Volume 2, Issue 1, June 2017

JUNIOR MANAGEMENT SCIENCE

Patrick Knust, CEO Communication during Strategic Change: A Regulatory Focus Perspective

Philip Schnorpfeil, Investment-Cash Flow Sensitivity – A Focus on the Panel-Data Econometrics Involved

Rico Rozzi, Einfluss der Gestaltung von Büroräumlichkeiten auf die Arbeitsplatzzufriedenheit von Führungskräften - Eine Untersuchung anhand eines Schweizer Dienstleistungsunternehmens

Nadine Chochoiek, Explaining the Success of User-Centered Design - An Empirical Study across German B2C Firms

Lucas Mantke, Kognitive Verzerrungen im strategischen Entscheidungsprozess

Published by Junior Management Science e. V.
CEO Communication during Strategic Change: A Regulatory Focus Perspective

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Abstract

The study examines CEO communication in times of strategic change based on regulatory focus theory that describes individuals’ promotion and prevention focus. While promotion-focused individuals strive for maximizing gains, prevention-focused individuals strive for minimizing losses. As CEO communication is especially relevant during strategic changes, when fundamental processes and beliefs are affected and employees need sense-making and meaning-making contributions, the paper analyzes the regulatory focus of CEO letters to shareholders in annual reports and links it to the intensity of change that the organization is currently executing. The paper first develops existing analysis tools further and examines regulatory focus of CEOs as well as the type of change qualitatively from annual reports. Secondly, the paper ties the intensity of change to the CEO regulatory focus quantitatively. Results indicate a persistence of both promotion as well as prevention elements in CEO letters to shareholders. While controlling for contextual variables of the organization, the findings furthermore show a positive association between a more promotion-focused CEO letter to shareholders and the intensity of the organization’s change.

Keywords: CEO Communication, Strategic Change, Regulatory Focus Theory, Promotion Focus, Prevention Focus

1. Introduction

Vast investments are yearly transacted to produce companies’ annual reports to persuade stakeholders of the organization’s business activities (Higgins and Bannister (1992)). As the uncertainty of the business environment amplified over the last decades due to increased competition and regulatory policies (Kohut and Segars (1992)), corporate communications became a field of interest for both organizational businesses as well as research scholars. Starting in the 1980s, especially the communication aspects of the organization’s CEO gained attention in research exploring strategy and change processes. Studies analyzed CEO communication in terms of causal reasoning (Bettman and Weitz (1983)), communication outcomes as share price activity (Higgins and Bannister (1992)) and communication effectiveness (Segars and Kohut (2001)).

Recently, a persistent individual attribute from psychology research, namely individuals’ regulatory focus, emerged into the field of management literature. This was achieved through linking CEO regulatory focus to existent management topics as entrepreneurship (Broekner et al. (2004)), executive compensation (Wowak and Hambrick (2010)) and alliance development (Das and Kumar (2011)). All in all, results from these researches indicate a high relevance of CEO’s regulatory focus on the firm activities and performance. However, neither study considered CEO communication during strategic change under the aspect of CEO’s regulatory focus so far (Gamache et al. (2015)). Thus, this paper intends to fill an existing gap in management literature about regulatory focus theory and CEO communication.

Regulatory focus theory (Higgins (1997)) distinguishes between two variant and independent motivational orientations that influence the process of self-regulation (Petrov et al. (2015)). Promotion-focused individuals are concerned with attaining desired end-states via “eagerness strategy”, which means striving for maximizing positive outcomes, whereas prevention-focused individuals are concerned with attaining desired end-states via “vigilance strategy”, which means striving for minimizing negative outcomes (Higgins (1997); Lanaj et al. (2012)). One might see the link between regulatory focus theory and existing management research when combining promotion and prevention focus with often examined organizational outcomes as goal setting, change implementation behavior and employee engagement (Sonenshein and Dholakia (2012)). Regulatory focus theory was therefore described as highly relevant personal attribute of individuals, which has to be examined further, especially in the context of CEO communication (Gamache et al. (2015)).
Petrou et al. (2015)). This paper answers calls in literature that claim additional research by linking CEO communication and regulatory focus theory with additional contextual factors as for example change processes.

Change management is one of the major research streams in management literature (Sonenshein and Dholakia (2012)). Particularly strategic changes, which affect the organization fundamentally in terms of structure, processes and routines (Rajagopalan and Spreitzer (1997)), need high managerial attention in both planning and implementation. CEO communication was found to facilitate the strategic change process considerably when used appropriately (Segars and Kohut (2001)). To the best of my knowledge, CEO regulatory focus in corporate communications during strategic change was never examined in literature before. In order to expand research, this paper is designed to answer the following questions: first, “To what extent is regulatory focus theory already persistent in management literature?”; secondly, “Does CEO communication vary in terms of promotion vs. prevention focus?”; thirdly, “Is CEO regulatory focus in CEO communication adapting to different forms of change, proposing an association between CEO regulatory focus and the intensity of change of the organization currently executing?”.

The paper is structured with the objective of empirically studying CEO regulatory foci in annual reports and interpreting them according to the respective type of change. In covering three diverse research streams (“CEO regulatory focus”, “CEO communication” and “strategic change”), the paper first introduces and interconnects the literature on these topics by focusing on regulatory focus theory and communication during change. Two hypotheses are developed in the following part to set the scene for the analyses part. Subsequently, the empirical study initially presents the sample design and afterwards executes the qualitative and quantitative analysis. After elaborating on the results of both types of analyses, theoretical as well as practical implications are discussed in the shed light of the under examined topic in literature. The paper concludes with limitations and future research directions.

2. Literature Research

I was prepared with some background reading by the Institute of Leadership and Organization, at which this bachelor thesis is written. These papers should work as a starting point for my analysis and thereby provide some initial authors and keywords to work with in the later literature research. From those readings, I determined that it is necessary to first get an overview of the literature and present the most relevant issues to the reader.

In order to get a broad range of input and to guarantee not to miss out any important contents, I initially decided to conduct a four-method research, including all relevant literature research tools: online public access catalogue (OPAC) of Ludwig-Maximilians-Universität’s library, the database ‘Business Source Complete’ via EBSCOhost, Google Scholar and Thomson Reuter’s ‘Web of Science’. All four tools were used to search for four different keywords and slight combinations of them in order to find applicable scientific articles and papers: “Regulatory focus”, “CEO communication”, “communication during strategic change” and “corporate communication”.

I used these keywords especially because my paper is conceptualized to consist of two main theoretical parts: “CEO communication during strategic change” being the first main part, linked with the “regulatory focus theory”, which represents the second main part. Thus, my research mainly concentrated either on management literature, which concerns CEO communication, or on psychological literature of regulatory focus theory or a combination of both. The aim of my theoretical background is to integrate regulatory focus theory into management literature in terms of CEO communication. I furthermore tried to examine relevant authors in the field in order to get a broad overview of the theoretical foundation (e.g. Higgins (1997) for regulatory focus theory). Thomson Reuter’s ‘Web of Science’ especially helped in the literature research process by providing an overview of citations of the resulting papers. The number of citations may indicate the importance of papers in the literature and a high number of citations for papers of one author may indicate a high relevance of this researcher in the research community. Thus, examining important authors in the fields of “CEO communication” and “regulatory focus theory” got a lot easier.

Since the management literature was linked with regulatory focus theory at a relatively late date (for explanation see 3.1.2), I secondly also conducted a manual research in various international journals of management literature since 2010 that seem relevant for this paper (detailed overview of examined journals see appendix A). Thirdly, I constantly checked the reference lists of the encountered articles for other relevant articles to conduct a “snowball method”, where necessary. This was especially important for regulatory focus theory and for the use of CEO communication in annual reports.

As a result of this research, a list of articles was created, which initially contained 65 items. After redundant results were deleted, 53 papers and articles were left to work with. To further specify the results in terms of relevance, I added the information of number of citations (based on the numbers provided by Thomson Reuter’s Web of Science) and the rating of the journal they were published in. Only articles in English language were included, since English is the language of all relevant journals and publications. Multiple articles that were not part of this initial list were added and consulted later on, when examining certain aspects in depth. Likewise, some articles of the initial list proved not to be relevant to this paper so that they were not taken into further consideration. Thus, such a literature research list may work as a profound initial starting point, which adapts during the research and writing process.
3. Theoretical Background

3.1. Regulatory Focus Theory

3.1.1. Basis Principles

Regulatory focus theory (Higgins (1997)) distinguishes between two variant and independent motivational orientations that influence the process of self-regulation (e.g. Stam et al. (2010); Petrou et al. (2015)). Promotion-focused individuals are characterized by motivational orientations that concern possible gains of an activity in their self-regulation. They are driven by growth opportunity and their ‘ideal selves’ and include their wishes, aspirations and positive world-view in attaining desired end-states (Petrou et al. (2015)). In short, promotion-focused individuals are “sensitive to [...] the presence and absence of positive outcomes” (Lanaj et al. (2012): 1001).

While prevention-focused individuals also try to achieve their desired end-states, they regulate themselves from different motivational esteems. Opposite to promotion-focused individuals, prevention-focused individuals concentrate on minimizing possible downsides of their activity and on reducing risks that may emerge (Petrou et al. (2015)). They are driven by their ‘ought selves’, which rely on duties, responsibilities and obligations (Petrou et al. (2015)). In short, prevention-focused individuals are “sensitive to [...] the presence and absence of negative outcomes” (Lanaj et al. (2012): 1001).

Concerning promotion and prevention focus, one may see overlaps to the approach and avoidance orientation of individuals (Stam et al. (2010)). In fact, literature argues that approach and avoidance orientation underlie the regulatory focus theory (Higgins (1997); Stam et al. (2010)). Table 1 is summarizing the self-regulatory principles of the approach vs. avoidance orientation (Higgins (1997): 17).

Importantly, promotion as well as prevention foci are strategies to attain desired end-states (Higgins (1997); Stam et al. (2010); Lanaj et al. (2012)), but the underlying affective, cognitive and behavioral processes differ (Gamache et al. (2015)). Approach oriented individuals are concerned with approaching pleasure, whereas avoidance oriented individuals are concerned with avoiding pain. Thus, in spite of attaining desired end-state in both orientations, approach oriented individuals strive for approaching matches to their desired end-states and avoidance oriented individuals strive for avoiding mismatches to their desired end-states (Higgins (1997)).

The regulatory focus, which these individuals incorporate for this process of self-regulation, is then called promotion-focus for approach oriented individuals and prevention-focus for avoidance oriented individuals. As a result, promotion-focused individuals explain their behavior in terms of accomplishment (match of desired end-state) and non-fulfillment (mismatch of desired end-state). Prevention-focused individuals in contrast concern about safety (match of desired end-state) and danger (mismatch of desired end-state) (Higgins (1997)).

Concerning the example of a CEO trying to increase business performance (meaning the desired end-state, which is the same for both mechanisms), the aim can either be achieved by focusing on the promotional opportunities of business (growth, increasing profits, expanding business operations etc.) or by focusing on the possible downsides and threats (minimizing losses, reducing risks, cost efficiency). Higgins et al. called these strategic means in achieving the desired end-state, depending on the regulatory focus of the individual, eagerness vs. vigilance strategy (Higgins et al. (2001)). Promotion-focused individuals use the eagerness strategy to maximize gains and to ensure again non-gains, meaning minimizing non-gains (Higgins et al. (2001)). Prevention-focused individuals are motivated by the vigilance strategy, while riveting on maximizing non-gains and ensuring again losses, meaning minimizing losses (Lanaj et al. (2012)). Thus, in short, promotion-focused individuals are concerned with gains and non-gains, while prevention-focused individuals are concerned with non-losses and losses.

Therefore, Förster et al. (2003) described the motivational orientations of promotion and prevention to be independent rather than being opposites in a continuum (Förster et al. (2003)). Supporting this thesis, the relationship between promotion and prevention focus was found to be relatively small (Lanaj et al. (2012)). Consequently, individuals' scores of promotion vs. prevention focus seem to be independent and for that reason, a high score on both foci may be possible as well as a low score on both or a combination of both. Imagining the example of the before mentioned CEO, the CEO may as well focus on growing business and increasing profits as well as on reducing risks and minimizing losses. In this case, the CEO would have a high score on both foci. (Higgins (2000): 4) comes to a precise summary of the above mentioned points:

“In sum, regulatory focus theory distinguishes between promotion and prevention orientations. A promotion orientation is concerned with advancement and accomplishment, with the presence and absence of positive outcomes. Eagerness (approach) means fit a promotion orientation. A prevention orientation is concerned with safety and responsibility, with the absence and presence of negative outcomes. Vigilance (avoidance) means fit a prevention orientation.”

For the sake of completeness, the difference between personality research in general and regulatory focus theory is mentioned in this paragraph. The work of Gamache et al. (2015) shall work as explaining example of the clear distinction in meaning. They distinguished regulatory focus theory from personality research or self-evaluative traits and consequently argued that regulatory focus theory may be differentiated from personality research in three aspects: First, regulatory focus works through motivational processes (e.g. meaning-making, sense-making) that are supported by strategic means like eagerness and vigilance strategy; secondly, it takes the desired end-state as given and does not intend to change the goals, but it is rather explaining how individuals try to attain these goals (promotion vs. prevention focus); and thirdly, regulatory focus seems to have a higher impact on behavior than other personality traits as extraversion and agreeableness (Lanaj et al. (2012); Gamache et al. (2015)).
though it has to be stated that this theory is relatively new to
tinance and economics, the attention in strategic management
Güngörm et al. (2015)). As this theory was also applied to fi-
thesis focusing on internalized ‘selves’ that in-
dividuals are constantly comparing with (Higgins (1997)).
The score of self-discrepancy may be described as adding
the matches between the actual self and the desired self and
subtracting the mismatches (Higgins (1997)). Based on this
theory, it becomes more obvious how regulatory focus the-
ory emerged later one, with Higgins being one of the most
significant contributors, publishing mainly in psychological
magazines like 'American Psychologist' in 1997 and 1998
and Journal of Personality and Social Psychology' in 1996,
thus be described as the main contributor of regulatory focus
theory, others expanded this field of research significantly.
Lookwood, Jordan and Kunda (2002) described how either a
promotion or prevention focus will influence the inspiration
of positive or negative role models on individuals’ motiva-
tion. Others focused on how the individual regulatory focus
influences the achievement orientation concerning the his-
tory of success of individuals (Higgins et al. (2001)). Förster
et al. tried to order the relatively new concept of regu-
latory focus theory into classical motivational esteems (Förster
and Higgins (2005); Förster et al. (2001)). Value to the
broad body of literature was also added in describing the
link between goal-attainment and regulatory focus theory
more precisely (Shah et al. (1998)) and with concentrating
on the role of interdependence in constructing the distinct
self-construal (Lee et al. (2000)).

Apparently, the concept of regulatory focus is building
upon both theoretical and empirical psychology literature,
but came to attention in the management literature later on
with major impact, starting with marketing research (Tunc-
dogan et al. (2015)). As this theory was also applied to fi-
nance and economics, the attention in strategic management
literature was arising as well (Tuncdogan et al. (2015)). Al-
though it has to be stated that this theory is relatively new to
the management literature, the general attention to this topic
in management research is high. As the research interest of
linking regulatory focus theory with management processes
raised, some studies focused on the effect of regulatory fit on
adaption to change (Petrou et al. (2015)), linking leader’s
exploration-exploitation activities to regulatory focus theory
(Tuncdogan et al. (2015)) and introducing regulatory focus
theory into the broad field of leadership style research (Stam
et al. (2010)). All of these publications added value to the
broad field of research because they tried to explain common
phenomena (e.g. the adaption processes on change or lead-
ership style consequences) in combination with regulatory
focus theory. One may therefore see the interesting transi-
tion of psychological themes into the management literature
over time (Gamache et al. (2015)). All in all, due to the ris-
ing interest of the management literature on regulatory focus
theory, the importance of explaining CEO communication in
the shed light of promotion vs. prevention focus is substanc-
tiated.

### Table 1: Self-regulatory Principles of Approach vs. Avoidance Orientation (following Higgins (1997): 17)

<table>
<thead>
<tr>
<th>Self-regulatory principle</th>
<th>Approach orientation</th>
<th>Avoidance orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory anticipation</td>
<td>Approach anticipated pleasure</td>
<td>Avoid anticipated pain</td>
</tr>
<tr>
<td>Regulatory reference</td>
<td>Approach regulation in reference to desired end-states</td>
<td>Avoidance regulation in reference to undesired end-states</td>
</tr>
<tr>
<td>Regulatory focus</td>
<td>Promotion Strategically approach matches to desired end-states (and mismatches to undesired end-states)</td>
<td>Prevention Strategically avoid mismatches to desired end-states (and matches to undesired end-states)</td>
</tr>
</tbody>
</table>

(2015)).

### 3.1.2. Relevance of Regulatory Focus Theory in Management Literature

Regulatory focus theory originally stems from psychology
literature. This may not only be seen by the name of the jour-
nals, the articles were first mainly published in, but also in
the underlying psychological process of self-regulation. The
origins of regulatory focus theory stem from self-discrepancy
theory, which emphasizes on internalized ‘selves’ that in-
dividuals are constantly comparing with (Higgins (1997)).
The score of self-discrepancy may be described as adding
the matches between the actual self and the desired self and
subtracting the mismatches (Higgins (1997)). Based on this
theory, it becomes more obvious how regulatory focus the-
ory emerged later one, with Higgins being one of the most
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magazines like 'American Psychologist' in 1997 and 1998
and Journal of Personality and Social Psychology' in 1996,
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nance and economics, the attention in strategic management
literature was arising as well (Tuncdogan et al. (2015)). Al-
though it has to be stated that this theory is relatively new to

### 3.1.3. Influence of Contextual Factors on Regulatory Focus

As stated above, each individual tries to achieve both: at-
taining desired end-states via maximizing gains and minimiz-
ing non-gains as well as minimizing losses and maximizing
non-losses (Tuncdogan et al. (2015)). The difference resides
in the individual score of promotion vs. prevention focus.
The higher promotion-focused the individual is, the more
able is the individual to maintain desired end-states via maxi-
mizing gains and minimizing non-gains (Tuncdogan et al. (2015)).
the shed light of promotion vs. prevention focus is substanc-
tiated.

“Chronic” and “contextual” forms of regulatory focus
are the two most important elements of an individual’s regu-
latory focus (Stam et al. (2010)). In spite of the occurrence
of the term “regulatory state” in some papers (Tuncdogan et al. (2015)),
for reasons of simplicity and common use in the
literature (Gamache et al. (2015)), the term “regulatory
focus” is used for the emergence state of chronic and con-
textual factors. Concerning the chronic form of regulatory focus,
several researchers suggested that personality traits in-
fluence the regulatory state of an individual (e.g. Lanaj et al.
(2012); Tuncdogan et al. (2015); Gamache et al. (2015));
but nevertheless, regulatory focus is not the same as e.g. personality traits (see explanation in 3.1.1). Although Higgins et al. (2001) suggested that the chronic regulatory focus can stay consistent to a certain extent over time, researcher also stress the importance of contextual factors shaping individuals’ regulatory state because of the possibility of overshining the chronic regulatory focus.

The immediate environment may also influence the regulatory focus (Higgins 2000; Lockwood et al. 2002; Gamache et al. 2015), not only in influencing the chronic orientation from early times on, but also as temporary situational cues of the environment (Tuncdogan et al. 2015). It is thus very relevant to incorporate the idea of today’s empirical evidence that the cues of the environment play a significant role in influencing the individuals’ regulatory state. The emergence of that state may significantly be shaped by contextual factors. These factors may be called contextual variables, contextual factors or situational factors (Gamache et al. 2015; Petrou et al. 2015; Tuncdogan et al. 2015; Stam et al. 2010; Higgins 2000). In the following, for reasons of simplicity and common use in the literature, the terms “contextual factors” and “regulatory focus” are used in this paper. To sum up, contextual factors seem to have a major impact on the regulatory state of individuals. This bachelor thesis is therefore establishing the following research on this presumption.

