing, Vol. 52, July, 22-39.

Jehn, K.A. (1994): Enhancing effectiveness: An investigation of advantages and disadvantages of value-based intragroup conflict. International Journal of Conflict Management, 5, 223–238.

Jehn, K.A. (1995): A multimethod examination of the benefit and detriments of intragroup conflict, Administrative Science Quarterly, 40, 256-282.

Jehn, K.A. (1997): Affective and cognitive conflict in work groups: Increasing performance through value-based intragroup conflict, in: De Dreu, C.K.W./Van de Vliert, E. (eds.), Using conflict in organizations. London (1997), 87–100.

Jehn, K. A./Northcraft, G. B./Neale, M. A. (1999): Why differences make a difference: A field study of diversity, conflict, and performance in workgroups, Administrative Science Quarterly, 44, 741–763.

Jensen, M.C. (1986): Agency costs of free cash flow, corporate finance, and takeovers, Amercian Economic Review, 76, 323-329.

Jensen, M.C. (1993): The modern industrial revolution, exit, and the failure of internal control systems, Journal of Finance, 48, 831-880.

Jobber, D./Allen, N./Oakland, J. (1985): The impact of telephone notification strategies on response to an industrial mail survey, International Journal of Research in Marketing, Vol. 2, Issue 4, 291-296.

Joereskog, K.G./Soerborn, D. (1993): New features in LISREL 8, Chicago (1993).

Joreskog, K.G./Wold, H. (1982): The ML and PLS techniques for modeling with latent variables: historical and comparative aspects, in: Joreskog, K.G./Wold, H. (eds.): Systems under indirect observation: causality, structure, prediction, Vol. 1, Amsterdam (1982), 263-270.

John, G./Martin, J. (1984): Effects of Organizational Structure of Marketing Planning on Credibility and Utilization of Plan Output, Journal of Marketing Research, 21 (May), 170-183.

Kahn, K.B. (1996): Interdepartmental Integration: A Definition with Implications for Product Development Performance, Journal of Product Innovation Management, 13 (1996), 137-151.

Keller, R.T. (2001): Cross-Functional Project Groups In Research And New Product Development: Diversity, Communications, Job Stress, And Outcomes, Academy of Management Journal, Vol. 44, Issue 3 (Jun), 547-555.

Keil, M./Tan, B.C.Y./Wei, K.-K./Saarinen, T./Tuuainen, V./Wassenaar, A. (2000): A Cross-Cultural Study on Escalation of Committment Behavior in Software Projects, MIS-Quarterly, Vol. 24, No. 2 (June), 299-324.

Kirton, M. (1994): Adaptors and innovators: Styles of creativity and problem solving, New York (1994).

Knoben, J./Oerlemans, L.A.G. (2006): Proximity and Inter-Organizational Collaboration: A Literature Review, International Journal of Management Reviews, Vol. 8, No. 2, 71-89.

Kohn, A. (1993): Why incentive plans cannot work, Harvard Business Review, Vol. 71, Issue 5 (Sep/Oct), 54-60.

Kruglanski, A.W./Friedman, I./Zeevi, G. (1971): The effects of extrinsic incentive on some qualitative aspects of task performance, Journal of Personality, 39, 606–617.

Larson, E.W./Gobeli, D.H. (1987): Matrix Management: contradicitons and insights. California Management Review, 29 (4), 126-138.

Larson, E.W. / Gobeli, D.H. (1988): Organizing for Product Development Projects, Journal of Product Innovation Management, 5, 180-190.

Laufer, A. (1997): Simultaneous management: Managing project in a dynamic envrionement, Boston (1997).

Lawrence, P.R./Lorsch, J.W. (1967): Differentiation and integration in complex organizations, Administrative Science Quarterly, 12, 1, 1-47.

Leenders, M.A.A.M./Wierenga, B. (2001): The effectiveness of different mechanisms for integrating marketing and R&D, Journal of Product Innovation Management 19 (2002), 305-317.

Lewis, M.W./Welsh, M.A./Dehler, G.E./Dehler, G.E./Green, S.G. (2002): Product Development Tensions: Exploring Contrasting Styles of Project Management, Academy of Management Journal, Vol. 45, No. 3, 546-564.

