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)*