3.2. Communication during Strategic Change

Since the title of this bachelor thesis consists of two theoretical backgrounds, the following paragraph presents the literature for communication during strategic change. After elaborating on the literature of regulatory focus theory, which was mainly conducted in psychology literature (see 3.1.2), this review will mainly concentrate on management literature, while trying to link these two different streams of research. Communication seems to be one of the most relevant tasks of management and because of that, strategically communicating change to internal and external stakeholders has a major impact on the meaning-making process of individuals, since it decreases ambiguity in people’s perceptions of the environment and increasing the feeling of controllability (Bordia et al. 2004)). Organizational and strategic change is characterized both as necessary to survive in changing environment and adapting to the environment, new customer needs, technological advancement, changing workforce and government regulation (Bordia et al. 2004; Kotter and Schlesinger 2008) as well as challenging and of high probability for failure, if not managed properly (Sonenshein and Dholakia 2012). In spite of that fact, research knows surprisingly little about the way that management should strategically communicate strategic change (Sonenshein and Dholakia 2012). Thus, one must differentiate strategic communication as a way of communicating a message properly to the recipients’ needs and therefore incorporating means to create sense and meaning in individuals’ perceptions versus strategic change as a special form of change in organizational settings.

3.2.1. Types of Strategic Change

**Strategic change** is defined as a fundamental change in an organization’s alignment to the surrounding environment and therefore a change in the content of what an organization does (Rajagopalan and Spreitzer 1997). The need to realign with modified competitive surroundings emerges from fundamental management knowledge of explaining company’s right and need to exist, e.g. the resource-based view or institutionalization theory (Lee and Rhee 2007)). Strategic change research concentrated on two different schools: the “content” school that tried to explain the change in the alignment of an organization to environmental needs and standards versus the “process” school that tried to examine the management processes and practices in strategic change processes (Rajagopalan and Spreitzer 1997)). While the first school, the “content” school, concentrated on large samples using quantitative analysis methods to examine the strategic change, the second school, the “process school”, used qualitative data to explore the psychological and cognitive processes in formulating and executing strategic change more in detail (Rajagopalan and Spreitzer 1997)). In recent studies, one might have found a more consistent and associated view of strategic change (e.g. Sonenshein and Dholakia 2012)), linking qualitative and quantitative analysis methods.

To differentiate strategic change from other, less fundamental changes in organizational environment, one should especially keep the item “strategic” in mind. Changes in organizations, which do not change the content of a strategy and the way the organization is strategically aiming for its goals, are characterized as less fundamental changes. For example, a change of the CEO in an organization might not be an indicator for a modified strategic change direction centeris paribus. Thus, a CEO change in organizations per se is a change for the organization, but not necessarily a strategic one. But if the new CEO is not only new to the organization, but also developing a new strategic program, then this may be characterized as strategic change. (Rajagopalan and Spreitzer 1997): 50) stated:

*However, organizational changes that do not result in changes in the content of a firm’s strategy are not included within the domain of strategic change.*

To describe the type of change more precisely, literature offers various tools to categorize different forms of change concerning speed, extent, schedule and proposal. Mintzberg and Waters (1985) ordered different forms of change into a planned vs. deliberate state-continuum and placed existing types of change into this continuum. This categorization should help others to examine change in terms of its controllability and intention. Klein (1996) used the Lewin-Model of different phases of change and described change in terms of chronology: unfreezing, changing and refreezing. It proposes that people first have to be sensitive to the need of change, before the actual change is taking place and is afterwards refreezed (Klein 1996). But rather than providing a tool for concrete categorization for the different and com-
plex forms of change, these above mentioned authors focused on only one dimension (influenceability) or on the phases of change. Thus, the model of Balogun (2001) was used to extent the persistent description of various types of change: the tool provides a relatively simple solution to a quite complex issue. Balogun (2001) classifies change onto two distinct dimensions, the extent of change and the speed of that change, concluding in four main types of change. The extent of change means the influence of the change program on basic cultural beliefs and norms; whether they are influenced by the change or not, whereas the dimension of speed is the degree of simultaneous implementation of different change programs (Balogun (2001)). The extent of change may be transformational or realigned, whereas the speed of change may be incremental or big bang (Balogun (2001)). Although this tool facilitates the categorization of change into important dimensions, it is quite difficult for this type of paper to examine the influence of change on basic cultural beliefs from the annual report without access to internal data. Thus, in spite of using this tool, another from Ackerman (1986) is used. It distinguishes between three types of change: developmental, transitional and transformational. An overview of the meaning of these forms of change is provided in table 2.

It is obvious that the dimension of the tool of Ackerman (1986) is the intensity of change, meaning the radical nature of the change in terms of influencing organizational basics as structures, processes, cultural beliefs and strategies. The developmental state seems to be the most incrementally and therefore less intense one, while the transition state already changes an organization episodically (mid-intensely). The transformational type of change is heavily impacting fundamental practices in an organization and is therefore characterized as the most intense one. As this categorization enables to examine the CEO communication in annual reports in terms of what CEOs mention about the extent of change on basic organizational practices even without access to internal data, these three forms are used for the analysis of this paper.

3.2.2. CEO Communication

Strategic communication is described as one of the most fundamental activities of managers and CEOs in organizations (Segars and Kohut (2001)). Communicating change in a strategic way is not always easily to conduct, is frequently neglected and often fails (Sonenshein and Dholakia (2012)). Many authors stress the importance of a strategic aligned communication in the successful change progress (Segars and Kohut (2001); Bordia et al. (2004); Kotter (2007); Sonenshein and Dholakia (2012)). They emphasize “communication during change [. . .] to play a vital [if not the most essential] role in change implementation” (Sonenshein and Dholakia (2012): 4).

Several studies examining change communication showed the significance of especially CEO communication during the strategic change process. For instance, Eggers and Kaplan (2009) compared the influence of CEO communication and other organizational communications on individuals’ adaptation to change based on the analysis of the CEO communication in annual reports, the letter to shareholders. They showed that the attention of the CEO to the change process has a major impact on the incumbents’ adaption to change. Others like Segars and Kohut (2001) suggested a model for the design of effective CEO communication in annual reports. They named the letter to shareholder the “perhaps […] most strategic [form of communication] in conveying the well-being and future direction of the enterprise” (Segars and Kohut (2001): 1). The CEO shareholder letter is not only a marketing tool for describing the positive events of the organization during the year (e.g. growth, positive performance), but also tries to link positive performance to the leadership abilities and the negative outcomes to the challenging environment (Bettman and Weitz (1983); Segars and Kohut (2001)). Thus, a CEO shareholder letter is both a report about the financial data in the past year and explanations for them as well as an instrument for sense-making and meaning-making for external and internal stakeholders and for achieving commitment to the CEO and top management teams’ (TMT) activities (Segars and Kohut (2001)).

However, one might not neglect the fact, that the annual report is often described as tool for shareholders and less for other stakeholder groups (as the often used title “letter to shareholder” also suggests) (Segars and Kohut (2001)). In spite of that, empirical studies examining the CEO letter to shareholder stress the importance of annual reports also for the organization internally and particularly for the employees, who play the most vital role in implementing a strategy (Sonenshein and Dholakia (2012)). Other studies also studied the CEO shareholder letter empirically and suggested an influence of the strategic communication manner in CEO shareholder letters on various outcomes. For example, the study of Higgins and Bannister (1992) found a relationship between the “CEO credibility” on the share price of the organization (Higgins and Bannister (1992)). In sum, several studies were undertaken to explore the CEO shareholder letter and its relevance, antecedents and consequences for various variables, including organizations’ share price (Higgins and Bannister (1992); Segars and Kohut (2001)), causal reasoning of the past year (Bettman and Weitz (1983)) and general effectiveness (Segars and Kohut (2001)). This shows the high relevance of studying especially the CEO letter to shareholders in the context of strategic communication means.

3.2.3. Regulatory Focus Theory and CEO Communication

Regulatory focus theory through its mechanism of eagerness and vigilance strategy may have an impact for strategy research (Gamache et al. (2015)). This is because psychological and personal attributes were ascribed to have an impact on the way of CEO communication (Kohut and Segars (1992)). Since regulatory focus theory is influenced by the personality of a CEO, research should link regulatory focus theory to CEO communication. Kohut and Segars (1992) state that the shareholder letter should be seen “as downward communication to the firm’s shareholders outlining past operating results and identifying new areas of potential corpo-
rate growth and profitability.” (Kohut and Segars (1992): 8). Especially the last part of this sentence illustrates the link between the strategic means of a CEO shareholder letter and the regulatory focus, since it can be seen as highly relevant communication instrument to stakeholders. “Identifying new areas of potential corporate growth and profitability” reminds to be the desired end-state in the regulatory focus theory that is communicated through the CEO shareholder letter. Hence, the link between regulatory state of the CEO and its way of communication seems quite interesting.

As the principle idea of this paper is empirically analyzing CEO communication in annual reports in terms of regulatory focus of the CEO, the wide existing body of literature of CEO communication was also examined especially in terms of possible links to regulatory focus theory. As Gamache et al. (2015) state in their paper, some theoretical work was done in terms of linking regulatory focus theory to strategic topics like increasing commitment, sense-making and meaning-making or explaining new strategic directions. Surprisingly, very little empirical work was undertaken to explore the impact of regulatory focus on these various outcomes (Gamache et al. (2015)). They only found three studies that examined the relationship of managers’ regulatory focus on strategic outcomes. The first one of Brockner et al. (2004) focused on the regulatory focus of managers in entrepreneurial processes and stated that promotion-focused individuals are equipped with the abilities of creating new ideas, whereas promotion-focused individuals are concerned with non-losses in terms of minimizing errors (Gamache et al. (2015)). These results fit to the conceptualization of regulatory focus theory. Secondly, Wowak and Hambrick (2010) studied different risk attitudes of promotion versus prevention-focused individuals in CEO compensation (Gamache et al. (2015)). Thirdly, Das and Kumar (2011) examined regulatory focus of managers in the due diligence process for alliances (Gamache et al. (2015)). Promotion-focused individuals were faster in decision and long-term oriented, while prevention-focused individuals were more careful in terms of information sharing and proposed with attitudes that helped them in decreasing partner conflicts (Gamache et al. (2015)). Empirical studies undertaken in this field were contradictory in their propositions for entrepreneurial business performance (Gamache et al. (2015)).

Thus, Gamache et al. (2015) themselves conducted an empirical work about the CEO regulatory focus and its influence on acquisition activity of the enterprise. Their findings suggest that the regulatory state of an individual, meaning its promotion or prevention focus, has an impact on both the quantity as well as the size of acquisitions (Gamache et al. (2015)). This work is important to the wide body of literature as it links regulatory focus theory to strategic outcomes and measured the significance of this study on a larger scale quantitatively. The year of publication indicates the progress of research in linking originally psychological theories to management literature and sets the focus for the following analysis.

As my literature research did not find more than the three above mentioned empirical studies in this field, I state that to the best of my knowledge, this empirical work is the first one, combining a qualitative with a quantitative analysis of CEO regulatory focus in shareholder letters in annual reports connected with change variables. I strive to extend the research in exploring the CEO regulatory focus qualitatively and to include various contextual variables, especially strategic change variables. The goal is to be able to predict the importance of strategic change in the CEO regulatory focus in his shareholder letter in the annual report.

3.3. Hypotheses

As the extensive elaboration on the theoretical foundations on strategic change and CEO communication in annual reports linked with regulatory focus theory indicates, this paper tries to integrate the regulatory focus of a CEO with the type of strategic change, the organization actually undergoes. In the following, two hypotheses are presented that are empirically examined in the analysis part. They are kept short and simple as the literature review already focused on the main theoretical foundations.

First, the regulatory focus of CEOs is investigated in terms of the extent of promotion vs. prevention focus. This is because research proposes that every individual uses both promotion vs. prevention focus in their usual communication (Tuncdogan et al. (2015)). Since CEO letter to shareholders in annual reports are a special form of communicating as the CEOs are representing the whole organization and especially their board members in their letters, it is questionable if

### Table 2: Types of Change (following Ackerman (1986))

<table>
<thead>
<tr>
<th>Type of Change</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| Developmental  | - Mainly continuously planned or emergent change  
|                |   - Incrementally influencing persisting elements in organizational settings |
| Transitional   | - Mainly discontinuously planned, episodic or radical change  
|                |   - Aims at adjusting organization to achieve a specific goal that is defined by management  
|                |   - Extremely radical change |
| Transformational| - Aims at fundamentally changing organization to a new organizational setting that is defined by management  
|                |   - Often radical change of structure, processes, culture and strategies |
their focus is different to non-official individual communication. As companies are usually striving for achievement and improving their financial strength (Tuncdogan et al. (2015)), they can be seen as both maximizing gains and minimizing non-gains as well as minimizing losses and maximizing non-losses. Therefore, promotion and prevention focus are necessary for CEO letters to shareholders to convince them about the organization’s strength and performance. Thus, combining regulatory focus theory and CEO communication literature, the following is proposed:

Hypothesis 1: CEO communication in annual reports contains both promotion as well as prevention focus elements.

Secondly, tracing back to chapter 3.1.3, contextual factors were found to have a major impact on the regulatory focus of individuals (Tuncdogan et al. (2015)). As main contextual factor in this bachelor thesis, change as influencing variable on the emergence of different regulatory foci was decided to be examined, since change seems to be a highly relevant element in organizational research (Klein (1996)) as well as the literature in change shows very little research in terms of regulatory focus (see 3.1.2). Also, the literature review suggests a relationship between the intensity of change (developmental, transitional and transformational) and the CEO regulatory focus. For example, Segars and Kohut (2001) propose a relationship between the type of change and the extent of promotion focus of CEOs (Segars and Kohut (2001)). The focus of this paper should therefore broaden the field in terms of striving to explain the focal CEO regulatory focus. In short, the emergence of the regulatory focus of CEO communication in annual reports is assumed to depend on the intensity of change (developmental, transitional, transformational), the organization is actually undergoing. The intensity of change may induce different motivational aspirations and ways for meaning-making in turbulent times (Sonenshein and Dholakia (2012)). CEOs may adapt their regulatory focus (un-)consciously to the focal situation to convince external as well as internal stakeholders of their leading role in the organization and the performance of the company.

Hence, it is presumed that transformational changes are accompanied with the highest promotion-focused communication (meaning more promotion-focused than prevention-focused communication), whereas developmental changes are accompanied with the lowest promotion-focused communication (meaning more prevention-focused than promotion-focused communication). Transitional changes will range in the middle between the two sides of the continuum. Thus, combining regulatory focus theory and strategic change literature, the following is proposed:

Hypothesis 2: The relation of promotion vs. prevention focus in CEO communication is positively associated with the intensity of change in organizations, meaning that the more intense and strategic the change is, the higher is the relation between promotion vs. prevention focus in CEO letters to shareholder letters in annual reports.

4. Empirical Study

4.1. Sample

To test the two above mentioned hypotheses appropriately, different samples were initially conducted to get a broad overview of the topic. To examine the CEO regulatory focus, analysis of CEO letters to shareholders in annual reports were found to provide one of the best platforms for qualitative research (e.g. Eggers and Kaplan (2009); Gamache et al. (2015)). Although analyzing the CEO letter to shareholders (often also called slightly different) is not without limitations as presented later on, these texts are useful when conducting qualitative research, meaning in-depth analysis of certain phrases and words. Annual reports offer a variety of information, not exclusively for shareholders and financial institutions, but also for other stakeholders like NGOs, government, business partner and also internal stakeholders like employees, who are interested in an overview of the business activities, the financial performance and other "hard facts". Hence, I decided on taking annual reports as basis of my analysis. Since researchers usually take major companies and very less small and medium-sized enterprises (SMEs) to conduct their research about CEO characteristics (Bettman and Weitz (1983); Kohut and Segars (1992); Higgins and Bannister (1992); Eggers and Kaplan (2009); Gamache et al. (2015)), annual reports from major companies were chosen as well. This selection facilitates the examination of CEO characteristics, since CEOs are very present in business news and therefore carefully decided on their way, extent and content of external communication. Thus, this procedure secures valuable insights into CEO characteristics. Further considerations were about the companies that should be included in the sample. For reasons of easier accessibility, only German companies from the “DAX” were included in the sample. DAX (abbreviation for “Deutscher Aktienindex” / German Stock Index) is the collection of the thirtieth largest German companies, measured by their annual revenue (in detail: measured on order book volume and market capitalization) (Deutsche Börse (2015)).

Since this paper is not only about examining CEO regulatory focus in annual reports, but also about linking the CEO regulatory focus with the context variable of change, an overview about the DAX companies provided an overview about internal change programs (see later on in qualitative analysis). To be able to control for different variables, it was decided to select companies from 2007 to 2012. This was done for several reasons: first, a six-year overview of data provides a feasible amount of primary data for both qualitative analysis in terms of in-depth examination as well as quantitative analysis. Secondly, qualitative analysis also shows later on, 2008 was the year with first major influence of the world financial crisis on the performance of companies (Dragsted (2014)). The DAX went down by 40 percent in 2008 compared to 2007 (Deutsche Bundesbank (2015)). Thus, 2007 was the last year without major impact of external crisis on the performance of companies before the financial crisis. As the impact of the financial crisis was mitigated
from 2011 on (Dragsted (2014)), the year 2012 may be seen as the first after the crisis without major impact of external crisis on the performance of companies, with the DAX climbing about 30 percent in 2012 compared to 2011 (Deutsche Bundesbank (2015)).

With the above mentioned considerations in mind, a spreadsheet was created which contained all thirty DAX companies. The lines contained the thirty companies (ordered alphabetically) and the columns contained the years 2007-2012. Two analysis were undertaken from that point: the first was to study if all companies were consistently “member” of the DAX 30-group. This was done to create a sample with companies that are comparable in terms of stability and magnitude differences. Due to the inclusion of companies according to revenue, market capitalization and order book volume, changes in the DAX 30-group are possible anytime. From the 30 companies, only 19 were consistently member of the DAX 30-group over the examination period. For example, Continental, a supplier for the automobile industry, was excluded from the DAX from 2008-2011. Also, Postbank was excluded 2009 and was not included to 2012 (This information was detected by reading the annual reports.).

With 19 companies left, a second analysis was executed: it was analyzed if all of the 19 companies include a letter to shareholder in their annual reports in the years 2007-2012. Two of the 19 companies were thus additionally excluded from the sample, as they did not consistently include a letter to shareholders from the CEO. In the end, 17 companies were left for analysis. Keeping the qualitative part with time-intense in-depth analysis in mind, it was decided to focus on the companies in the sample from the finance and insurance industry, since they are usually described the ones with the heaviest impact of the financial crisis on their business (Dragsted (2014)), with major change programs most probable. These were “Allianz SE”, “Commerzbank AG”, “Deutsche Bank AG” and “Munich RE AG”, the first and last being mostly insurance and asset management companies and the two in the middle being mostly financial and asset management companies. So in the end, the sample consisted of four companies, meaning their annual reports (in English) from six years (2007 to 2012), resulting in 24 data sets in total.

4.2. Qualitative Analysis

To explore the CEO regulatory focus empirically, the use of CEO letter to shareholders is described as appropriate and reasonable in literature. First, CEOs themselves use annual reports as important communication tool to external and internal stakeholders (Kohut and Segars (1992)). They use it as marketing tool to communicate both their board members’ strength and ability to lead the organization as well as their own performance individually (Kohut and Segars (1992)). Secondly, shareholder and investors see annual reports as important influencing tool for their work; especially, not only the income and balance sheet, but also “soft” texts as the CEO letter to get to know the board management and their future directions (Kohut and Segars (1992)). Thirdly, annual reports provide a comparable set of data over years with the annual report usually being published in the same period every year and merely containing the same paragraphs with only minor structural changes (Bettman and Weitz (1983)). Critics often claim that also interviews of the CEOs, articles or commentary should be included in analysis of CEO characteristics as well (Bettman and Weitz (1983); Gamache et al. (2015)). Although these other data may provide additional information, these are usually unstructured and shaped by the interviewer (Gamache et al. (2015)), thus needing precise examination and attention with minor opportunities to compare within one industry. Especially examining the CEO regulatory focus, it was decided to focus therefore on the letter to shareholders by the CEO (not the supervisory chairman). Interestingly, the analysis showed comparability in the format of letters (all companies used letters and not interviews or the like). (Eggers and Kaplan (2009): 468) summarized:

CEOs’ comments in speeches, media interviews, or conference calls with analysts are ad hoc and therefore not available in comparable forms for all firms in all time periods.