Lounamaa, P.H./March, J. G. (1987): Adaptive coordination of a learning team. Management Science, 33, 107–123.

Lovelace, K./Shapiro, D. L./Weingart, L. R. (2001): Maximizing Cross-Functional New Product Teams' Innovativeness And Constraint Adherence: A Conflict Communications Pespective, Academy of Management Journal, Vol. 44 Issue 4 (Aug), 779-793.

Lukas, B. A./Menon, A. (2004): New Product Quality: Intended and Unintended Consequences of New Product Development Speed, Journal of Business Research, 57 (11), 1258-1264.

Maltz, E./Kohli, A.K. (2000): Reducing Marketing`s Conflict With Other Functions: The Differential Effects of Integrating Mechanism, Journal of the Academy of Marketing Science, Vol. 28, No. 4, 479-492.

March, J. G. (1981): Footnotes to organizational change, Administrative Science Quarterly, 26, 563–577.

Marino, K.E. **(1982):** Structural Correlates of Affirmative Action Compliance, Journal of Management, Vol. 8, No. 1, 75-93.

McDonough, E.F. (2000): Investigation of Factors Contributing to the Success of Cross Functional Teams, Journal of Product Innovation Management, 17 (2000), 221-235.

McDonough, E.F./Griffin, A. (1997): The impact of organizational tools on new product development efficiency and effectiveness, Proceedings of the international PDMA Conference, Monterey (CA), October 1997.

McDonough, E.F./Barczak, G. (1991): Speeding up new product development: The effects of leadership style and source of technology, Journal of Product Innovation Management, 8, 203–211.

McGrath, J. E. (1964): Social Psychology: A Brief Introduction, New York (1964).

Mc Shane, S./von Glinow, M.A. (2006): Organizational Behavior, Boston (2006).

Menon, A./Jaworski, B.J./Kohli, A.K. (1997): Product Quality: Impact of Interdepartmental Interactions, Journal of the Academy of Marketing Sciences, 25, 3 (Summer), 187-200.

Miliken, F.J./Martins, L.L. (1996): Searching for Common Threads. Understanding the Multiple Effects of Diversity in Organizational Groups, Academy of Management Review, 21 (2), 402-423.

Millson, M.R.; Wilemon, D. (2002): The Impact of Organizational Integration and Product Developement Proficiency on Market Success, Industrial Marketing Management, 31 (2002), 1-23.

Moenaert, R.K./Souder, W.E. (1990): An information transfer model for integrating marketing and R&D personnel in new product development projects, Journal of Product Innovation Management, 7 (2), 91-107.

Moenaert, R.K./Souder, W.E./De Meyer, A./Deschoolmester, D. (1994): R&D-Marketing Integration Mechanisms, Communication Flows, and Innovation Success, Journal of Product Innovation Management, 11, 31-45.

Naveh, E. (2005): The effect of integrated product development on efficiency and innovation, International Journal of Production Research, Vol. 43, No. 13, 1 (Jul), 2789-2808.

Nihitila, J. (1999): R&D-Production integration in the early phases of new product development projects, Journal of Engineering and Technology Management, 16, 55-81.

Nohria, N./Gulati, R. (1996): Is slack good or bad for innovation? Academy of Management Journal, 39, 1245–1264.

Nunnally, J.C. (1978): Psychometric Theory (2nd ed.), McGraw-Hill, New York.

Oldham, G.R./Cummings, A. (1996): Employee creativity: Personal and contextual factors at work. Academy of Management Journal, 39, 607–634.

Olson, E.M., Walker O.C., Ruekert R.W. (1995): Organizing for Effective New Product Development: The Moderating Role of Product Innovativeness, Journal of Marketing, Vol. 59, No. 1 (Jan), 48-62.

Olson, E.M./Walker O.C./Ruekert, R.W./Bonner, J.M. (2001): Patterns of cooperation during new product development among marketing, operations and R&D: Implications for project performance, Journal of Product Innovation Management, 18, 258-271.