Fourthly, the use of letters to shareholders may be criticized as many CEOs delegate the writing process to their communications or public relations departments. To respond to these critics, research provided evidence that the CEO is in fact significantly attributing and changing the CEO letter to shareholders in terms of “style, length and content” (Eggers and Kaplan (2009): 468) to his personal characteristics and adjusting to the firms circumstances and needs (Kohut and Segars (1992); Gamache et al. (2015)). Gamache et al. (2015) also provided references that the individual regulatory focus of different CEOs varies significantly. Consequently, taken together the four aspects, CEO letters to shareholders in annual reports can be taken as reasonable and appropriate basics for analyzing CEO regulatory focus. For that reason, the qualitative analysis is structured into two steps: the first one is about analyzing the regulatory focus of the CEOs and how this analysis was designed and executed, while the second part is about the qualitative part of exploring the type of change from the annual reports.

4.2.1. CEO Regulatory Focus

To conduct qualitative research, one should concentrate on in-depth analysis of issues in a mainly unstructured and explorative manner, which tries to get new insights into topics and conduct research with open mind (Bansal and Corley (2012)). As this paper tries to link regulatory focus theory with CEO communication during change, this approach was chosen for exploring the CEO regulatory focus and to explore the type of change in detail. Following Kohut and Segars (1992), a content analysis of the annual reports, especially the CEO letter to shareholders, was designed. This includes getting insights from the CEO letters, coding important contextual variables and try to explain them quantitatively with the relevant advantage that this form of research allows the exploration of unconscious behavior, compared to a self-described behavior in interviews or the like (Kohut and Segars (1992)). As this form of linguistic approach was
proven successful in literature for getting insights in regulatory focus of CEOs (Lanaj et al. (2012); Gamache et al. (2015)), this study used this form of counting the amount of specific words that represent promotion or prevention focus. “Microsoft Word” was used with its function for searching for words; the words were then added manually in a spreadsheet.

It is important to mention that Gamache et al. (2015) were, to the best of my knowledge, the first that defined specific words and published them in their article. Their words (nouns, adjectives, adverbs) were conducted from literature analysis. That means that they based their work on the definition of promotion (maximizing gains etc.) and prevention (minimizing losses etc.) and both thought about new words that fit to these definitions as well as conducting main phrases from literature. For example, in their listing they use the words “gain” and “promotion” for the promotion list and “duty” and “loss” for the prevention list (Gamache et al. (2015): 1270). To support the proposition that these words are ordered correctly in the right category promotion vs. prevention, they verified them via experts and undergraduate students. As my intention was to conduct an examination of CEO regulatory focus as well, these words firstly seemed appropriate. Although these words provide a well-founded starting point, my first analysis results showed that some words did not fit into their category one-hundred percent or that I was missing important words. As qualitative research is adapting in the process of exploring data (Bansal and Corley (2012)), I decided to use the words of Gamache et al. (2015) as foundation for CEO regulatory focus analysis, combined with detailed revision. The goal of this revision was to ensure objectivity in creating a second list of words and comparing it to the proposed one as well as to enhance data reliability. In doing so, I approached the letters to shareholders of the four companies open-minded with the aim of reviewing the existing list of words critically and exploring additional words from my literature review. So, I removed words from the list that did not seem to fit in their category one-hundred percent while depending on the context, in which they are mentioned as well as I added others.

I listed 15 additional possible terms for the promotion category and 34 additional for the prevention category, some of them from literature, the rest from CEO letters. For example, “empowerment”, “flourish”, “positive” and “virtuous” were defined as promotion words from literature (Cameron and McNaughtan (2014): 2) as well as “opportunity” (Segars and Kohut (2001): 541) and “success” (Lockwood et al. (2002): 1) as they collectively reflect the strive for achieving goals via maximizing gains and a match with the desired state (compared with the mismatch of undesired goals for prevention words). For instance, “opportunity” reflects the way of taking unexpected chances to achieve goals. From CEO letters, e.g. “appeal”, “innovation” and “progress” were identified as promotion words, because they all reflect taking chances and striving for achieving goals with maximizing losses and minimizing non-downsides. On the other side, “anxiety”, “problem” (Cameron and McNaughtan (2014): 2) and “worry” (Lee et al. (2010): 10) were taken from literature for prevention words, since these words show the CEOs attention to possible downsides and losses. As prevention-focused individuals strive to minimize losses and maximizing non-downsides, these words were taken as relevant for further analysis. Furthermore, “disruptions”, “volatility” and “uncertainty” may provide as examples for alternative prevention words, which were identified in CEO letters, as they reflect the possibility for negative performance of the company, which is a loss in the definition of regulatory focus theory.

After merging the lists from Gamache et al. (2015) and my research, I had 42 promotion and 59 prevention words. My aim at this point of analysis was to eliminate doubles and words that may not fit one-hundred percent into their category. For instance, “swift” and “velocity” were excluded from the list as the link between a certain word for “speed” and promotion focus could not be seen. It could also be a prevention word, if it is used in terms of e.g. “we try to swiftly minimize our losses”. Another example would be “accomplish”, which is also seen as duty in usual linguistic usage, e.g. “I did my duty in accomplishing the task.”. Also, the list of prevention words were analyzed in detail and words like “adjust”, “mitigate” and “reduction” were eliminated for reasons of ambiguity. These words do not solely reflect only one of the two categories, instead the context in which they are said is highly important. After renewal of the listing, it contained 30 promotion words and 48 prevention words in total. In the above mentioned shed light of high ambiguity, it becomes very clear, that the categorization into promotion vs. prevention with self-examined words is not an easy endeavor. Hence, the list was forwarded via email in an unstructured order (without the “promotion” or “prevention” as category) to another bachelor student of business administration for validity scrutiny. He was provided with the exact definition of promotion and prevention focus and was asked to order the words into either promotion or prevention category. As a result, a high overlap (96 %) was recognized which supports the confidence in the identified words. The words “competitive”, “hope” and “stability” were identified as unclear and were ordered in the wrong category by the verifier. Thus, these words were excluded from the list. As final result, the list contains 29 promotion words and 46 prevention words. Since the first insight into the annual reports revealed more promotion words than prevention words and literature sees prevention words as more critical in use than promotion words (Petrou et al. (2015)); the surplus of promotion words is reasoned. The complete list can be seen in table B1 in appendix B.

4.2.2. Strategic Change in Annual Reports

To examine the type of change from the annual reports, I used the presented categories “developmental”, “transitional” and “transformational”. Keeping the definition of these types in mind, I approached the annual reports in an open manner to explore the type of change. Therefore, I especially concentrated on the first announcement of the strategy of the company (e.g. “3+” of Allianz, started in
and prevention words varied across the years, but not only in
time focus words and that the scores varies considerably.
to shareholders contains both promotion as well as preven-
tions hypothesis 1 with the exploration that every CEO letter
to prevention words) to 0,23 (vice versa). It therefore sup-
1,86 (relatively high amount of promotion words compared

ter to shareholders. As it is indicated with the relation be-
type of change and other contextual variables as e.g. performance over the years.

4.3. Quantitative Analysis

With the qualitative analysis as foundation, I decided to conduct quantitative research in a comparatively simple manner with the aim to get first quantitative insights into the field of change and CEO regulatory focus. Therefore, the type of change was coded into “0-1-2”, with rising number reflecting the higher intensity of change. CEO regulatory focus was defined as metric variable in the following way: the accounted number of promotion words was divided by the total number of prevention words and this variable was
called “CEO regulatory focus”. Thus, the higher the rela-
tion of this variable, the more promotion-focused was the communication and vice versa. The relative growth of the operating profit was used as contextual variable as it allows to control for the performance in the analysis; it was coded “0” for staying constant or a decrease and “1” for an increase compared with the year before. Because performance was found to have an impact on CEOs (Gamache et al. (2015)), this was thought to be relevant for controlling. As the goal of this paper is to analyze the relationship between change and the regulatory focus, IBM analytics software “SPSS” was used for correlation matrix as well as mean comparison and box plots. With the sample containing 24 items in the lines (six years multiplied with four companies) and being qual-
itive basically, I decided to disregard regression analysis for reasons of significance and missing prerequisites.

4.4. Results

Table 3 shows the results of counting promotion and prevention words in the focal company annual report’s CEO letter to shareholders. As it is indicated with the relation between promotion and prevention words, scores range from 1,86 (relatively high amount of promotion words compared to prevention words) to 0,23 (vice versa). It therefore supports hypothesis 1 with the exploration that every CEO letter to shareholders contains both promotion as well as prevention focus words and that the scores vary considerably.

Qualitative analysis also revealed another interesting ob-
servation, shown in table 4. The mean scores for promotion and prevention words varied across the years, but not only in relative composition, as just seen in table 3, but also in absolute composition. Table 4 shows that in times of high uncertainty of the environment, the absolute scores for prevention words are higher than in times with lower uncertainty. This may especially be seen in years 2008 and 2009, when the financial crisis hit the four companies (e.g. Allianz, 2008; Deutsche Bank, 2008). The ambition for minimizing losses that could not be estimated yet, may have led to the usage of more prevention than promotion words in total. Consequ-
ently, years with minor uncertainty and a more positive outlook as 2007 and 2010f. (e.g. Allianz, 2007, 2010) show higher absolute scores of promotion words compared with prevention words. The year 2012 is exceptional; it shows higher scores of prevention focus than promotion focus, unless the profit raised again and the companies escaped additional major losses. This exceptional year may be explained with the persistence of the financial crisis that continued to threaten particularly financial institutes worldwide (e.g. Munich Re, 2008).

Additionally, standard deviation varies between promotion and prevention words over the years. Promotion words appear to be more constant in usage (SD = 2.8), while prevent-
ion words seem to emerge more volatile (SD = 3.7). To sum up, results indicate that prevention words become visible in times of ambiguity to make the audience sensitive to the possibility of negative outcomes of the company, whereas promotion words are relevant in all settings since the stress on positive outcomes are needed in positive and negative situations.

Besides, box plots and mean comparisons show a difference for CEO regulatory focus depending on the various types of change. As it can be seen in figure 1, graphical illustration shows that the CEO regulatory focus, plotted as dependent variable (on the y-axis), is influenced by the type of change (independent variable on the x-axis). The mean of the CEO regulatory focus varies between the types of change. Develop-
mental changes result in the lowest score of promotion vs.
prevention, meaning that developmental changes are usu-
ally accompanied by a tendency towards prevention focus (median = 0,97; mean = 0,90; SE = 0,11). Transitional changes result in a higher mean score, meaning that they are resulting in a tendency towards more promotion focus (me-
dian = mean = 1,04; SE = 0,17). Transformational changes are accompanied with the highest mean score of CEO regu-

latory focus, meaning that the tendency to communicate in a more promotion-focused way is higher than in transition states (median = 1,28; mean = 1,26; SE = 0,22) (the des-
criptive statistics table C1 can be found in appendix C).

As mentioned before, other contextual variables may influence the CEO regulatory focus in annual reports, mainly performance. Therefore, it was decided to control for the relative profit growth compared with the year before. Thus, a comparison between the correlation between the two variables CEO regulatory focus and the type of change with a par-
tial correlation between these two variables while controlling for performance may reveal the influence of performance on CEO regulatory focus. Table 5 shows the (bivariat) corre-
Table 3: CEO Regulatory Focus

<table>
<thead>
<tr>
<th>CEO Regulatory Focus</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allianz</td>
<td>1.86</td>
<td>0.65</td>
<td>0.94</td>
<td>0.97</td>
<td>1.32</td>
<td>1.12</td>
</tr>
<tr>
<td>Commerzbank</td>
<td>1.22</td>
<td>1.15</td>
<td>1.28</td>
<td>1.08</td>
<td>0.59</td>
<td>1.58</td>
</tr>
<tr>
<td>Deutsche Bank</td>
<td>0.43</td>
<td>0.23</td>
<td>0.55</td>
<td>1.50</td>
<td>1.00</td>
<td>0.94</td>
</tr>
<tr>
<td>Munich RE</td>
<td>1.53</td>
<td>0.73</td>
<td>1.38</td>
<td>0.65</td>
<td>1.19</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Table 4: Mean Promotion and Prevention Scores

<table>
<thead>
<tr>
<th>Mean Promotion and Prevention Scores</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promotion</td>
<td>26.3</td>
<td>21.0</td>
<td>28.8</td>
<td>26.3</td>
<td>24.0</td>
<td>23.0</td>
<td>2.8</td>
</tr>
<tr>
<td>Prevention</td>
<td>22.5</td>
<td>31.5</td>
<td>30.5</td>
<td>25.0</td>
<td>23.3</td>
<td>26.8</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Figure 1: Box plots CEO Regulatory Focus

While the correlation matrix shows the expected correlation with a score of 0.342, the partial correlation matrix, which controls for the performance of the company compared with the year before, shows only slightly less correlation of 0.336. It is very important to notice that as the significance level indicates (mainly due to the small sample size), just no significance can be observed as significance is slightly above the 10%-level. As a consequence, a reliable numeric interpretation of the score is not possible. However, as this research is qualitatively founded and should solely indicate a possible correlation direction, this observation indeed shows a positive correlation between CEO regulatory focus and the intensity of change.

In short, there is a positive association between the CEO regulatory focus in letter to shareholders in annual reports and the type of change, the organization is actually executing, even when controlling for performance variable. The results therefore support hypothesis 2, claiming that the higher the intensity of change, the higher the promotion focus of CEOs.
Table 5: Correlation Matrix

<table>
<thead>
<tr>
<th>Type of Change (Ackerman (1986))</th>
<th>Type of Change (Ackerman (1986))</th>
<th>CEO Regulatory Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>1</td>
<td>0.342</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.102</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>CEO Regulatory Focus</td>
<td>Pearson Correlation</td>
<td>0.342</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.102</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

Table 6: Partial Correlation Matrix

<table>
<thead>
<tr>
<th>Control Variables</th>
<th>Type of Change (Ackerman (1986))</th>
<th>CEO Regulatory Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Profit</td>
<td>Correlation (2-tailed)</td>
<td>1</td>
</tr>
<tr>
<td>Growth</td>
<td>Significance (2-tailed)</td>
<td>0.336</td>
</tr>
<tr>
<td></td>
<td>df</td>
<td>0.117</td>
</tr>
<tr>
<td>df</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>CEO Regulatory</td>
<td>Correlation (2-tailed)</td>
<td>0.336</td>
</tr>
<tr>
<td>Focus</td>
<td>Significance (2-tailed)</td>
<td>0.117</td>
</tr>
<tr>
<td></td>
<td>df</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

5. Discussion

5.1. Theoretical Implications

My findings contain notable contributions for research on CEO communication during strategic change. With linking the psychological characteristics of an individual’s regulatory focus to different types of change, these findings add new insights to the rising research that links psychology traits and traditional management research (Gamache et al. (2015); Tuncdogan et al. (2015)). To the best of my knowledge, this is the first paper examining the type of change and CEO regulatory focus qualitatively to reveal a positive correlation between these two variables when analyzed quantitatively. The paper was structured in terms of getting both in-depth insights into the regulatory focus of CEOs as well as exploring these phenomena in a quantitative way. It therefore introduced the basic principles of regulatory focus theory and communication during strategic change. It afterwards set the scene for examining CEO letters to shareholder in terms of regulatory focus of CEOs, linking that with the current type of change of the organization. The paper contributes to the research on regulatory focus and CEO communication in four distinct ways.

First, through further developing existing analysis tools (Gamache et al. (2015)), the paper is able to broaden the view on regulatory focus of CEO communication in annual reports. The fundament for approaching regulatory focus with content analysis is the word definition for promotion and prevention focus. The thesis broadens and improved this fundament with a critical study on the words, eliminating and adding new words to both categories. Furthermore, the paper supports the hypothesis that every CEO letter contains promotion as well as prevention focus and that the prevention focus varies more than the promotion focus. This supports existing literature that proposes that CEO regulatory focus can be examined successfully (Kohut and Segars (1992); Gamache et al. (2015)). Secondly, this paper also proves existing change types as useful for exploring change (Ackerman (1986)). With approaching annual reports qualitatively, I was able to classify the intensity of change to certain types. Thirdly, the quantitative analysis supported hypothesis 2 that proposed a positive association between the CEO regulatory focus and the type of change that the organization is currently executing. It moreover also responds to possible critics through controlling for the most important variable that may influence the CEO regulatory focus in annual reports, the performance of the company in the respective year (Bettman and Weitz (1983)). But even with controlling for performance of the organization, one sees a positive association between these two variables. Although this correlation may not be reliably interpreted numerically due to (just missed 10 % - ) significance level, it indicates not only the fact of existing correlation, but also the direction of this relationship. This shows the importance of this research as it started to answer calls in literature for more research on firm-level variables and strategic context variables of organizations (Lanaj et al. (2012); Gamache et al. (2015)). Fourthly, this study also contributes to research on communication during strategic change. Since communication is often described as the most important tool in change management (Klein (1996); Kotter (2007)), literature in this field should not only deliberate the content of management communication during change,
but also concentrate on the regulatory focus of CEO letters to shareholders. With management communication having a major impact on the success of change programs, including M&As (Klein (1996); Kotter (2007); Gamache et al. (2015)), the regulatory focus in CEO communication, not solely in annual reports, should be considered when designing strategic communication.

5.2. Practical Implications
The results also have important implications for managerial practice of CEO communication. First, managers should be aware of the fact that their CEO letter to shareholder is no longer addressing external stakeholders exclusively, but all relevant stakeholders of the organization, especially including employees. Thus, it is of high relevance for CEOs to communicate consistently and aligned via all channels, internally and externally. This approach may be called “Omni-channel communication”, stressing the importance of focusing on one’s communication while leading organizations. Nevertheless, the “soft” content of a CEO letter to shareholders (in comparison to the “hard” facts of financial data included) also impact the perception of investors of the change process (Higgins and Bannister (1992)) and should therefore be designed appropriately to serve all stakeholders’ needs. Secondly, CEOs should keep in mind that their unconscious or conscious way of speaking is influenced by the intensity of change, which the organization is actually executing. Major changes as strategic acquisitions or merger phases are accompanied with a stronger promotion focus in CEO letters to shareholders. While promotion was found to be more stable in usage, particularly the amount of prevention focus varies. CEOs should therefore be aware of the importance of a balanced letter to shareholders. Thirdly, although external help as PR departments or consultancies are supporting the CEO in writing these letters (Gamache et al. (2015)), CEOs, or in general board members, should be aware of the fact that their communication in annual reports does not only have major influence on investors’ decisions (Kohut and Segars (1992)), but also on employees motivation (Petrou et al. (2015)). The way of communicating, especially in turbulent times of transformational or strategic changes, is proposed to have a major influence on the meaning-making processes of employees (Sonenshein and Dholakia (2012)).

5.3. Limitations, Future Research and Concluding Remarks
As most other articles that undertake empirical research, this paper includes some limitations and future research directions. As my limitations directly point out future research, this paragraph should combine these two elements in three different topics.

First, one significant limitation of this paper is the small sample size that does not allow to reliable interpret the result numerically. However, this was not the actual aim of this paper. The idea of this paper was rather getting insights into CEO regulatory foci through examining annual reports qualitatively. Therefore, my quantitative analysis should merely increase awareness for a possible positive relation between the intensity of change and the CEO regulatory focus and show an interesting direction for future research. That is why future research should test the hypotheses in a larger scale with the aim of significant results that can be also interpreted numerically afterwards. As well as testing the hypothesis, the list of promotion and prevention words should be tested for further validity. Although this list was tested by an external expert as well, a validity check in a larger scale would lend this list even more confidence. Additionally, the positive association between CEO regulatory focus and the intensity of change is very interesting, but needs more validity proof. It should not only be tried to replicate the results with another sample, but especially the direction of influence should be tested, possibly via regression models. It is not completely clear yet, which of the two variables influences which one or if there are backward effects from the one to the other. A model of influence should be designed in future work. Another possible study would examine CEO regulatory focus and the type of change and test various regression models with other contextual variables as moderators to check for different models empirically. This work should also include the question, whether regulatory focus of the CEO is chronic or manually induced (Lanaj et al. (2012)), which was not proved for reasons of accessibility to CEOs in this study.

The second topic concerns other contextual or moderating variables. Individuals’ leadership style may play an important role in examining CEO regulatory focus (Hall et al. (2012)). Research should concentrate on exploring the effects of CEO regulatory on leadership style and vice versa, as well as studying leadership style as moderating variables in empirical models. The structure of the management team in terms of age, tenure and personal characteristics may also influence the emergence of CEO regulatory focus and play a vital role in explaining CEO regulatory focus under strategic change. Another important variable is the thinkable bias of cultural values and beliefs in this paper. As only German DAX companies were included in the sample, the study should be replicated with companies from other cultural backgrounds. Cultural values may play an essential role in explaining CEO communication to stakeholders because they influence personal characteristics and shape the way of thinking (Lee et al. (2000)).

Thirdly, regulatory fit should be included in future papers. Regulatory fit and corresponding theory (Lanaj et al. (2012); Gamache et al. (2015)) were not analyzed in this paper due to reasons of accessibility to CEOs. Future research has to analyze regulatory fit between message sender (CEO) and message receiver (investors, employees, other relevant stakeholders) to exclude conceivable bias in linking CEO regulatory focus and change. As change may be perceived differently by various message receivers, the fit between the message in terms of regulatory focus and the perceivers should be content of future examination.

In conclusion, my study contributes considerably to research in linking regulatory focus of CEO communication to change in organizations. I developed existing analysis tools
further and approached annual reports qualitatively to set the scene for analyzing hypotheses quantitatively. The results showed persistence of different regulatory foci in CEO letters to shareholders as well as it demonstrated a positive association between CEO regulatory focus and the intensity of change in organizations. I therefore believe that CEO regulatory focus is a topic of high interest for management research and will be continuously considered in future publications.
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Investment-Cash Flow Sensitivity – A Focus on the Panel-Data Econometrics Involved

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Abstract

I revisit Fazzari et al. (1988) seminal paper on the investment-cash flow sensitivity as a measure of financing constraints and augment their approach with the findings from recent papers. I find that the investment-cash flow sensitivity has decreased and mostly disappeared over time, in line with recent literature. This finding is robust to alternative specifications and a number of robustness checks. I contribute to the literature by explicitly analyzing the strict-exogeneity assumption of the fixed-effects and first-differences estimators in empirical practice. In this setting, strict exogeneity does not hold and the violation can cause substantial inconsistencies.

Keywords: Investment-cash flow sensitivity; Capital market imperfections; Strict exogeneity; Panel data

1. Introduction

Many empirical business investment models have relied and still generally rely on the assumption that there is a “representative firm.” This firm responds to prices set in centralized security markets. For this firm, only its cost of capital and investment demand affect investment spending. Its financial structure, for example, is irrelevant to investment, given that internal and external finance are perfect substitutes. So, generally, when capital markets are perfect, this firm’s investment decisions are independent of its financial condition. However, an alternative research stream has been focusing on the view that there is a wedge between the internal and external cost of finance – a firm is then said to be financially constrained (Fazzari et al. (1988) (FHP), p. 141). This definition provides a useful framework to differentiate firms according to the extent to which they are financially constrained (Kaplan and Zingales (1997), p. 172). (A firm is considered more financially constrained as the gap between its cost of internal and external funds widens.)

Following this research, a firm’s investment may also depend on financial factors, such as the availability of internal finance and access to new debt or equity finance. For example, a firm’s internal cash flow may affect investment spending because of a financing hierarchy, in which internal funds have a cost advantage over external funds. Thus, a firm’s sensitivity of (physical) investment to cash flow has often been used in the empirical literature as a measure of capital constraints. The underlying logic is that if firms could easily access external capital, there would be no need to alter investment due to shocks to cash flow. As a result, there would be no significant relation between cash flow and investment (Gatchev et al. (2010)).

Conventional representative firm models, in which the financial structure is irrelevant to the investment decision, are likely to be suitable for mature firms, whose prospects are well known. However, for other firms, financial factors might – even today – matter in the sense that, especially in the short run, internal and external funds are imperfect substitutes. For these firms, the availability of internally generated funds may have an effect on investment decisions (Fazzari et al. (1988), p. 142). A main foundation for such a capital market imperfection is the presence of information asymmetries. This makes it very costly for providers of external finance to evaluate the quality of firms’ investment opportunities. Theoretical arguments that support this view draw heavily from the “lemons” problem first considered by Akerlof (1970). Akerlof argues that some sellers with inside information about the quality of an asset or a security may be unwilling to accept the terms offered by a less-informed buyer. This can cause the breakdown of the market; at least, this can lead to the sale of an asset at a price that is lower than it would be if all parties had full information. This argument can be applied to the example of new share issues, as suggested by Myers and Majluf (1984), in cases in which managers have inside information. If this information is favorable, it may happen that management, acting in the interest of existing shareholders, does not issue new shares, as
these would be underpriced. Knowing about this asymmetric information problem, investors might generally interpret management’s decision to issue new shares as a signal that shares are overpriced. In this case, given the adverse selection problem, new equity finance can only be obtained at a premium (Devereux and Schiantarelli (1990), p. 282).

Agency costs might also give ground to capital constraints. Conflicts between shareholders and debtholders can lead to agency costs of debt. When a company is partly financed with debt, Jensen and Meckling (1976) suggest that stockholders have an incentive to engage in projects that would otherwise be too risky, thereby increasing the probability of financial distress. If the project is successful, the payoff to the firm owners is large. However, if unsuccessful, the limited liability provision of debt contracts stipulates that it is the creditors who bear most of the costs. On top of that, Myers (1977) suggests that in these cases, in which a firm is partly debt financed, it may underinvest in the sense that it forgoes projects with a positive net present value. Provided that potential creditors understand the incentives of stockholders and incorporate the risk of bankruptcy in loan negotiations, the company owners ultimately bear the consequences of these agency problems in terms of a higher cost of debt (Devereux and Schiantarelli (1990), p. 280).

According to Jensen and Meckling (1976), the possible divergence of interest between managers and outside shareholders can give rise to agency costs of equity. In case of a separation between ownership and control, managers are encouraged to use a greater than optimal amount of the firm’s resources in the form of perquisites. Though such activities can be monitored by outside shareholders, doing so is costly. Ultimately, it is again the owners who have to bear the costs in terms of a reduced price that prospective outside shareholders are willing to pay for a stake in the firm. Marris (1964) growth model is also based on the divergence of interest between managers and outside shareholders. Marris shows that managers may wish to increase the growth rate of their company beyond the level that maximizes shareholder wealth. They do so while they try to maintain the company’s share price at a sufficiently high level to avoid a takeover by outsiders, who would then be likely to dismiss the managers.

Finally, capital market imperfections causing capital constraints can exist due to transaction costs. For example, investment-banking fees must be paid when raising external finance (Duesenberry (1958)). Implications arise for the study of macroeconomic investment fluctuations and the impact of public policy on capital spending in the case that capital market imperfections still exist. These capital market imperfections lead to binding financial constraints on investment. Financial constraints in capital markets could then magnify the macroeconomic effect of shocks to cash flow or cash stock on aggregate investment. With regards to tax policy, in case of frictionless financial markets, only the marginal tax rate on returns from a new project matter. However, for firms that face imperfect markets for external finance, the amount of earnings devoted to taxes – and therefore the average tax rate on returns from existing projects – matters for investment, possibly along with incentive effects of marginal tax rates (Fazzari et al. (1988), pp. 184–186).

Several recent studies have shown that the investment-cash flow sensitivity has decreased over time. There are several reasons to suspect why this is the case. One important reason is the substantial development in US equity markets over the last decades. For example, in 1971, young firms got access to a much more efficient stock exchange when Nasdaq was created. This is underlined by a steep increase in public equity finance use by young firms suggesting that stock issues may have become a closer substitute for internal finance. The second reason is closely related to that. It is the sharp increase in the fraction of publicly traded firms that consistently present negative cash flow figures. When cash flow is particularly low, these firms often make heavy use of public equity to expand investment. Hence, a failure to account for external finance in investment-cash flow regressions can result in a downward omitted variable bias in the estimated cash-flow coefficient. For example, cash flow goes down, causing external finance to go up, which then finances investment. A third reason is the change in the composition of total investment. Research and development (R&D) intensity has risen strongly for the typical manufacturing firm, while the absolute and relative importance of physical investment has deteriorated. Given that most investment-cash flow studies have so far focused on physical investment, its declining relative importance has potentially led to a decline in the conventionally measured investment-cash flow sensitivity (Brown and Petersen (2009)).

In this research paper, I revisit the very early literature on investment-cash flow sensitivity as a measure of financing constraints and see what has changed. Concretely, I use Fazzari et al. (1988) partially as a guidance and comparison. I augment this with the findings from influential, recent papers in the literature (e.g., regarding the changing composition of investment). Inter alia and naturally, this implies that I investigate whether the sensitivity of investment to cash flow has reduced over time.

Throughout the paper, I put a great focus on the econometrics involved (e.g., careful selection of the estimation method). Noteworthy, this is one of the first papers to explicitly acknowledge and analyze the strict exogeneity assumption of the fixed-effects and first-differences estimator in empirical practice. Apart from the typical notion of contemporaneous exogeneity, which only requires a lack of contemporaneous correlation between the error term and the explanatory variables, strict exogeneity requires the absence of feedback from the dependent variable to future values of the independent variable. So far, the overwhelming majority of panel-data finance literature does not explicitly account for the strict exogeneity. To overcome this weakness, I partially follow the approach in Grieser and Hadlock (2015). They show not only that it is highly likely that the strict exogeneity assumption is quite commonly violated in practice, but also that, in many instances, the possible magnitude of the inference errors is substantial. Given that I pay explicit attention to this assumption and that practical, empirical
evidence is still rare, credibility of my general results is increased, plus I can offer additional evidence on the topic of strict exogeneity in empirical practice.

I test the following hypotheses: a) in the investment-cash flow regression, the coefficient on cash flow is still positive on average, b) the coefficient is still significantly larger for companies a priori assigned into the more financially constrained sub-sample, c) the investment-cash flow sensitivity has decreased over time, d) fixed effects (FE) is the most appropriate estimation method for this research question, e) the strict exogeneity assumption is generally violated, and f) there is evidence that the inconsistency caused by violation of strict exogeneity can be substantial. My main findings indicate that the investment-cash flow sensitivity has decreased and (mostly) disappeared over time. This finding is robust to alternative specifications and a number of robustness checks. Also, the usage of different estimation methods does not significantly alter the main findings, while FE seems to be the most suitable estimation method; however, the choice of the estimation method can have a substantial effect on the estimation results. Furthermore, in this setting, strict exogeneity does not seem to hold and the inconsistency caused by this can be substantial.

The rest of the paper is organized as follows. Section 2 scans the relevant literature, divided into chapters on the influential early papers, more recently written papers, and papers written on common application errors of estimation methods on panel data. Section 3 describes the data and the classification scheme applied to the data. Section 4 presents the models used in this thesis, specified as market-to-book and sales accelerator models of investment. Section 5 covers the relevant estimation methods employed, as well as explanations of the strict exogeneity test and the impact of a violation of the strict exogeneity assumption. Section 6 addresses the topic of standard errors, including a discussion of appropriate clustering. Section 7 presents the results, compares these to Fazzari et al. (1988), analyses differences of estimates based on the respective estimation methods, draws inferences based on the strict exogeneity tests, and explores whether the general findings hold in a number of robustness checks. Section 8 concludes, discusses this paper’s contributions and drawbacks, and outlines possibilities for future research.

2. Literature Review

2.1. Early Investment Literature

In the post-war period, investment research, especially the work of Meyer and Kuh (1957), examined the importance of financial considerations in business investment decisions. In general, established by the “debt-inflation” school, financial effects on various facets of real economic activity received much attention. However, starting in the 1960s, research mostly isolated real firm decisions from purely financial factors. The theoretical basis was laid by Modigliani and Miller (1958) who demonstrated that, under certain conditions, financial structure and financial policy are irrelevant for real investment. According to them, a firm’s financial structure does not affect its market value in perfect capital markets. If the assumptions put forward in their work are satisfied, real firm decisions, motivated by the maximization of shareholder value, are independent of financial factors such as a firm’s liquidity, debt leverage, and dividend payments.

Fazzari et al. (1988) relate the traditional study of financial effects on investment to a recent literature on capital market imperfections by studying investment behavior in groups of firms with different financial characteristics. Their article was a starting point for a number of studies that show that investment is more sensitive to cash flow for firms that are a priori classified to be more financially constrained. FHP’s findings are based on a sample that comprises manufacturing firms with positive sales growth from 1969–1984. The size of the cash flow coefficients is generally large, ranging from approximately 0.2 for the unconstrained sub-sample of firms to 0.6 for the constrained sub-sample. They test for the accelerator, neoclassical, and q models of investment, with q being the main specification. A simple cash flow model stresses only the cost of capital side. This is of crucial importance, however, given that it may capture the wedge between the internal and external costs of finance and given that internal finance in the form of retained earnings generates the majority of the net funds for firms in all size categories.

The simple accelerator model stresses the demand for the capital side of the investment decision. The neoclassical theory incorporates the principle of the accelerator model by making investment a function of output and lagged capital stock. However, it differs from the accelerator model by additionally making investment dependent on product price and idiosyncratic cost of capital. For the purposes of this paper, it is sufficient to use – besides a q measure – the accelerator model, as both theories, accelerator and neoclassic, make today’s investment a function of today’s output. The q theory of investment incorporates the basic assumptions and conditions of the neoclassical model. Under these, differences in q across firms reflect differences in desired capital stocks relative to actual capital stocks. Thereby, these differences should explain differences in investment, without actually having to measure the cost of capital of individual firms. Fazzari et al. (1988) invoke transaction costs, tax advantages, agency problems, costs of financial distress, and (especially) asymmetric information as reasons for internal and external finance not being perfect substitutes in practice. They argue that if the cost of capital differs by the source of funds, the availability of finance will likely have an effect on the investment practice of some firms. In financing hierarchy models, the availability of internal funds allows firms to undertake desirable investment projects without the need to resort to high-cost external finance.

Devereux and Schiantarelli (1990) have written an influential paper whose findings are in line with those presented in Fazzari et al. (1988). They provide empirical evidence on the impact of financial factors like cash flow, debt, and stock measures of liquidity on the investment decisions of 720 U.K.
manufacturing firms. These firms are split by size, age, and type of industry (growing or declining) – as proxies for the degree of financing constraints – over the period 1969–1986. This classification scheme is different to those employed in most of the other early papers in the field, such as Fazzari et al. (1988), Gertler and Hubbard (1988), and Hoshi et al. (1991), which use “broad” proxies for financing constraints like the dividend-payout ratio. Apart from that, while the approach in Devereux and Schiantarelli (1990) is very similar to the one in Fazzari et al. (1988), the explanatory variables are introduced via a different, more comprehensive extension of the q model of investment. The model explicitly includes a term representing agency costs. This agency cost function is expected to vary for firms in different age and size classes and in different industries. The model also includes lagged values of the dependent variable and of each regressor to allow for the possibility of an innovation error that follows a first-order autoregressive process. The model is – contrary to the common approach in the literature – estimated in first differences to allow for firm-specific, time-invariant effects and an instrumental variables procedure is used to allow for endogeneity of the regressors. (Endogeneity can arise because current cash flow, debt, current assets, Q, and investment may all be simultaneously determined.)

Like in Fazzari et al. (1988), the econometric results indicate that financial factors, principally in the form of lagged cash flow, have an independent effect on investment. The size of the effect is, however, smaller than in Fazzari et al. (1988), ranging from around 0.05–0.25. Cash flow has a (slightly) higher coefficient in the small, young firm sub-sample than in the small, mature firm sub-sample, as one expects when the market learns to evaluate investment opportunities better with time. Moreover, as outlined in Titman and Wessels (1988), smaller firms regularly tend to be less diversified, to display greater earnings volatility, and to be more prone to bankruptcy. In contrast to that, since size may proxy for (a diversified) ownership structure, in which agency problems can be more pronounced, there is some ambiguity in assessing the effect of size on agency cost. Hence, the authors use these agency costs arising from large firms’ diversified ownership base to explain the magnitude of the impact of cash flow on investment, which is larger for large firms than for small firms.

Hoshi et al. (1991) is another well-known study that interprets a greater investment-cash flow sensitivity of firms, which are a priori considered to be more likely to face a larger wedge between the internal and external cost of funds, as evidence that these firms are indeed financially constrained. The authors work with a panel data sub-set of Japanese manufacturing firms listed on the Tokyo Stock Exchange between 1965 and 1986. These firms are divided on the basis whether they belong to a keiretsu and, thus, to a large extent whether they have a main-bank relationship. This scheme is based on the theories by Myers and Majluf (1984), who suggest a positive role for a main-bank relationship in reducing informational asymmetries and, thus, in alleviating financing constraints. Stressing these theories, the authors interpret their findings, namely that Japanese firms with an exclusive bank relationship have a lower investment-cash flow sensitivity, as evidence that a main-bank relationship reduces financial constraints. However, this interpretation is questioned by the theory of Sharpe (1990), among others. Sharpe argues that banks can exploit an exclusive main-bank relationship and make client firms more constrained by charging them a higher cost of capital. The finding in Hoshi et al. (1991) that the financially strongest Japanese firms subsequently broke their bank relationship is consistent with this interpretation. This theoretical ambiguity is not unique to this paper.

Blanchard et al. (1994) analyze what firms do with cash windfalls, which do not change their investment opportunity set, that is, their marginal Tobin’s q. The authors’ sample is comprised of eleven firms with such windfalls in the form of a won or settled lawsuit during 1980–1986. This sample includes firms without attractive investment opportunities. Nevertheless, the managers of these firms choose to keep the cash windfall in the firm rather than distribute it to the shareholder. If anything, they typically borrow more after the windfall. Like in Fazzari et al. (1988), this evidence is broadly inconsistent with the perfect capital markets model; rather it supports the agency model of managerial behavior, in which managers try to ensure the long-term survival and independence of the firms with themselves as the commander-in-chief.

In Lamont (1997), data from the 1986 oil price decrease are used to examine physical investment of oil companies’ non-oil subsidiaries. The 1986 oil shock, during which oil prices fell by 50 percent, is argued to be an unambiguously exogenous shock to any individual firm. Lamont identifies a group of firms that have corporate segments in the oil extraction industry and in non-oil industries and tests whether a decrease in cash/collateral decreases investment and whether the finance costs of different parts of the same corporation are interdependent. Similar to Blanchard et al. (1994), the profitability of investment opportunities is not impacted. This is because marginal q in corporate segments in the non-oil industries is uncorrelated with marginal q in the oil extraction industry. Results in Lamont (1997) support the hypotheses: oil companies significantly reduced their non-oil investment compared to the median industry investment. Though the sample size is fairly small, the results appear to be moderately robust. This is interpreted as external capital markets being imperfect (i.e., financial slack matters for investment) and as internal capital markets allocating capital within firms (i.e., different parts of the firm are interdependent).

Kaplan and Zingales (1997) is the first influential study to oppose the findings in Fazzari et al. (1988) and in the follow-up literature. Kaplan and Zingales are agnostic on what source of capital market imperfection causes financing constraints. Unlike Blanchard et al. (1994), the authors’ goal is to understand the effects capital market imperfections have on investment. For that, they investigate the relationship between financing constraints and investment-cash flow sensitivities by analyzing the 49 low-dividend-firms identified in
2.2. Recent Investment Literature

Despite – and probably also because of – controversy in the investment-cash flow literature, many studies still analyze and use investment-cash flow sensitivity. \( ? \) use data from 1985–2001 to examine the investment-cash flow sensitivity of US manufacturing firms in relation to five factors that they associate with capital market imperfections. They are one of the first to explicitly analyze and find a steady decline in the estimated sensitivity over time. The overall evidence suggests that the sensitivity of investment to cash flow decreases with factors that reduce capital market imperfections. This implies that the sensitivity of investments to the availability of internal funds cannot be explained solely as an artifact of measurement error – which has often been used in the more recent literature to explain a positive sensitivity, especially related to the \( M/B \) measure employed.