Osterloh, M./Frost, J./Frey, B.S. (2002): The Dynamics of Motivation in New Organizational Forms, International Journal of the Economics of Business, Vol. 9, No. 1, 61-77.

Pfeffer, J. (1982): Organizations and Organization Theory. Stanford, CA (1982)

Pfeffer, J./Salancik, G.R. (1978): The External Control of Organizations: a Resource Dependency Perspective, New York (1978).

Pinto, M.B./Pinto, J.K. (1990): Project Team Communication and Cross-Functional Cooperation in New Program Development, Journal of Product Innovation Management, 7, 3 ,200-212.

Pinto, M.B./ Pinto, J.K./Prescott, J.E. (1993): Antecedents and Consequences of Project Team Cross-Functional Cooperation, Management Science, Vol. 39, No. 10 (Oct), 1281-1297.

Phillips, L.W./Chang, D.R./Buzzell, R.D. (1983): Product Quality, Cost Position, and Business Performance: A Test of Some Key Hypothesis, Journal of Marketing, 47 (Spring), 26-42.

Podsakoff, P.M./MacKenzie, S.B./Podsakoff, N.B. (2003): Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies, Journal of Applied Psychology, Vol. 88, No. 5, 879-903.

Quinn, R.E. (1988): Beyond rational management: Mastering the paradoxes and competing demands of high performance, San Francisco (1988).

Roberts, E.B. (1995): Benchmarking the strategic management of technology II, Research Technology Management, 38 (2), 18-26.

Rochford, L./Rudelius, W. (1992): How involving more functional areas within a firm affects the new product success, Journal of Product Innovation Management, 9, 287-299.

Rossiter, John R. (2002): The C-OAR-SE procedure for scale development in marketing, in: International Journal of Research in Marketing, Vol. 19, S. 305-335.

Ruekert, Robert W./Walker Jr., Orville C. (1987): Marketing´s Interaction With Other Functional Units: A conceptual Framework and Empirical Evidence, Journal of Marketing, 51 (January), 1-19.

Sansone, C./Harackiewicz, J. M. (1998): "Reality" is complicated, American Psychologist, 53, 673–674.

Sarin, S./Mahajan, V. (2001): The Effect of Reward Structures on the Performance of Cross-Functional Product Development Teams, Journal of Marketing, Vol. 65 (Apr), 35-53.

Schermelleh-Engel, K./Moosbrugger, H./Mueller, H. (2006): Evaluating the Fit of Structural Equation Models: Tests of Significance and Descriptive Goodness-of-Fit Measures, Methods of Psychological Research Online, Vol. 8, No. 2, 28-74.

Scholderer, J./Balderjahn, I. (2006): PLS versus LISREL: Ein Methodenvergleich, in: Bliemel, F./Eggert, A./Fassott, G./Henseler, J. (eds.): Handbuch PLS-Pfadmodellierung – Methode, Anwendung, Praxisbeispiele, Stuttgart (2006), 19-29.

Schulze, A./ Hoegl, M. (2006): Knowledge Creation in New Product Development Projects, Journal of Management, Vol. 32 No. 2 (Apr.), 210-236.

Sethi, R. (2000a): New Product Quality and Product Developement Teams, Journal of Marketing, Vol. 64 (April 2000), 1-14.

Sethi, R. (2000b): Superordinate Identity in Cross-Functional Product Development Teams: Its Antecedents and Effect on New Product Performance, Journal of the Academy of Marketing Science, Vol. 28, No. 3, 330-344.

Sethi, R./Smith, D.C./Park, C.W. (2001): Cross-Functional Product Development Teams, Creativity, and the Innovativeness of New Consumer Products, Journal of Marketing Research, Vol. XXXVIII (Feb), 73-85.

Shalley, C.E./Gilson, L.L./Blum, T.C. (2000): Matching Creativity Requirements and the Work Environment: Effects on Satisfaction and Intentions to leave, Academy of Management Journal, Vol. 43, No. 2, 215-223.

Shalley, C.E./Gilson, L.L. (2004): What leaders need to know: A review of social and contextual factors that can foster or hinder creativity, The Leadership Quarterly, 15, 33–53.

Sicotte, H./Langely, A. (2000): Integration Mechanisms and R&D project performance, Journal of Engineering and Technology Management, 17, 1-37.