A paper by Brown and Petersen (2009) follows \( ? \), but lays a greater emphasis on the impact of the changing composition of investment and of developments in equity markets on the sensitivity. Brown and Petersen cover the period 1970–2006, split into three sub-periods. They split firms into young and mature. The standard OLS fixed-effects model used in the investment-cash flow literature is employed, though the paper’s main results are based on dynamic investment regressions using general methods of moments (GMM), where cash flow and other financial variables are treated as endogenous. Sensitivity of investment to cash flow largely disappears for physical investment, remains relatively strong for R&D, and substantially declines for total investment. The GMM regressions that control for negative cash flow and include measures of external finance show a decline in the sensitivity of at least 70 percent over 1970–1981 and 1994–2006, largely explained by the decrease in importance of tangible investment relative to total investment. The empirical strategy in Brown and Petersen (2009) is motivated by a number of papers that criticize conventional investment-cash flow regressions, especially when these do not control for the potential endogeneity of cash flow and when the possible importance of external finance is neglected.

Criticism of the methodology in the standard investment-cash flow literature is also the motivation of a study written by Gatchev et al. (2010), who develop a dynamic multi-equation model where firms make financing and investment decisions simultaneously, subject to the constraint that sources must equal uses of cash. They argue that static models of financial decisions – as mostly employed in the literature – produce inconsistent coefficient estimates, and that models that do not acknowledge the interdependence among decision variables produce inefficient estimates. The authors work with annual data, which exclude financial institutions and utilities, spanning the period 1950–2007. When they use a standard single-equation approach, the coefficient on cash flow has a size of 0.47 – as substantial as in the papers by Fazzari et al. (1988) and Kaplan and Zingales (1997). However, using their system-of-equations model, estimates are in many specifications indistinguishable from zero. This difference in coefficient estimates basically stems from the inclusion of lagged capital expenditures (CapEx) in the system-of-equations model. This suggests that failing to account for persistence can lead to biased results. The system-of-equations approach examines capital constraints comprehensively by allowing indirect (investment-cash flow) and direct (financing-cash flow) effects to be studied simultaneously. Compared to the static single-equation methodology, the multivariate model produces substantially smaller estimates of the investment-cash flow sensitivity and makes clear that the sensitivity to cash flow of financing dominates over investment. This makes clear that firms absorb cash-flow fluctuations mainly by altering net debt – and not by changing real assets. That is, they decrease leverage and basically do not invest. In addition to that, unlike the static single-equation studies that find that firms underinvest given cash-flow shortfalls, Gatchev, Pulvino, and Tarhan conclude that firms maintain investment by borrowing.

Chen and Chen (2012) try to settle the debate on the interpretation of investment-cash flow sensitivity as a measure of financial constraints. They find that the investment-cash flow sensitivity has declined and disappeared, even during
the 2007–2009 credit crunch. The results are robust to considerations of R&D and cash reserves, and across groups of firms. Though the information content in cash flow regarding investment opportunities has declined, measurement error in Tobin's q cannot completely explain the patterns in the sensitivity. Decline and disappearance can neither be explained by changes in sample composition, corporate governance, or market power. The authors show that the investment-cash flow sensitivity is about 0.3 in the 1960s. Since 1997, it has been below 0.03. It has disappeared in manufacturing, as well as non-manufacturing firms. These findings are robust to alternative model specifications.

Like in Blanchard et al. (1994) and Lamont (1997), Andrén and Jankensgård (2015) use an exogenous shock as a basis for their study. They are the first to bring evidence from some kind of natural experiment in which there was an unexpected, substantial, and persistent decrease in the cost of external financing: the sudden abundance of liquidity in the oil and gas industry in the mid 2000s. This abundance was triggered by high oil prices and an eased access to external financing, and the authors look at its influence on the investment-cash flow relationship. For that, they use a balanced sample of 78 firms, rendering 612 firm-year observations. Firm size is the splitting criterion for classifying firms as constrained or unconstrained. By carrying out regressions with cash, accruals, and financial variables (cash flow, cash, and leverage), the authors use the standard methodology in the literature. They find that, for financially constrained firms, the investment-cash flow sensitivity decreased in the abundance period (2005–2008), suggesting that the financial constraints became less binding. Instead, for financially unconstrained firms, the sensitivity increases over time, suggesting that this relationship is driven by agency problems related to free cash flow. Hence, this paper's results are partly at odds with findings in other recent papers, such as Brown and Petersen (2009), who find that the investment-cash flow sensitivity has decreased over time due to capital market improvements. Andrén and Jankensgard verify the differential role of cash flow to investment across systematically different types of firms, even in a recent period (2000–2008).

Chowdhury et al. (2016) try to mitigate some of the conceptual and methodological problems brought up in the investment-cash flow literature by using a research design that relates changes in the sensitivity to changes in information asymmetries. The bid-ask spread surrounding the implementation of the Sarbanes-Oxley (SOX) Act (2002) and the deregulation of firms in the transportation, telecommunication, and petroleum and natural gas industries (end of 1970s) serves as a measure of information asymmetry. The authors base their paper on the idea in Cleary et al. (2007) that two firms, ceteris paribus, may face differently severe problems of information asymmetry. Cleary et al. (2007) predict that the investment-cash flow sensitivity is unambiguously higher the greater the asymmetry of information. Chowdhury et al. (2016) find that information asymmetry decreases following SOX and that there is a corresponding decrease in the sensitivity, pre- to post- SOX. Greater decreases in information asymmetry following SOX are associated with greater decreases in the sensitivity of investment to cash flow. They also detect an increase in information asymmetry with a corresponding increase in the sensitivity following deregulation.

Other relatively recent studies examine the presence of financial market frictions. For that, they analyze the connection between changes in the values of pledgeable assets and financing. These tests generally produce evidence that financially weak firms face difficulties in raising funds through equity or debt markets. For example, Rauh (2006) finds that CapEx decline with mandatory contributions to defined benefit pension plans. Also, Almeida and Campello (2007) find that sensitivity of investment to cash flow increases – in the case of financially constrained firms – in the tangibility of assets. Hence, they conclude that financing frictions influence investment decisions. Another influential example showing that the topic of financing constraints is broadened beyond investment-cash flow sensitivities is the forthcoming paper in The Accounting Review by Linck et al. (2013). They hypothesize that a financially constrained firm with valuable projects can use discretionary accruals to credibly signal positive prospects, thus easing the possibility to raise capital to make the investments. To test the hypothesis, the authors use panel data for 1987–2009. They find, inter alia, that financially constrained firms with good investment opportunities have significantly higher discretionary accruals prior to investment compared to their unconstrained counterparts. Their results support evidence that the use of discretionary accruals can help promising firms suffering from financing constraints to ease those constraints and increase firm value.

2.3. Application Errors of Estimation Methods on Panel Data

A couple of important papers have recently been written on common application errors in the finance literature of the fixed-effects estimator on panel data (Grieser and Hadlock (2015), p. 1). For example, Gormley and Matsa (2014) discuss the limitations of two widely used approaches in finance research: demeaning the dependent variable with respect to the group (e.g., industry-adjusting) and adding the mean of the group’s dependent variable as a control. Both methods produce inconsistent estimates, thereby distorting inference. As an alternative, the FE estimator is consistent and should therefore be used.

Petersen (2009) examines the different methods used in the literature to work around the problem that, in panel data sets, the residuals may be correlated across firms or across time. Thompson (2011) writes that it is common practice, when estimating finance panel regressions, to adjust the standard errors for correlation either across firms, or across time. These procedures are only valid if the residuals are not correlated across time and firms. Thompson shows that it is easy to calculate standard errors that are robust to simultaneous correlation along two dimensions, such as firms and time. Both Petersen (2009) and Thompson (2011) highlight that researchers do not use the appropriate standard errors
to adjust for the types of error variance and covariance structures that are common in finance settings. This recent literature does not emphasize the strict exogeneity assumption that must hold for the FE estimator or its cousin, the first-difference (FD) estimator, in order to have a chance to consistently estimate the coefficients of interest. It is already a cursory consideration of the variables used in finance research that suggests that this assumption will often be violated. Many of the relevant dependent variables to financial economists are likely to be related to the subsequent evolution of the key explanatory variables. In Strebulaev et al. (2012), as well as in other papers, dynamic theoretical models posit exactly this feedback that will lead to violation of the assumption.

The work by Wintoki et al. (2012) is the first exception in that it acknowledges the strict exogeneity issue in a panel data finance model that does not include a lagged dependent variable. (As the inclusion of a lagged dependent variable in any panel data analysis structurally violates strict exogeneity in the underlying model, there is no need to test for it anymore.) Wintoki, Linck, and Netter highlight the importance of strict exogeneity in the setting of the effect of board structure on firm performance. They question prior work on this issue that relies on (probably) inconsistent FE or FD estimators when the authors reject the validity of the strict exogeneity assumption. A paper by Grieser and Hadlock (2015) is similar in many ways to Wintoki et al. (2012). However, by examining the strict exogeneity assumption in a set of canonical panel-data regression models selected from the existing finance literature, the paper does not restrict attention to one specific research context, but highlights that this issue applies to a large set of empirical models in finance. The work by Grieser and Hadlock (2015) serves as a basis and guidance for the analysis of the strict exogeneity assumption in this thesis. The authors use the entire universe of available Compustat data (excluding financials and utilities) from 1965–2012. They search through every issue of the Journal of Finance, Journal of Financial Economics, and Review of Financial Studies over the period 2006–2013. They categorize each paper that features an empirical model with unit-level (e.g., firm, bank, person) fixed effects rather than solely time (e.g., year, quarter) effects into traditional FE estimates (most often used), traditional FD estimates, or dynamic panel GMM estimates. Each categorized panel data study is then assigned into a broad set of mutually exclusive categories based on the employed dependent variables (inter alia, leverage) and corresponding relevant independent variables (inter alia, return on assets). That way, the authors work out the five dependent variables that are used most frequently in the literature.

Based on Wooldridge (2010), for every model created, it is tested whether the strict exogeneity assumption holds and explored whether failures in the assumption are probable to lead to substantial inconsistencies in the common estimators. In the paper, it becomes evident that the strict exogeneity assumption is quite frequently violated; it can even be rejected in virtually all of the canonical regression models considered by the authors when large samples are used. In addition to that, the inconsistency caused by the violation can have a significant effect on economic inferences in finance settings. The problem of the inconsistency in the FE estimator is known to be around \( \frac{1}{T} \), where \( T \) denotes the number of time periods. (The inconsistency in the FD estimator does not depend on \( T \): \( \frac{1}{T} \) requires the presence of stable, i.e., time-invariant, fixed effects. Demonstrating that in common finance panel settings unit-level fixed effects seem to change over time, the authors show that it appears unlikely that the \( \frac{1}{T} \) results will solve the problem – provided that a large number of time periods is actually available. Also, differences between the FE and FD estimates are regularly in the order of 50 percent or higher. Using these differences to gauge the possible magnitude of inference errors, a substantial economic impact of basing inferences on inconsistent estimates is not unlikely. Based on the evidence presented, Grieser and Hadlock (2015) indicate that simple FE or FD panel data estimators are in many cases not the correct tools to use in settings that include the presence of unit-level fixed effects – and they offer a serious challenge to empirical finance research.

Overall, this literature review makes clear, among other things, that a) the investment-cash flow sensitivity has decreased over time, b) a number of papers criticize the interpretation of the sensitivity as a measure of financial constraints (e.g., an increase in sensitivity cannot be seen as an increase in financing constraints), c) a number of recent papers criticize conventional investment-cash flow regressions (e.g., for neglecting the possibility of impact of external finance), d) the topic of financing constraints and investment-cash flow sensitivity constitutes one of the largest literature streams in corporate finance and is still a vivid research field, and e) testing for violation of the strict exogeneity assumption is of importance. This paper adds value to a line of research that is of ongoing interest. It basically uses the structure in Fazzari et al. (1988) – the parent of all papers on this topic –, analyzes what has changed (e.g., decrease in sensitivity over time), puts a greater focus on the econometrics involved (e.g., analyses of estimation methods, strict exogeneity assumption, and standard errors), and adds some of the more important findings in the recent literature to the thesis (e.g., changing composition of investment, impact of external finance).

3. Sample

The sample in this study consists of US industrial firms between 1990 and 2015. Data is obtained from Compustat. The sample period covers two times of crises and three waves of corporate investment. The first crisis happened after the burst of the dot-com bubble, which climaxed in 2000. The second crisis was the global financial crisis of 2007–2008. The first wave of corporate investment was related to the dot-com splurge of 1997–2001. Cash was poured into building cell-phone networks and the Internet’s backbone. From 2003–2010, there was an emerging-market
frenzy, with Western firms investing about $2 trillion in factories and other facilities in places like China and India. Finally, also driven by insatiable Chinese demand, there was a craze for commodities over 2005–2013. Global energy and metals firms spent $6 trillion digging in the Australian outback and drilling for oil in North Dakota and deep beneath Brazil’s coastal waters (The Economist (2016)). Data in this sample are annual and include companies with calendar-year end unequal to fiscal-year end. (This will slightly impact year-fixed effects.) Analyses are based on an unbalanced panel. This might come with the disadvantage that there is a non-random sample in advanced time periods, as, for example, a lack of investment took companies out of business (Wooldridge (2013), p. 491). Balancing the panel, however, may introduce sample bias in that firms with certain characteristics are more likely to enter or exit the sample, such as survivorship bias (Andrén and Jankensgård (2015), p. 206). Given the pros and cons, the robustness section (7.3) includes an analysis based on a balanced panel. The definition of the empirical variables follows in chapter 4.

Robust regression is an alternative to ordinary least squares (OLS) regression when data is contaminated with outliers or influential observations and it can be used for the purpose of detecting influential observations. The idea of robust regression is to weight the observations differently based on how well behaved these observations are. Hence, it is a form of weighted and reweighted least squares regression (Li (1985)). In Stata, the programming language used for this thesis, a version of robust regression first runs OLS regression, gets the Cook’s distance – a measure that combines the information of leverage and residual of the observation – for each observation, and then drops any observation with Cook’s distance greater than one. In the following iteration process, the most influential points are dropped, and then cases with large absolute residuals are down-weighted (Verardi and Croux (2009)). Figure 1 shows the leverage versus the squared residuals of observations, labeled with the entity names (GVKEY) and serving as the basis for the computation of Cook’s distance. I drop the observations with Cook’s distance greater one. (In figure 1, these are observations on entities 109522 and 165743.) When the two observations are excluded, the estimation results of robust regression and OLS regression are very close together. Also, for OLS, standard errors are lower, F-statistics higher, and root mean squared error lower – and thereby summary statistics more closely resemble those of the robust regression. (Results are not shown in a table; the corresponding Stata commands can be found in the appendix.)

The impact of outliers can be substantial. In Fazzari et al. (1988), for example, eliminating or down-weighting high-growth firm years reduces the estimated investment-cash flow sensitivity of the entire low dividend-payout sample to 0.2–0.25. This is effectively identical to the estimate of their unconstrained, low-retention sample. These results suggest that FHP’s overall findings are at least partially impacted by extreme observations, given that high-payout firms are less likely to experience such extreme growth rates (Kaplan and Zingales (1997), p. 206).

Biased findings based on differential outliers in sub-samples are not restricted to Fazzari et al. (1988). These differential outliers are one reason why “broad” classification schemes are generally no longer without controversy. Any splitting criterion that sorts firms into sub-samples with differential outliers in growth rates – this holds, for example, for splits on size and age as well –, so that certain groups grow faster, may be biased toward finding a difference in coefficients on cash flow. This bias may partially explain the large body of evidence (in early literature) finding a higher investment-cash flow sensitivity in fast growing companies, which tend to be classified as financially constrained (Kaplan and Zingales (1997), p. 206). In another criticism, Cleary et al. (2007) find that two otherwise identical firms may face differently severe problems of information asymmetry – implying that there might be substantial heterogeneity regarding financing constraints in a single sub-sample that is based on these broad classifications. Their model predicts that the sensitivity of investment to cash flow is unambiguously higher the greater the asymmetry of information.

This idea serves as a basis for research designs in a number of recent studies, such as Chowdhury et al. (2016), using measures of information asymmetry as proxies for capital market imperfections / financing constraints instead of the broad splits mentioned above. Anyway, applying the research design in Fazzari et al. (1988), I use industrial firm data to analyze differences in investment in firms classified according to their dividend- payout practices. Payout practices should reveal little about investment if the cost disadvantage of external finance is small. Firms will, in this case, use external funds to smooth investment when internal finance fluctuates, independent of their dividend policy. If the cost disadvantage is significant, however, investment should be driven by fluctuations in cash flow for firms that retain and invest most of their income, indicating that they do not have a low-cost source of investment finance (Fazzari et al. (1988), pp. 157–158). Thus, observed payout practices may provide a useful a priori criterion for identifying firms that are likely to face relatively high costs of external finance.

The classification scheme applied in this paper divides firms into three groups based on dividend payouts. Also, the sample period is divided into two sub-sample periods: period 1 covers the years 1990–2002; period 2 covers 2003–2015. Class-1 firms have a ratio of dividends to net income of less than 0.1 for at least 16 years over the total sample period. In order to be classified as a class-1 firm in either period 1, or period 2, a firm needs to have a dividend-net income ratio of less than 0.1 in at least eight years, respectively. Class-2 firms have a dividend-income ratio of less than 0.3, but more than 0.1, for at least 15 years over the total sample period (seven years for periods 1 and 2, respectively). I use 15 and seven years due to the small number of observations in the second class. The third class includes all other firms. A firm’s income can be abnormally low in a particular year. Because of the resulting outlier in the dividend-income ratio, this approach is more robust than classifying firms according...
to their average payout ratio. Also, the classification scheme with at least 7–8 ratio observations in the respective time periods does not come at the cost of too many lost observations, as most firm-year payout observations are available over the entire (sub-)sample period. On top of that, the classification scheme implies that many firms that went out of business over the sample period are naturally excluded, because they will not have that many payout observations – impeding the impact of attrition bias. Structural interpretation of the coefficients should be seen with caution. As is standard in the literature, it is the differential results across sub-samples that inferences are based on.

Summary statistics of the three payout-classes are presented in table 1. These statistics are based on the sample that excludes the two observations with Cook's distance greater one. Clearly, the lowest number of observations is available for class-2 firms. This is why the sub-sample includes firms with payout ratios of up to 0.3 – in contrast to Fazzari et al. (1988), whose class-2 firms are in the payout ratio range of 0.1–0.2. With 4.3, the average number of years with positive dividends in class 1 is obviously the lowest, given that class-2 and class-3 firms pay dividends in almost every year over the sample period. Median sales growth figures are inconspicuous across classes, while their standard deviations are very high for classes 1 and 3. Cash flow (0.2) is insufficient to stem physical investment for class-1 firms (0.94). Both variables are scaled by capital. Again, standard deviations are very high for classes 1 and 3. Average capital stock values across classes are much higher than median values, accounting for the number of high-capital-stock observations. Average capital stock growth over the sample period is highest in classes 1 and 2, with some companies in class 2 experiencing very high growth in the capital stock, while median capital stocks grow strongest in class 1. Finally, average \( M/B \) ratios are higher than median \( M/B \) ratios. Average \( M/B \) is highest in class 1, driven by some high-growth/high-potential companies. Median \( M/B \) is highest in class 3 and lowest in class 1. Section 7.1 includes a comparison of descriptive statistics to those in Fazzari et al. (1988).

4. Models

I examine two of the broad empirical specifications that encompass the most common approaches of constructing models' investment demand side. First (and more important), these are models based on a market-to-book, \( M/B \), ratio – though usually called \( q \) models of investment in the literature – that emphasize market valuations of the firm's assets as the determinant of investment. Derived from an adjustment cost technology, investment is determined according to

\[
I_{it}/K_{it-1} = \beta_0 + \beta_1 (M/B)_{it} + u_{it} .
\]

where \( I_{it}/K_{it-1} \) represents investment in property, plant, and equipment (CapEx) for firm \( i \) during period \( t \), normalized by a firm’s capital stock at the beginning of the period.
the value of an extra unit of capital is just its replacement unit of capital, marginal $M$ keep investing as long as the shadow value of an additional capital market imperfections, a value-maximizing firm will $M$ of the liquidity constraints are important.) However, the intuition $q$ both variables are significant. (Either 0.1 is zero. $M$ is zero. $M/B$ is calculated as number of common shares outstanding, multiplied with the annual closing stock price, plus the book value of current and long-term liabilities; the sum is divided by the book value of total assets. These variables are preferred over Compustat’s total debt (DT) and market capitalization (MKVALT) variables, as for the two latter variables observations are unavailable prior to 1998. It is common practice to assume equivalence of the liabilities’ market and book value. $u_{it}$ is an error term. Some skeptical authors point out that Tobin’s $q$ is difficult to measure and has strict conditions under which it is sufficient to assess how much the firm should invest – this is why it is called $M/B$ in this paper. Hayashi (1982) has derived these conditions. There are at least two problems in measuring $q$ that might affect the econometric results for liquidity: first, $q$ may not reflect market fundamentals when the stock market is excessively volatile. Second, there might be measurement error in the replacement capital stock in $q$ (Hoshi et al. (1991), p. 43).

Hence, it should not be surprising that in investment regression equations that include (flow or stock of) liquidity and $q$, both variables are significant. (Either $q$ is mismeasured, or liquidity constraints are important.) However, the intuition of the $M/B$ model is that, absent considerations of taxes or capital market imperfections, a value-maximizing firm will keep investing as long as the shadow value of an additional unit of capital, marginal $M/B$, exceeds unity. In equilibrium, the value of an extra unit of capital is just its replacement cost, so that marginal $M/B$ is unity. The theoretical advantage of this framework in modeling the effects of internal finance on investment (see below) is that $M/B$ supposedly controls for the market’s evaluation of the firm’s investment opportunities (Fazzari et al. (1988), p. 165). This is important, as internal finance also proxies for other unobservable determinants of investment, in particular the profitability of investment. High liquidity signals that the firm has done well and is likely to continue doing well. Thus, more liquid firms have better investment opportunities; it is not surprising that they tend to invest more (Hoshi et al. (1991), p. 36). Again, there is theoretical ambiguity, this time on the economic interpretation of a high cash stock. Almeida et al. (2004) claim that constrained firms hoard cash to protect against future downturns. (They call this the cash flow sensitivity of cash.) Following this reasoning, high liquidity may be a signal for poor performance, contrary to what Hoshi, Kashyap, and Scharfstein (Hoshi et al. (1991), p. 36) outline.

### 4.1. M/B Specification

In this paper, investment is often determined using the $M/B$ model, including cash flow and firm and year fixed effects, for each of the three payout-classes. That is,

$$ I_{it}/K_{it-1} = \beta_0 + \beta_1(M/B)_{it} + \beta_2(CF_{it}/K_{it-1}) + \alpha_t + \lambda_i + u_{it}. $$

where $CF_{it}/K_{it-1}$ is net income before depreciation, less dividend payments, deflated by beginning-of-period capital.

### Table 1: Summary Statistics: Sample of Firms, 1990-2015

Source: author's calculations based on samples selected from the Compustat database. See text.

<table>
<thead>
<tr>
<th>Category of firm</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of observations</td>
<td>51,111</td>
<td>2,763</td>
<td>27,788</td>
</tr>
<tr>
<td>Median payout ratio</td>
<td>0.01</td>
<td>0.21</td>
<td>0.58</td>
</tr>
<tr>
<td>Average number of years with positive dividends</td>
<td>42,798</td>
<td>42,790</td>
<td>42,847</td>
</tr>
<tr>
<td>Median sales growth</td>
<td>8.4%</td>
<td>8.2%</td>
<td>0.05</td>
</tr>
<tr>
<td>Standard deviation sales growth</td>
<td>8,000.2%</td>
<td>14.9%</td>
<td>4,900.2%</td>
</tr>
<tr>
<td>Median investment-capital ratio</td>
<td>0.94</td>
<td>0.24</td>
<td>0.17</td>
</tr>
<tr>
<td>Standard deviation investment-capital ratio</td>
<td>42,824</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Median cash flow-capital ratio</td>
<td>0.2</td>
<td>0.49</td>
<td>0.19</td>
</tr>
<tr>
<td>Standard deviation cash flow-capital ratio</td>
<td>217.5</td>
<td>42,795</td>
<td>21</td>
</tr>
<tr>
<td>Average capital stock, 1990</td>
<td>154</td>
<td>929.8</td>
<td>2,457.2</td>
</tr>
<tr>
<td>Median capital stock, 1990</td>
<td>42,890</td>
<td>148.8</td>
<td>556.2</td>
</tr>
<tr>
<td>Average capital stock, 2015</td>
<td>566.3</td>
<td>4,721.9</td>
<td>4,516</td>
</tr>
<tr>
<td>Median capital stock, 2015</td>
<td>45.2</td>
<td>67.2</td>
<td>1,440.2</td>
</tr>
<tr>
<td>Average M/B ratio</td>
<td>42,737</td>
<td>42,767</td>
<td>42,887</td>
</tr>
<tr>
<td>Median M/B ratio</td>
<td>0.3</td>
<td>0.6</td>
<td>0.7</td>
</tr>
</tbody>
</table>

$\beta_0$ is the normal value for $I / K$ for the $i$th firm when $M/B$ is zero. $M/B$ is calculated as number of common shares outstanding, multiplied with the annual closing stock price, plus the book value of current and long-term liabilities; the sum is divided by the book value of total assets. These variables are preferred over Compustat’s total debt (DT) and market capitalization (MKVALT) variables, as for the two latter variables observations are unavailable prior to 1998. It is common practice to assume equivalence of the liabilities’ market and book value. $u_{it}$ is an error term. Some skeptical authors point out that Tobin’s $q$ is difficult to measure and has strict conditions under which it is sufficient to assess how much the firm should invest – this is why it is called $M/B$ in this paper. Hayashi (1982) has derived these conditions. There are at least two problems in measuring $q$ that might affect the econometric results for liquidity: first, $q$ may not reflect market fundamentals when the stock market is excessively volatile. Second, there might be measurement error in the replacement capital stock in $q$ (Hoshi et al. (1991), p. 43).

Hence, it should not be surprising that in investment regression equations that include (flow or stock of) liquidity and $q$, both variables are significant. (Either $q$ is mismeasured, or liquidity constraints are important.) However, the intuition of the $M/B$ model is that, absent considerations of taxes or capital market imperfections, a value-maximizing firm will keep investing as long as the shadow value of an additional unit of capital, marginal $M/B$, exceeds unity. In equilibrium, the value of an extra unit of capital is just its replacement cost, so that marginal $M/B$ is unity. The theoretical advantage of this framework in modeling the effects of internal finance on investment (see below) is that $M/B$ supposedly controls for the market’s evaluation of the firm’s investment opportunities (Fazzari et al. (1988), p. 165). This is important, as internal finance also proxies for other unobservable determinants of investment, in particular the profitability of investment. High liquidity signals that the firm has done well and is likely to continue doing well. Thus, more liquid firms have better investment opportunities; it is not surprising that they tend to invest more (Hoshi et al. (1991), p. 36). Again, there is theoretical ambiguity, this time on the economic interpretation of a high cash stock. Almeida et al. (2004) claim that constrained firms hoard cash to protect against future downturns. (They call this the cash flow sensitivity of cash.) Following this reasoning, high liquidity may be a signal for poor performance, contrary to what Hoshi, Kashyap, and Scharfstein (Hoshi et al. (1991), p. 36) outline.

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$$ I_{it}/K_{it-1} = \beta_0 + \beta_1(M/B)_{it} + \beta_2(CF_{it}/K_{it-1}) + \alpha_t + \lambda_i + u_{it}. $$

where $CF_{it}/K_{it-1}$ is net income before depreciation, less dividend payments, deflated by beginning-of-period capital.
\(\alpha_i\) is a firm dummy to remove firm-specific effects. \(\lambda_i\) is a year dummy to weed out macro shocks. (A detailed analysis of estimation methods can be found in chapter 5.) The argumentation for subtracting dividends in the cash flow number follows the reasoning of Lintner (1956). Lintner shows that dividend-smoothing behavior is widespread, based on three important observations concerning dividend policies: first, managers are primarily concerned with the stability of dividends. They believe that the market puts a premium on firms with a stable dividend policy. Second, earnings are the most important determinant of any change in dividends. Most companies appear to have a target payout ratio. If there is a sudden unexpected increase in earnings, firms adjust their dividends slowly. Also, firms are very reluctant to cut dividends. Third, management sets their dividend policy first. Other policies are then adjusted, taking dividend policy as given. For example, if investment opportunities are abundant and the firm has insufficient internal funds, it would resort to outside funds instead of cutting dividends. Hence, subtracting dividends is meaningful, as dividends seem to have a higher priority use of cash flow than investment. Anyway, the robustness section includes a test on the effects of cash flow defined without subtracting dividends.

Theories discussed in Fazzari et al. (1988) imply that for firms that face asymmetric information problems in capital markets, the supply of investment finance is not perfectly elastic. This is in line with Myers and Majluf (1984), who stress that if managers are better informed than investors about a firm’s prospects, the firm’s risky securities will sometimes be underpriced, thereby raising the cost of external finance. It is not only information problems, but also, as described above, incentive problems that lead managers to prefer financing investment with internal funds. Jensen and Meckling (1976) argue that these incentive problems raise the cost of external finance. Outside financing dilutes management’s ownership stake, thereby exacerbating incentive problems that arise when managers control the firm but do not own it. So, regardless of the true economic process at the foundation of investment demand, i.e., no matter whether it is a q model, an accelerator model or any other model, the supply of low-cost finance, and therefore the level of internal cash flow, enters the investment equation of firms for which internal and external finance are not perfect substitutes. This is confirmed by a large body of theoretical work that shows that (flow and stock measures of) liquidity should be an important determinant of investment when there are information problems in the capital markets. Basically all models that posit some sort of information problem in the capital market predict that more liquid firms should invest more. Models also predict that liquidity is irrelevant when there are no information problems (Hoshi et al. (1991), pp. 33–34).

In a first alternative specification of the model in equation 2, I include an analysis of models with cash flow lags and lagged \(M/B\) ratios, respectively. The rationale for this analysis, apart from the possibility to compare the results to FHP (1988, table 6), is that it can give greater insights on the question whether cash flow contains news about investment opportunities. Effects of lagged coefficients on cash flow could well reflect shortcomings in the empirical performance of the \(M/B\) ratio. For example, in FHP (1988, pp. 31–32), \(Q\) is only half as large (0.001 vs. 0.002) when their model includes cash flow lags – a finding that supports this interpretation. Another rationale is that cash flow could have explanatory power in a time-to-build context, which could explain why a contemporaneous coefficient on cash flow lacks significance. In a second alternative specification, the effect of stock measures of a firm’s internal liquidity is analyzed with the model

\[
I_{it}/K_{it-1} = \beta_0 + \beta_1 (M/B)_{it} + \beta_2 (Cash/K)_{it-1} + \alpha_i + \lambda_i + \epsilon_{it} \tag{3}
\]

where \((Cash/K)_{it-1}\) is the stock of liquidity, defined as cash and short-term securities, i.e., securities the firm describes as readily convertible into cash, normalized by the firm’s capital stock in the beginning of the year. The stock of liquidity is measured at the beginning of the period to measure the stock of liquid assets the firm has when it decides on investment at the beginning of the period. This approach follows Kaplan and Zingales (1997) and Kashyap et al. (1994). Stock measures of a firm’s internal liquidity, just like flow measures, might have an effect on investment for firms that must pay a premium for external funds; cash and marketable securities provide a low-cost source of investment finance for these firms. A financial cushion through accumulated liquid resources may reduce the sensitivity of investment to cash flow fluctuations for such firms. Hence, one might expect to observe a positive effect of stock measures of liquidity for the high-retention firms, whose investment is especially sensitive to fluctuations in cash flow. The motivation for this test is analogous to thoughts on precautionary saving. Managers should accumulate a stock of liquid assets when the operational cash flow is high if they know that there is a wedge in the costs of internal vis-à-vis external finance. That liquidity can help to smooth investment over downturns, so that firms impede the necessity to obtain potentially costly capital from external sources. In addition to that, the financial cushion provides collateral for new debt. Covenants may constrain a firm’s ability to use stocks of liquidity. Therefore, when financially constrained firms experience a higher cash stock, they might be able to increase CapEx. Financially unconstrained firms – likely those in Class 3 that pay out a substantial portion of their earnings in the form of dividends – are not expected to experience a significant impact of stock measures of liquidity on investment. If these firms’ retained earnings are lower than their desired level of investment, they should be able to easily raise low-cost external finance.

A potential further reason for the importance of specifying a model with cash stock as a key explanatory variable is that it is less likely than cash flow to indicate much about the profitability of new investments (Fazzari et al. (1988), pp. 179–181). However, Almeida et al. (2004) outline that high liquidity may also be a signal for poor performance. Kaplan and Zingales (Kaplan and Zingales (1997), pp. 202–203) argue that, in theory, there should be no difference between...
Many successful empirical investment models are based on the traditional acceleration principle, despite a lack of a compelling theory behind it (Hoshi et al. 1991, p. 35). For example, Schiantarelli and Georgoutsos (1987) have shown that when firms have monopoly power, lagged production should be related to current investment. Incorporating this sales model in the analysis is also helpful, as one possible explanation for the effects of cash flow variables is that internal finance is correlated with sales (omitted variable bias). As it is typical that both sales and cash flow have significant effects in an investment equation, the question arises whether the cash flow variable should be interpreted as a signal of the profitability of investment not captured in the sales formulation; or does significance mean that cash flow represents low-cost investment supply for firms that face a wedge between the costs of internal and external finance? Incorporating the M/B ratio variable in the regression equation (in an additional model) might help to resolve the question, as it should be more adequate in capturing the prospective profitability of investment than lags of past profits, given that it is based on asset prices determined in forward-looking markets (Fazzari et al. 1988), pp. 173–175). However, both empirical specifications of a model’s investment demand side, M/B and sales accelerator – and including the alternative specifications – are imperfect attempts to control for effects that are difficult to observe. Structural interpretation of the coefficients should be seen with caution. This is why, inter alia, Fazzari et al. (1988) draw conclusions based on estimated differences across the three retention classes, Hoshi et al. (1991) make inferences based on the differences in the effects of liquidity across the two subsets of Japanese firms, and Kaplan and Zingales (1997) rest conclusions on the differences across firms with various degrees of financing constraints.

5. Estimation Methods

This paper pays special attention to the various estimation methods that are used for standard corporate finance regression equations with panel data, such as the equations handled here. In this chapter, these estimation methods are introduced and discussed. Chapter 7.2 handles the estimation specific results. A population multiple linear regression model usually takes the following form:

\[ y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + u. \]  

(5)

The key assumption for this general multiple regression model is \( E(u|x_1, x_2, \ldots, x_k) = 0 \). It requires that all factors in the unobserved error term be uncorrelated with the explanatory variables. It also means that one has correctly accounted for the relationships between the dependent and independent variables. Any problem that causes \( u \) to be correlated with any of the explanatory variables causes the assumption to fail (Stock and Watson (2015), pp. 236–238).

5.1. Ordinary Least Squares

OLS is a main estimation method. An exemplary estimated OLS equation, in the case of two independent variables, looks as follows:

\[ \hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2. \]  

(6)

OLS chooses the estimates that minimize the sum of squared residuals. That is, given \( n \) observations on \( y, x_1 \), and \( x_2 \), the argument that minimizes \( \sum_{i=1}^{n} (y_i - \hat{\beta}_0 - \hat{\beta}_1 x_{i1} - \hat{\beta}_2 x_{i2})^2 \). The estimates \( \hat{\beta}_1 \) and \( \hat{\beta}_2 \) have partial effect, or ceteris paribus, interpretations. Hence, holding all other independent variables constant, the coefficient on \( x_1 \) measures the change in \( \hat{y} \) due to a one-unit increase in \( x_1 \) (Wooldridge (2013), pp. 72–76). Under the first four Gauss-Markov assumptions, OLS is unbiased. When a homoskedasticity assumption, i.e., a constant error variance assumption, is added, OLS has an important efficiency property; the estimator is then the best linear unbiased estimator (BLUE), where best is defined as being the most efficient. Adding an irrelevant variable to an equation generally increases the variances of the remaining OLS estimators because of multicollinearity (Wooldridge (2013), p. 105).

5.2. Fixed Effects

The combined entity and time FE regression method, which is the main method used in this paper, eliminates omitted variable bias arising both from unobserved variables
that are constant over time and from unobserved variables that are constant across entities. A model with a single explanatory variable has the following form:

\[ y_{it} = \beta_1 x_{it} + \alpha_i + \lambda_t + u_{it}, \]  

(7)

where \( \alpha_i \) is the unobserved effect, which is constant over time and disappears in the within-transformation. \( \lambda_t \) denotes a full set of year dummies, which can be left out from the following transformation. For each \( i \), equation 7 is averaged over time:

\[ \bar{y}_i = \beta_1 \bar{x}_i + \alpha_1 + \bar{u}_i, \]  

(8)

Then, equation 8 is subtracted from equation 7:

\[ y_{it} - \bar{y}_i = \beta_1 (x_{it} - \bar{x}_i) + u_{it} - \bar{u}_i. \]  

(9)

Accordingly, in time-demeaned data, the unobserved effect, \( \alpha_i \), has disappeared:

\[ \tilde{y}_{it} = \beta_1 \tilde{x}_{it} + \tilde{u}_{it}. \]  

(10)

The pooled OLS estimator that is based on time-demeaned variables is called the FE estimator. It allows for arbitrary correlation between the unobserved effect and the explanatory variables in any period. Because of this transformation, any explanatory variable that is constant over time gets swept away. Hence, variables, such as a firm’s distance from the airport, cannot be included in the regression equation (Wooldridge (2013), p. 484–485). Regression software typically does not use the dummy variable model formulation (not presented here), as it is tedious if the number of entities is large (Stock and Watson (2015), p. 403). The number of entity-specific intercepts required would be too large. Naturally, time demeaning is potentially problematic when the key explanatory variables do not vary much over time. But even with sufficient time-varying explanatory variables, the FE estimator can be subject to biases—just like the first differences (FD) estimator (see below). For example, strict exogeneity is a critical assumption. If it does not hold, the estimator is inconsistent. Fortunately, unlike the FD estimator, if each \( x_{it} \) is uncorrelated with \( u_{it} \), but the strict exogeneity assumption is otherwise violated—e.g., when the lagged dependent variable is included among the regressors—, the FE estimator’s bias tends to zero at the rate of \( 1/T \) in theory (Wooldridge (2013), pp. 473–491). In a multiple regression with panel data, if the FE regression assumptions hold, the FE estimator is consistent and asymptotically normally distributed when \( n \) is large (Stock and Watson (2015), p. 406). The assumptions (see table 2) extend the least squares assumptions to panel data.

5.2.1. Strict Exogeneity Test

The theoretical part on the strict exogeneity assumption is put as an FE sub-chapter, because the strict exogeneity tests are mainly based on the FE transformation, given that this is the main estimation method for linear unobserved effects panel data models employed in this paper, in the investment-cash flow literature, and in the papers published in the three leading finance journals (Grieser and Hadlock (2015), p. 9). However, I also conduct strict exogeneity tests based on the FD transformation. With an unobserved effect, the strict exogeneity assumption can have the following form:

\[ E(y_{it}|x_{it}, x_{it-1}, ..., x_{it-K}) = E(y_{it}|\alpha_i) = x_{it} \beta + \alpha_i. \]  

(11)

Once controlled for \( x_{it} \) and \( \alpha_i \), \( x_{it} \) has no partial effect on \( y_{it} \) for \( s \neq t \). This assumption is more reasonable than the one without the unobserved effect. The natural assumption is that, once it is controlled for contemporaneous inputs and the unobserved effect, explanatory variables in other years do not affect the dependent variable during the current year. In every year, the explanatory variables generally depend on the unobserved effect. So, it is likely that some partial correlation between the dependent variable in year \( t \) and explanatory variables in other years will exist if it is not controlled for the unobserved effect (Wooldridge (2010), pp. 252–254).