Song, M./Dyer, B./Thieme, R.J. (2006): Conflict Management and Innovation Performance: An integrated Contingency Perspective, Journal of the Academy of Marketing Science, Vol. 34, No. 3, 34-356.

Song, M./Thieme, J.R./Xie, J. (1998): The impact of cross-functional joint involvement across product development stages: An exploratory study, Journal of Product Innovation Management, 15, 289-303.

Song, M./Xie, J./Dyer, B. (2000): Antecedents and Consequences of Marketing Manager's Conflict-Handling Behaviors, Journal of Marketing, Vol. 64 (Jan), 50-66.

Sosik, J.J./Potoski, D./Jung, D.I. (2002): Adaptive Self-Regulation: Meeting Other's Expectations of Leadership and Performance, Journal of Social Psychology, 2002, 142 (2), 211-232.

Souder, W.E./Moenaert, R.K. (1992): Integrating Marketing and R&D Project Personnel within Innovation Projects: An Information Uncertainty Model, Journal of Management Studies, 29, 4(Jul.), 485-512.

Spender, J.-C./Kessler, E.H. (1995): Managing the uncertainties of innovation: Extending Thompson (1967): Human Relations, 48 (1), 35-56.

Stewart, G.L./Barrick, M.R. (2000): Team Structure and Performance: Assessing the Mediating Role of Intrateam Process and the Moderating Role of Task Type, The Academy of Management Journal, Vol. 43, No. 2 (Apr.), 135-148.

Stock, R.M. (2006): Interorganizational Teams as Boundary Spanners Between Supplier and Customer Companies, Journal of the Academy of Marketing Science, Vol. 34, No. 4, pp. 588-599.

Subin, I./Workman J.P. (2004): Market Orientation, Creativity and New Product Performance in High-Technology Firms, Journal of Marketing, Vol. 68 (Apr), 114-132.

Swink, M. (2000): Technological Innovativeness as a Moderator of New Product Design Integration and Top Management Support, Journal of Product Innovation Management, 17, 208-220.

Tajfel, H. (1982a). Social identity and intergroup behavior, Cambridge (1982).

Tajfel, H. (1982b): Social Psychology of Intergroup Relations, Annual Review of Psychology, 33, 1-39.

Taylor, J./McAdam, R. (2005): Innovation adoption and implementation in organizations: a review and critique, Journal of General Management, 30, 1, 17-38.

Tenenhaus, M./Vinzi, V.E./Chatelin, Y.-M./Lauro, C. (2005): PLS path modeling, Computational Statistics & Data Analysis, 48, 159-205.

Thamhain, H.J. (1990): Managing technologically innovative team efforts toward new product success, Journal of Product Innovation Management, 7, 5–18.

Thamain, H.J. (2003): Managing innovative R&D teams, R&D Management, 33, 3 (2003), 297-309.

Tierney, P./Farmer, S.M./Graen, G.B. (1999): An examination of leadership and employee creativity: the relevance of traits and relationships, Personnel Psychology, 1999, 52, 591-620.

Trent, R.J./Monczka, R.M. (1994): Effective cross-functional sourcing teams: critical success factors. International Journal of Purchasing and Materials Management, 30 (4), 3-11.

Troy, L.C./Szymanski, D.M./Varadarajan, P.R. (2001): Generating New Product Ideas: An Initial Investigation of the Role of Market Information and Organizational Characteristics, Journal of the Academy of Marketing Science, Vol. 29, No. 1, 89-101.

Tushman, M./Smith, W.K./Wood, R.C./Westerman, G./O'Reilly, C. (2004): Innovation Streams and Ambidextrous Organization Designs, Working Paper, Harvard University, Dec. 15, 2004, 1-63.

van der Stede, W.A. (2000): The relationship between two consequences of budgetary controls: budgetary slack creation and managerial short-term orientation, Accounting, Organizations & Society, Vol. 25, Issue 6 (Aug), 609-622.

Vandevelde, A./Van Dierdonck, R. (2003): Managing the design-manufacturing interface, International Journal of Operations & Production Management, Vol. 23, No. 11, 1326-1348.