Following the approach by Grieser and Hadlock (2015), I conduct strict exogeneity tests that follow the procedure outlined by Wooldridge (2010). The strict exogeneity tests add one-period-ahead future values of the independent variable to the regression model and test whether the associated coefficient is zero, as should be the case if strict exogeneity holds. (In my case, I use a CapEx lag (dependent variable) and cash flow lag (independent variable), and augment the equation with contemporaneous cash flow.) Hence, evidence of a non-zero one-period-ahead coefficient is taken as evidence against the strict exogeneity assumption. Giving theoretical grounds for the violation of the assumption in this equation, economic intuition suggests that (physical) investment today translates into a future cash inflow stream—that is the nature of decision making based on a project’s expected net present value. The FE investment equation that is subject to the Wooldridge (2010) test takes the following form:

\[ I_{it-1}/K_{it-2} = \beta_0 + \beta_1 (CF_{it}/K_{it-1}) + \beta_2 (CF_{it-1}/K_{it-2}) + \alpha_i + \lambda_t + u_{it}. \]  

(12)

The test is for a model in which the dependent variable is a linear function of the firm fixed effect, year dummies, and the selected explanatory variable. Apart from the test on equation 12, a test for a model in which all of the independent variables are included (that is, cash flow, as well as \( M/B \)) is conducted as well. Both tests are for the total sample period. Given the lack of general significance of the traditional investment-cash flow sensitivity (see results section), the strict exogeneity test is conducted again with a regression of total investment on cash flow, as results for this equation are relatively significant (see robustness section). This is meaningful, because a lack of contemporaneous correlation of cash flow and CapEx (i.e., no violation of simple exogeneity) makes the finding of a violation of the strict exogeneity assumption unlikely, undermining the relevance of strict exogeneity tests in the setting of this thesis. For this equation, I
conduct tests on periods 1 and 2 as well. I follow the procedure outlined in this paragraph for tests on the FD transformation. The first-differenced equation is augmented by the standard variable of contemporaneous cash flow, scaled by the capital stock.

5.2.2. Magnitudes of Errors if no Strict Exogeneity
Economic theory also suggests that strict exogeneity should be violated in many other standard panel finance settings. Hence, general inconsistency of the FE and FD estimates in these settings is a concern. However, if the inconsistency is small – as many researchers assumed prior to Grieser and Hadlock (2015) –, inferences regarding the magnitude of a coefficient or whether it is significantly different from zero may be at least approximately valid. As Wooldridge (2010) notes, substantial differences between FE and FD estimators are often an indication of a violation of strict exogeneity – and suggest that the problem caused by inconsistency is one of a large magnitude. To gauge the possible magnitude of inference errors, I analyze the relative variation in the FE and FD estimates based on an unbalanced, as well as on a balanced panel. Under strict exogeneity, these two estimates asymptotically converge to the same true underlying parameter value. If the assumption is violated, both estimators have different probability limits, neither of which is the true parameter value of interest (Grieser and Hadlock 2015, p. 3).

As a researcher, a reason for working with FE, though knowing that its estimator might be inconsistent, is that he could hope for a $1/T$ save. The FE and FD estimators are both inconsistent when strict exogeneity fails. However, the degree of inconsistency of the FE estimator may be smaller in a long panel than the inconsistency in the FD estimator. This is because the FE estimator effectively differences variables from their means while the FD estimator takes differences from adjacent periods. Feedback effects are intuitively more influential when directly comparing adjacent periods. In fact, this notion is formally captured in that the inconsistency of the FE estimator is in the order of $1/T$, while the inconsistency of the FD estimator is independent of $T$. This is why researchers, when a long panel is available, hope that the FE coefficients are relatively informative. For this to be justified, a firm’s fixed effect for the dependent variable of interest needs to be stable over the entire sample period. But, for example, due to occasional changes to an average firm’s management, shareholder base, and capital, economic intuition makes obvious that the assumption of a stable unit-level fixed effect over a long sample period may not hold. In fact, Grieser and Hadlock (2015) do not find support for the stability of the underlying unit-level fixed effects coefficients.

5.3. First Differences
A third main estimation method employed is first differencing. After first differencing the data, a full equation looks like

$$
\Delta y_{it} = \alpha_i + \alpha_j d_3 + \alpha_k d_4 + \ldots + \alpha_l d_T + \beta_1 \Delta x_{i1} + \beta_2 \Delta x_{itk} + \Delta u_{it},
$$

(13)

where there are $T-1$ time periods on each unit $i$. $d_3$, $d_4$, etc. denote year dummies. $\Delta y_{it}$ is equal to $y_{it}$ minus $y_{it-1}$. The total number of observations is $N(T-1)$. As there is nothing to subtract from $t=1$, there is no differenced equation for $t=1$. By allowing an intercept to be included, a differenced equation for $t=2$ must be excluded. The reason I include a dummy variable for each time period is to account for the secular changes that are not being modeled. This is meaningful when $T$ is small relative to $N$. Provided that the observations have been properly organized and the differencing has been carefully done, equation 13 is simple to estimate by pooled OLS. Arranged chronologically, the first $T$ records are for the first cross-sectional observations, the second $T$ records are for the second cross-sectional observations, arranged chronologically, and so forth. Just like with the FE method, there are

### Table 2: Fixed Effects Regression Assumptions

| Assumption FE.1 | For each $i$, the model is $y_{it} = \beta_1 x_{it1} + \ldots + \beta_k x_{itk} + \alpha_i + u_{it}$, $t = 1, T$, where the $\beta_j$ are the parameters to estimate and $\alpha_i$ is the unobserved effect. |
| Assumption FE.2 | The sample is randomly chosen from the cross section. |
| Assumption FE.3 | No perfect multicollinearity is present. |  
In addition to that, at least for some entities, each explanatory variable changes over time. |
| Assumption FE.4 | Given all $t$ values of $x_i$ and the unobserved effect, the error term has conditional mean zero. This implies that there is no omitted variable bias. This assumption is violated if current $u_i$ is correlated with past, present, or future values of $x_i$. |
| Assumption FE.5 | The errors are homoskedastic. |
| Assumption FE.6 | Conditional on all explanatory variables and $\alpha_i$, the idiosyncratic errors are uncorrelated. |
| Assumption FE.7 | The variables are i.i.d. across entities for $i = 1, \ldots, n$. This assumption holds if entities are selected by random sampling from the population. |

potential problems with first differencing when the key explanatory variables do not vary much over time. The strict exogeneity assumption is even more critical for the FD method. If this assumption is violated, the bias in the FD estimator does not depend on \( T \), that is, having more time periods does not reduce the inconsistency in the estimator. Also, employing the FD estimator can be worse than pooled OLS if at least one of the explanatory variables is subject to measurement error (Wooldridge (2013), pp. 473–491). When the disturbances follow a random walk, the FD estimator is more efficient than the FE estimator. The FE estimator, however, is more efficient when the errors are serially uncorrelated (Wooldridge (2010), p. 284). In many applications, the unobserved factors that change over time are serially correlated. Anyway, in practice, the FE estimator is used more frequently than the FD estimator. This is because the unobserved effects model is typically stated with serially uncorrelated idiosyncratic errors (Wooldridge (2013), p. 490). Under assumptions FD.1–FD.6, which are quite similar to the FE assumptions, the FD estimator of the \( \beta_j \) is the BLUE, conditional on the explanatory variables (table 3). FD.7 is needed in order to have a normal distribution of the FD estimators. Without this assumption, it can be relied on the asymptotic approximations.

5.4. Random Effects

In using FE or FD, the goal is to eliminate \( \alpha_i \), because the effect presumably is correlated with one or more of the \( x_{itj} \). A transformation to eliminate \( \alpha_i \) is redundant (and inefficient) when one thinks that \( \alpha_i \) is uncorrelated with each explanatory variable in all time periods. So, when \( \text{Cov}(x_{itj}, \alpha_i) = 0 \), the standard unobserved effects model of equation 7 becomes a random effects (RE) model, if correlation is assumed, FE or FD should be used. (The RE estimation method is the fourth and last method used/analyzed in this paper.) In cases in which the unobserved effect is thought to be uncorrelated with the explanatory variables, the \( \beta_j \) can be consistently estimated using a single cross section, as there is no need to control for the unobserved effect in order to avoid omitted variable bias. Though there is no need for panel data, a single cross section disregards much useful information in the other time periods. Under the FE assumptions, employing a pooled OLS procedure instead of RE produces consistent estimators of the \( \beta_j \) as well; but it allows for positive serial correlation in the composite error term. The composite error term is defined as \( \nu_{it} = \alpha_i + u_{it} \). So, the pooled OLS procedure ignores a key feature of the model: because \( \alpha_i \) is in the error term in each time period, the \( \nu_{it} \) are autocorrelated. Generalized least squares (GLS) can be used to solve the serial correlation in the errors. The transformed GLS equation turns out to be

\[
y_{it} - \theta \tilde{y}_{i} = \beta_0 (1 - \theta) + \beta_1 (x_{it1} - \theta \bar{x}_{i1}) + \ldots + \beta_k (x_{itk} - \theta \bar{x}_{ik}) + \nu_{it} - \theta \tilde{\nu}_{i}, \tag{14}
\]

where, again, the overbar denotes time averages. The transformed GLS equation involves quasi-demeaned data. The difference to time-demeaned data is that the RE transformation subtracts a fraction, \( \theta \), of the time averages. This fraction depends on \( \sigma^2_u, \sigma^2_{\alpha} \), and the number of time periods, \( T \). The FE estimator, as usual, subtracts the time averages from the corresponding variable. The fraction, \( \theta \), equals \( 1 - \text{Corr}(\nu_{it}, \bar{\nu}_i) \). Pooled OLS is obtained when \( \theta = 0 \). FE is obtained when \( \theta = 1 \). Whereas, in practice, the estimator is never zero or one, the RE estimates will be close to the pooled OLS estimates when \( \sigma^2_u \) is small relative to the error variance, which implies that the unobserved effect is relatively unimportant. It is more common for the unobserved effect’s variance to be large relative to \( \sigma^2_{\alpha} \) in which case \( \tilde{\theta} \) will be closer to unity. The GLS estimator, which uses \( \theta \), is called RE estimator and is simply the pooled OLS estimator of equation 14, in which the errors are no longer autocorrelated. RE allows for explanatory variables that are constant over time. This clearly is an advantage over FE and FD. These time-constant right-hand-side variables can be included in the RE method because only a fraction of the time averages is subtracted, given that RE assumes that the unobserved effect is uncorrelated with these variables. However, in many applications, the whole reason for using panel data is to allow the unobserved effect to be correlated with the explanatory variables. Therefore, situations when RE is preferred over FE/FD are scarce. This is though FE and FD are not necessarily more suitable than RE when there is a time-varying key policy variable. It is just that it takes, for example, a natural experiment setting to achieve \( \text{Cov}(x_{itj}, \alpha_i) = 0 \). It is much more likely that the regressors themselves are outcomes of choice processes. Compared to pooled OLS, RE is preferred, as it is generally more efficient. Comparing efficiency of RE to FE, the RE estimator is more efficient for coefficients on time varying-explanatory variables. But FE is not meant to be efficient under the RE assumptions, which can be seen in table 4. There is a tradeoff between robustness and efficiency, as FE is just intended to be robust to correlation between \( \alpha_i \) and the \( x_{itj} \). Naturally, the RE assumptions include the requirement that \( \alpha_i \) is independent of all explanatory variables in all time periods. On top of that, the ideal RE assumptions include most of the FE assumptions. Under these, the estimator is consistent (not unbiased) and asymptotically normally distributed (Wooldridge (2013), pp. 490–496). Assumption FE.3 is omitted, because time-constant explanatory variables are allowed (Wooldridge (2013), p. 510).

6. Standard Errors

The asymptotic 95 percent confidence interval is \( \hat{\beta} \pm 1.96 \times se \), where \( se \) stands for standard error. Hypothesis testing is typically based on the Wald \( t \)-statistic, defined as \( w = (\hat{\beta} - \beta_0)/se \). It is clear that both \( \hat{\beta} \) and \( se \) are critical ingredients for statistical inference, so that obtaining accurate standard errors is of fundamental importance (Cameron and Miller (2015), pp. 4–5). In panel data, the regression error can be correlated over time within an entity. This correlation does not introduce bias into the fixed effects
estimator, but it affects the variance of the fixed effects estimator and, thus, it affects how one computes standard errors, just like with heteroskedasticity (Stock and Watson (2015), pp. 411–413). It is not unusual to have applications where standard errors that control for within-cluster correlation are several times larger than default standard errors that ignore such correlation (see robustness section below for an example). A failure to control for within-cluster correlation can lead to these misleadingly small standard errors that ignore such correlation (see robustness section for clustered errors, as the cluster-robust standard errors are estimated to control for within-cluster error correlation, these cluster-robust standard errors require the additional assumption that the number of clusters, rather than just the number of observations, goes to infinity (Cameron and Miller (2015), p. 5).

There are two principles that give guidance to determine what to cluster over: first, whenever there is reason to believe that both the regressors and the errors might be correlated within cluster, one should think about clustering defined in a broad enough way to account for that clustering. Second, $\hat{V}_{\text{cluster}}[\hat{\beta}]$ is the group average, a term that gets closer to $V[\beta]$ only as the number of groups becomes large. ($\hat{V}_{\text{cluster}}$ is the standard estimator for the variance of the cluster.) This means that, if one defines very large clusters, so that there are very few clusters to average over, the resulting $\hat{V}_{\text{cluster}}[\hat{\beta}]$ can be a very poor estimate of $V[\beta]$. Just like when comparing the estimation methods FE and RE in chapter 5.4, these two principles illustrate the bias-variance tradeoff that is common in many estimation problems: larger and fewer clusters have less bias but more variability. There is neither a general solu-

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### Table 3: First Differences Regression Assumptions


| Assumption FD.1 | For each $i$, the model is $y_{it} = \beta_1 x_{i1t} + \ldots + \beta_k x_{ik} + \alpha_i + u_{it}, t = 1, T$, where the $\beta_j$ are the parameters to estimate and $\alpha_i$ is the unobserved effect. |
| Assumption FD.2 | The sample that is being worked with is randomly chosen from the cross section. |
| Assumption FD.3 | No perfect multicollinearity is present. In addition to that, at least for some entities, each explanatory variable changes over time. |
| Assumption FD.4 | Given all $t$ values of $x_i$ and the unobserved effect, the error term has conditional mean zero. This implies that there is no omitted variable bias. This assumption is violated if current $u_i$ is correlated with past, present, or future values of $x_i$. |
| Assumption FD.5 | The differenced errors are homoskedastic. |
| Assumption FD.6 | The differenced errors follow a random walk; the $u_{it}$ are serially uncorrelated. |
| Assumption FD.7 | Conditional on the explanatory variables, the $\Delta u_{it}$ are i.i.d. normal variables. |

### Table 4: Random Effects Regression Assumptions


| Assumption RE.1 | There is no perfect multicollinearity. |
| Assumption RE.2 | Given all explanatory variables, the expected value of $\alpha_i$ is constant. This is the key distinction between RE and FE, as it rules out $\text{Corr}(x_{it}, \alpha_i) \neq 0$. |
| Assumption RE.3 | $\alpha_i$ is homoskedastic. |
tion to this tradeoff, nor a formal test of the level at which to cluster. The consensus is to be conservative and avoid bias, and use bigger and more aggregate clusters when possible. In practice, one should start clustering at a narrow level, which is then being broadened until there is relatively little change in the standard errors (Cameron and Miller (2015), p. 21). This procedure is being followed in section 7.3, and serves as a basis for the decision to cluster over firms in this paper. There are several settings where one may not need to use cluster-robust standard errors at all. In any of these cases, it is always possible to still obtain these errors and compare them with the default standard errors. The appreciable differences revealed in the robustness section serve as a general reason for choosing cluster-robust standard errors. The above-mentioned cluster-robust standard error assumption, which implies that the number of clusters should go to infinity, is another argument in favor of clustering at firm level. As outlined in chapter 5, Wooldridge (Wooldridge (2010), p. 256) writes that for pooled OLS, the composite errors will be autocorrelated due to the presence of $a_i$ in each time period. Hence, inference using pooled OLS requires robust test statistics.

7. Results

Table 5 presents estimates of the $M/B$ investment model, including cash flow, for each of the three retention-classes. The equations were estimated with fixed firm and year effects. Results are presented for three time periods, 1990–2002 (period 1), 2003–2015 (period 2), and 1990–2015 (total sample period). The striking result is that it is only the coefficient on cash flow for group 2 that is strongly statistically and slightly economically significant; I would rather expect significance for class-1 firms. The coefficient amounts to 0.088 for period 1, 0.033 for period 2, and 0.04 for the total sample period, and is always significant at least at the five-percent level. Economically, this means that an increase in the cash flow-capital ratio by one increases the investment-capital ratio by 0.088 (period 1). An increase by one is equivalent to increasing the cash flow, scaled by capital, of the median class-2 firm by just over 200 percent. An effect on investment-capital of 0.088 is equivalent to 37 percent of the median class-2 firm's investment-capital ratio (see table 1). Hence, for the median class-2 firm over 1990–2002, increasing the cash flow-capital ratio by 200 percent translates into an increase in the investment-capital ratio of 37 percent.

Sticky dividends, that is, a reluctance to cut dividends, cannot be the driver of this finding, because the signaling effect is incorporated in the definition of cash flow, in which dividends are already subtracted. Also, the signaling effect should then lead to cash flow significance for the third-class firms as well. The underlying rationale for a potential impact is that, in the case of small cost differentials between internal and external finance, mature firms with substantial payouts might reduce investment instead of cutting dividends when cash flow falls (Fazzari et al. (1988), p. 183).

Agency costs of internal finance, that is, potential "managerial waste" on less productive investments, could be a driver of the effect – just like irrational or overly risk-averse managers, who choose to rely primarily on operational cash flow to invest despite the possibility to get low-cost external funds (Kaplan and Zingales (1997), p. 173; Andrén and Jankensgård (2015)). But again, this point should then hold for class-3 firms as well – but for these firms, the coefficient on cash flow is statistically and economically insignificant in any sample period examined. As outlined in Cleary et al. (2007), two otherwise identical firms may face severe differences in asymmetric information problems. The authors conclude that a model that captures information asymmetries (bid-ask spreads) is more adequate to proxy for financing constraints than a broad proxy, such as dividend payouts. Though this potentially explains the findings presented here, it stands in contrast to the vast literature using these broad proxies to classify firms according to their degree of financing constraints. Still, dividend payouts specifically might no longer serve as an adequate proxy for financing constraints. However, the class-2 coefficient on cash flow is insignificant when sales variables are included in the model (see table 8). This suggests that the apparent correlation between cash flow and investment in these (more mature) firms may be due to the omission of output terms important in reconciling the difference between marginal and average $M/B$. Still, this should then hold for the third class as well.

The general interpretation of a lack of significance of cash flow in explaining investment across the three payout-classes is that there is only a small (if at all) cost disadvantage of external finance, so that payout ratios reveal nothing about investment: firms will use external funds to smooth investment when internal finance fluctuates. This finding is in line with the growing literature showing a decrease (often disappearance) of the investment-cash flow sensitivity (inter alia, Chen and Chen (2012)). No present financing constraints – measured by the investment-cash flow sensitivity – across classes could be, as described in chapter 1, driven by a) the downward omitted variable bias that might occur due to a failure to account for external finance in the regression, b) a deterioration in the relative importance of tangible investment, and/or c) an increased and cheaper usage of public equity markets by young firms (Brown and Petersen (2009)).