Vázquez-Carrasco, R./Foxall, G.R. (2006): Positive vs. Negative switching barriers: the influence of service consumers' need for variety, Journal of Consumer Behavior, 5, 367-379.

Vroom, V.H. (1964): Work and motivation, New York (1964).

Wageman, R. (1995): Interdependence and group effectiveness, Administrative Science Quarterly, 40, 145-180.

Wageman, R./Baker, G. (1997): Incentives and cooperation: The joint effects of task and reward interdependence and group performance, Journal of Organizational Behavior, 18, 139-158.

Wall, S./Lepsinger, R. (1994): Cross-functional obstacles, Training (May), 125-126.

Webber, S.S./Donahue, L. M.. (2001): Impact of highly and less job-related diversity on work group cohesion and performance: a meta-analysis, Journal of Management, 27, 2, 141-162.

Webster, C. (2006): An empirical analysis of the relationships between the interactive use of performance measurement systems, creativity and performance: the intervening role of psychological empowerment, Working Paper (Monash University, AU), available for download: <http://wwwdocs.fce.unsw.edu.au/accounting/news/seminars2006_s2/Carly WebsterWorkingPaper.pdf>, (Dec. 2nd 2006), 1-33.

Weinkauf, K./Högl, M./Gemünden, H.-G./Hölzle, K. (2005): Zusammenarbeit zwischen organisatorischen Gruppen: Ein Literaturüberblick über die Intergroup Relations-, Schnittstellen- und Boundary-Spanning Forschung, Journal für Betriebswirtschaft, 55, 85-111.

West, M.A./Hirst, G./Richter, A./Shipton, H. (2004): Twelve steps to heaven: Successfully managing change through developing innovative teams, European Journal of Work and Organizational Psychology, 13 (2), 269-299.

West, M.A. (2002): Sparkling Fountains or Stagnant Ponds: An Integrative Model of Creativity and Innovation Implementation in Work Groups, Applied Psychology 51 (3), 355–387.

White, C.J./Varadarajan, P.R./Dacin, P.A. (2003): Market Situation Interpretation and Response: The Role of Cognitive Style, Organizational Culture, and Information Use, Journal of Marketing, Vol. 67 (July 2003), 63-79.

Wilson, J. (1966): Innovation in organizations: Both toward a theory, in: Thompson, J.D. (ed): Approaches to organizational design, Pittsburg (1996), 195-218.

Williams, L.J./Edwards, J.R./Vandenberg, R.J. (2003): Recent Advances in Causal Modeling Methods for Organizational and Management Research, Journal of Management, Vol. 29, No. 6, 903-936.

Wold, H. (1982): Soft Modeling: The Basic Design and Some Extensions, in: Joreskog, K.G./Wold, H. (eds.): Systems Under Indirect Observations: Part 2, Amsterdam (1982), 1-54.

Wold, H. (1985): Systems analysis by partial least squares, In: Nijkamp, P./Leitner, H./ Wrigley, N. (eds.): Measuring the unmeasurable, Dordrecht, 221-252.

Woodman, R.W./Sawyer, J.E./Griffin, R.W. (1993): Toward a Theory of Organizational Creativtiy, Academy of Management Review, Vol. 18, No. 2, 293-321.

Wurst, K. (2001): Zusammenarbeit in innovativen Multi-Team Projekten, Wiesbaden (2001).

Xie, J./Song, M./Stringfellow, A. (1998): Interfunctional Conflict, Conflict Resolution Styles, and New Product Success: A Four-Culture Comparison, Management Science, Vol. 44, No. 12, 192-206.

Xie, J./Song, M./Stringfellow, A. (2003): Antecedents and Consequences of Goal Incongruity on New Product Development in Five Countries: A Marketing View, Journal of Product Innovation Management, 20, 233-255.

Zimdars, L. (2003): The World of Cross-Functional Teams, in: Parker, G.M. (ed): Cross-Functional Teams: Working with Allies, Enemies, and Other Stangers, San Francisco (CA), 1-11.

Zaltman, G./Duncan, R./Holbeck, J. (1973): Innovations and Organizations, New York (1973).