A different aspect is described in Kaplan and Zingales (Kaplan and Zingales (1997), p. 205). They outline that when deflating variables by net property, plant, and equipment, estimates are only consistent when there is no growth, among other things. So, if investment and cash flow growth at a rate similar to the rate of sales growth, part of the two variables' co-movement may be due to a scale factor. As this effect biases the investment-cash flow sensitivity upwards, firms with higher annual growth rates may drive the results. Neither the median sales growth of class-1 firms (8.4 percent), nor that of class-2 firms (8.2 percent) is abnormally high, such as the 18 percent growth rate in the sample of Kaplan and Zingales (1997). Unlike in Fazzari et al. (1988), outliers (see the high standard deviation of sales growth for classes...
Table 5: Effects of Cash Flow and M/B on Investment, Various Periods, 1990-2015

Source: author’s estimates of equation 2 based on a sample of firm data from Compustat database. See text.

a. Property, plant and equipment and K is beginning-of-period capital stock. The equations were estimated using fixed firm and year effects (not reported). The constant is not reported. Cluster-robust standard errors appear in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

b. Independent variables are defined as follows: (CF/K)$_{it}$ is the cash flow-capital ratio, defined as the sum of net income and depreciation, less dividend payments, deflated by beginning-of-period capital. (M/B)$_{it}$ is the market-to-book ratio. It is calculated as the common stock, multiplied with the annual closing stock price, plus current and long term liabilities; the sum is divided by total assets.

<table>
<thead>
<tr>
<th>Independent variable and summary statistic$^a$</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(C F/K)_{it}$</td>
<td>-0.011*</td>
<td>0.088***</td>
<td>0.036</td>
</tr>
<tr>
<td>(0.007)</td>
<td>(0.016)</td>
<td>(0.044)</td>
<td></td>
</tr>
<tr>
<td>$(M/B)_{it}$</td>
<td>0.009</td>
<td>0.016***</td>
<td>-0.000</td>
</tr>
<tr>
<td>(0.011)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
<td>Within $R^2$</td>
<td>0.0124</td>
<td>0.425</td>
<td>0.0790</td>
</tr>
<tr>
<td>1990-2002</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$(C F/K)_{it}$</td>
<td>0.022</td>
<td>0.033**</td>
<td>0.000</td>
</tr>
<tr>
<td>(0.020)</td>
<td>(0.014)</td>
<td>(0.000)</td>
<td></td>
</tr>
<tr>
<td>$(M/B)_{it}$</td>
<td>0.051</td>
<td>0.002**</td>
<td>0.009***</td>
</tr>
<tr>
<td>(0.041)</td>
<td>(0.001)</td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
<td>Within $R^2$</td>
<td>0.0140</td>
<td>0.0852</td>
<td>0.008</td>
</tr>
<tr>
<td>2003-2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$(C F/K)_{it}$</td>
<td>-0.007</td>
<td>0.040***</td>
<td>-0.003</td>
</tr>
<tr>
<td>(0.008)</td>
<td>(0.015)</td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
<td>$(M/B)_{it}$</td>
<td>-0.003</td>
<td>0.007*</td>
<td>0.005***</td>
</tr>
<tr>
<td>(0.009)</td>
<td>(0.004)</td>
<td>(0.002)</td>
<td></td>
</tr>
<tr>
<td>Within $R^2$</td>
<td>0.004</td>
<td>0.104</td>
<td>0.016</td>
</tr>
<tr>
<td>1990-2015</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 and 3) do not seem to bias the sensitivity upwards, given the lack of significance in the cash flow coefficients. Apart from that, a lack of significance of class 1 firms’ coefficient on cash flow might be because class-1 firms include companies that are in financial distress. For these, it is plausible that there are low investment-cash flow sensitivities. For example, creditors might force an insolvent firm to use additional cash flow to repay debt rather than for CapEx. Necessarily, this reduces the investment-cash flow sensitivity (Kaplan and Zingales (1997), p. 208).

It is unexpected that there is no (general small) sensitivity of investment to cash flow for the vast majority of firms, as this sensitivity would be easy to justify. There is a wedge between internal and external costs of finance for all firms as long as some transaction costs are involved (Kaplan and Zingales (1997), p. 173). Findings might be interpreted in that transaction costs might simply be too low by now to establish a sensitivity of investment to cash flow. Finally, it is intuitive that the cash flow effect on investment of class-2 firms is stronger in period 1 (0.088) than in period 2 (0.033) and stronger than over the total sample period (0.04). Asymmetric information should reduce with the degree to which the market understands the companies and its projects, that is, with the time the companies are in existence.

There is no clear-cut pattern in the coefficients on M/B. The coefficient on M/B is statistically significant for class-2 across all periods. For class 1, the coefficient is economically significant (0.051) in the period 2003–2015. For class 3, it is statistically significant in the second period, as well as for the entire sample period. These findings are not surprising, as in most empirical studies, the size of the coefficient on M/B is small. Also, in cases, in which there is a premium for issuing new shares, there is a possibility that the firm finds itself at a point of discontinuity where all profits are retained, no dividends are paid, and the firm’s future prospects are not good enough to induce it to issue new shares. In that case, M/B does not matter, while cash flow should matter (Devereux and Schiantarelli (1990), p. 293). This argument is based on the adverse selection argument in Myers and Majluf (1984).

In addition to that, as addressed in section 4, the market-to-book ratio may not reflect market fundamentals during times when the stock market is excessively volatile. In this case, one would expect that during times of potential speculative bubbles or fads in the stock market over the sample period (dot-com bubble, financial crisis), the coefficients...
on $M/B$ and cash flow should be different, compared with more stable periods. In particular, one may expect that $M/B$ matters less relative to cash flow during these extreme times (Blanchard et al. (1993)). Obviously, even ex-post, it is difficult to identify unambiguously when bubbles/fads caused stock prices to be a poor reflection of fundamentals. A glance at the within R-squared numbers underlines that the regressions are driven by the cash flow coefficients. Within R-squared is, with 0.425, high for class 2 in the first period (in which the cash flow coefficient is the highest as well). For period 2 and the total sample period, within R-squared figures for class 2 are noteworthy as well. For classes 1 and 3 – with the small exception of class 3, first period, due to a cash flow coefficient of 0.036 – within R-squared is not substantially different from zero.

Table 6 reports estimates of alternative specifications in order to test the previous result’s robustness and to check whether cash flow lags have a stronger effect on investment, for example, in a time-to-build context. Results are reported for both periods, 1990–2002 and 2003–2015, for each of the three payout-classes. The first model in table 6 includes two cash flow lags. For classes 1 and 3 over both time periods, coefficients on these lags are statistically and economically insignificant. The coefficient on contemporaneous cash flow of class 2 is robust to the incorporation of the lags. This implies that financial constraints positively affect the sensitivity of investment to cash flow – as well as within R-squared – are indistinguishable from the estimation results in table 5. This implies the following: a) the stock of liquidity does not function as a financial cushion to smooth investment and to reduce the sensitivity of investment to cash flow; b) a cushion does not seem to provide collateral for new debt, which could be used for CapEx; c) cash stock does not proxy for longer lags of cash flow – but lags of cash flow were insignificant already; d) as expected, cash stock does not reveal any news about the profitability of investments. Results might also be impacted by an unclear relation of cash holdings to financing constraints, as outlined in Hadlock and Pierce (2010). To the extent that the significant coefficient on cash flow for the second class is driven by data issues or omitted accelerator effects of sales, clear-cut insignificance of cash stock is a windfall for the hypothesis that there is really no significant cost disadvantage for external finance for any of the three payout-classes. The second model in table 7 includes the sum of the flow of cash and the stock of cash instead of two separate variables. As cash stock does not capture any information relevant for explaining the variation in CapEx, the sum of cash flow and cash stock is less helpful in explaining investment than cash flow itself. This leads to a lower statistical and economic significance of the coefficient on the sum relative to the coefficient on cash flow and, hence, a lower R-squared.

Table 8 presents estimated equations for the three payout-classes that include cash flow and current and lagged values of sales. Two equations are reported: one that includes only cash flow augmented by sales variables (see equation 4 above), and a second one that adds $M/B$ to that equation 4. In both estimations, it is striking that none of the coefficients on cash flow is significant, while the contemporaneous effect of sales is approximately equally significant in economic terms across the three classes and statistically significant in the second class. Therefore, the effects of cash flow in the $M/B$ model can indeed be explained by the correlation of cash flow and sales – and, hence, by an omitted variable bias. Fluctuations in sales seem to motivate changes in capital spending; cash flow does not seem to represent an additional supply of low-cost investment finance for firms that have to pay a premium for external funds. Findings are not impacted when the equation is augmented by $M/B$.

7.1. Comparison to Fazzari et al. (1988)

Beginning with Fazzari et al. (1988), a comprehensive empirical literature has documented that a positive and significant relationship between cash flow and investment exists, holding investment opportunities constant (Andrén and Jankensgård (2015), p. 204). In addition to that, almost all of the earlier studies support the Fazzari et al. (1988) findings that financial constraints positively affect the sensitivity of investment to cash flow (Gatchev et al. (2010), p. 729). Though this financing constraints view has been challenged and the interpretation of the investment-cash flow sensitivity

Source: same like table 5.

a. The dependent variable is the investment-capital ratio \((I/K)_{it}\). All independent variables are as defined in table 5, note b. Equations are estimated with fixed firm and year effects (not reported). The constant is not reported. Cluster-robust standard errors appear in parentheses. *** \(p<0.01\), ** \(p<0.05\), * \(p<0.1\).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>((CF/K)_{it})</td>
<td>-0.014 (0.009)</td>
<td>0.028 (0.027)</td>
<td>0.027*** (0.013)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.000 (0.001)</td>
<td>-0.001** (0.001)</td>
</tr>
<tr>
<td>((CF/K)_{it-1})</td>
<td>-0.004 (0.005)</td>
<td>0.010 (0.011)</td>
<td>0.030*** (0.009)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.005 (0.006)</td>
<td>-0.005 (0.014)</td>
</tr>
<tr>
<td>((CF/K)_{it-2})</td>
<td>-0.000 (0.001)</td>
<td>0.003 (0.007)</td>
<td>0.029*** (0.006)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.001 (0.002)</td>
<td>0.016 (0.014)</td>
</tr>
<tr>
<td>((M/B)_{it})</td>
<td>0.000 (0.006)</td>
<td>0.058 (0.044)</td>
<td>0.015*** (0.002)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.002 (0.002)</td>
<td>0.002* (0.002)</td>
</tr>
<tr>
<td>Within (R^2)</td>
<td>0.031 (0.021)</td>
<td>0.472 (0.120)</td>
<td>0.007 (0.009)</td>
</tr>
</tbody>
</table>

Model with cash flow lags

| \((CF/K)_{it}\)                           | -0.011 (0.007)      | 0.029*** (0.017)  | 0.032** (0.014)   |
|                                          |                     | -0.000 (0.001)    | -0.000 (0.000)    |
| \((M/B)_{it}\)                            | 0.017 (0.016)       | 0.052 (0.041)     | 0.017*** (0.004)  |
|                                          |                     | 0.001 (0.001)     | 0.005** (0.002)   |
| \((M/B)_{it-1}\)                         | -0.014 (0.013)      | 0.025 (0.047)     | 0.002 (0.004)     |
|                                          |                     | 0.003* (0.002)    | 0.000 (0.003)     |
| Within \(R^2\)                            | 0.013 (0.013)       | 0.120 (0.087)     | 0.007 (0.003)     |

Model including lagged market-to-book ratio

| \((CF/K)_{it}\)                           | -0.006 (0.009)      | 0.039*** (0.015)  | -0.003 (0.015)    |
|                                          |                     |                   | (0.030)           |
| \((M/B)_{it}\)                            | 0.004 (0.004)       | 0.001 (0.001)     | 0.001 (0.001)     |
|                                          |                     |                   | (0.001)           |
| \((M/B)_{it-1}\)                         | -0.001 (0.010)      | 0.007* (0.004)    | 0.004** (0.002)   |
|                                          |                     |                   | (0.002)           |
| Within \(R^2\)                            | 0.006 (0.010)       | 0.105 (0.087)     | 0.019 (0.003)     |

Table 7: Effects of Cash Flow, Cash Stock, and M/B on Investment, 1990 - 2015a

Source: first model is based on the author's estimates of equation 3. Second model is based on a variant of that model. Both models are based on a sample of firm data from Compustat database. See text.

a. The dependent variable is the investment-capital ratio \((I/K)_{it}\), where I is investment in property, plant and equipment and K is beginning-of-period capital stock. Equations are estimated with fixed firm, and year effects (not reported). The constant is not reported. Cluster-robust standard errors appear in parentheses. *** \(p<0.01\), ** \(p<0.05\), * \(p<0.1\).

b. Cash is defined as beginning-of-period cash and short-term securities. All other independent variables are as defined in table 5, note b.

<table>
<thead>
<tr>
<th>Independent variable and summary statistic</th>
<th>Class 1 Class 2 Class 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>((CF/K)_{it})</td>
<td>-0.006 (0.009)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>((Cash/K)_{it-1})</td>
<td>0.004 (0.004)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>((M/B)_{it})</td>
<td>-0.001 (0.010)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Within (R^2)</td>
<td>0.006 (0.010)</td>
</tr>
</tbody>
</table>

Model including sum of cash flow and stock variable

| \((CF_{it} + Cash_{it-1})/K_{it}\)       | 0.002 (0.004)         | 0.003** (0.001)    | -0.000 (0.001)    |
|                                          |                       | (0.001)            |
| \((M/B)_{it}\)                           | 0.005 (0.008)         | 0.008** (0.004)    | 0.004*** (0.002)  |
|                                          |                       | (0.002)            |
| Within \(R^2\)                           | 0.002 (0.008)         | 0.077 (0.044)      | 0.005 (0.002)     |
Table 8: Effects of Cash Flow, Safes, and M/B on Investment, 1990-2015

Source: first model is based on the author’s estimates of equation 4. Second model is based on equation 4 and includes (M/B). Both models are based on a sample of firm data from Compustat database. See text.

a. The dependent variable is the investment-capital ratio (I/K), where I is investment in property, plant and equipment and K is beginning-of-period capital stock. Equations are estimated with fixed firm, and year effects (not reported). The constant is not reported. Cluster-robust standard errors appear in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

b. (S/K)_it is the ratio of sales, S, to the beginning-of-period capital stock. All other independent variables are as defined in table 5, note b.

<table>
<thead>
<tr>
<th>Independent variable and summary statistic</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model with sales-capital ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(CF/K)_it</td>
<td>-0.017</td>
<td>-0.016</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.015)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>(S/K)_it</td>
<td>0.014</td>
<td>0.012**</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.006)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>(S/K)_{it-1}</td>
<td>-0.002</td>
<td>0.004</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>(S/K)_{it-2}</td>
<td>-0.001</td>
<td>-0.001</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>(S/K)_{it-3}</td>
<td>-0.001</td>
<td>-0.003</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.004)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Within R^2</td>
<td>0.020</td>
<td>0.164</td>
<td>0.028</td>
</tr>
<tr>
<td>Model with sales-capital ratio and M/B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(CF/K)_it</td>
<td>-0.017</td>
<td>-0.016</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.015)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>(S/K)_it</td>
<td>0.013</td>
<td>0.012**</td>
<td>0.011</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.006)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>(S/K)_{it-1}</td>
<td>-0.001</td>
<td>0.004</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>(S/K)_{it-2}</td>
<td>-0.001</td>
<td>-0.001</td>
<td>-0.011**</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>(S/K)_{it-3}</td>
<td>-0.001</td>
<td>-0.003</td>
<td>0.031**</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.004)</td>
<td>(0.014)</td>
</tr>
<tr>
<td>(M/B)_it</td>
<td>-0.006</td>
<td>0.009**</td>
<td>0.004**</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.004)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Within R^2</td>
<td>0.019</td>
<td>0.167</td>
<td>0.127</td>
</tr>
</tbody>
</table>

continues to generate controversy, it is sensible to compare the findings of this paper with the ones by the parent of all papers in this literature (Fazzari et al. (1988), p. 695).

While my approach is relatively close to that in Fazzari et al. (1988), there could still be significant differences in estimation results, inter alia, due to the following: first, Fazzari et al. (1988) use Value Line data, while I work with data from Compustat. Second, many variables are defined differently. For example, they use three Q measures (Tobin’s q, tax-adjusted Q with no dividends paid, tax-adjusted Q with dividends paid), while I work with the simple M/B measure. Also, FHP (Fazzari et al. (1988), pp. 193–194) employ a replacement value of the capital stock, estimated from book values using a method similar to that of Salinger and Summers (1983), in contrast to the book value of net property, plant, and equipment in this paper. The robustness section (7.3) includes estimations based on cash flow defined without subtracting dividends, like in Fazzari et al. (1988). Third, as outlined above, it is plausible that financially distressed firms exhibit low investment-cash flow sensitivities. In fact, FHP (Fazzari et al. (1988), p. 158) intended to eliminate distressed firms because they explicitly excluded firms with overall negative real sales growth from their sample. Though their results do not change substantially by including firms with negative sales growth in the sample, the section on robustness includes model estimations that only incorporate firm-year observations with positive sales growth. Fourth, data in FHP (Fazzari et al. (1988), p. 191) are uninterrupted from 1970–1984, while data in this paper are unbalanced over 26 years from 1990–2015. Section 7.3 includes estimations using a balanced panel as well. Fifth, estimations in this paper work with cluster-robust standard errors, clustering over firms. Fazzari et al. (1988) could not yet do so.

Substantial differences in sample statistics, among other
things because of the differences stated above, could impact the findings. Naturally, differences in descriptive statistics also exist because of mainly comparing mean values (FHP) with median values (this paper). The median is preferred over the mean, given that extreme values substantially impact the summary statistics when these are based on mean values. This paper is much more comprehensive with regards to firm-year observations for each class. Apart from that, many differences relate to the supposedly capital constrained class of firms, that is, class 1. For the vast majority of these firms, in FHP (Fazzari et al. (1988), p. 159), the sales growth is higher (13.7 percent vs. 8.4 percent), investment-capital ratio is lower (0.26 vs. 0.94), and standard deviation of the investment-capital ratio is lower (0.17 vs. 30.3). Regarding the cash flow-capital ratio, averages of the FHP sample are higher for the first class (0.3 vs. 0.2) and lower for the second class (0.26 vs. 0.49) compared to the sample in this paper, while standard deviations of that ratio are lower for all classes in FHP, especially the first class (0.2 vs. 217.5) and third class (0.06 vs. 21).

Four tables that summarize estimation results are compared. The first estimation output is based on standard equation 2, which augments the $M/B$ investment model with cash flow (see Fazzari et al. (1988), table 4). FHP find that cash flow is significant in explaining CapEx across the three classes, and its coefficient is significantly higher for the high-retention sample. This paper presents findings (table 5) showing only statistical significance of the coefficient on cash flow for the second class, translating into the single specification in which a substantial portion of the variance in investment is explained (0.425, for the first period). Both papers see the deterioration of the cash flow effect over time, having its root in lower asymmetric information.

The second regression results compared are based on the basic equation 2, including either cash flow lags, or a lagged market-to-book ratio. FHP (1988, table 6) show that collinearity among cash flow variables reduces the impact of the current cash flow variable in all classes when its lags are included; the pattern, however, remains clear. The mostly significant cash flow lags might well reflect shortcomings in the empirical performance of Q, which is lower when lags of cash flow are included. In contrast to that, this paper (table 6) finds that contemporaneous cash flow is robust to augmentation with its lags, while the coefficient on $M/B$ does not change in all three classes. Both papers demonstrate that the pattern of the cash flow coefficients across classes for both time periods is virtually identical when the lagged investment demand variable is included.

The third comparison is based on the investment-cash stock model (equation 3), to which the cash flow variable is added. Again, the contrast in results is obvious. FHP (1988, table 10) find that the stock liquidity has a significant effect on investment for the low-payout firms. The strong results of the cash stock variable, which, in contrast to the flow of liquidity, do not indicate much about the profitability of new investment, are interpreted as strong evidence for the imperfect substitutability of internal and external finance at the margin. However, I find (table 7) that cash stock is statistically and economically insignificant across the three classes – a windfall for the hypothesis that there is no cost disadvantage of external finance.

The last comparison uses estimations of equation 4, the sales accelerator equation. FHP (1988, table 7) report that most of the sales terms are statistically significant individually, with the effect of contemporaneous sales clearly being the strongest; cash flow coefficients decline in all three classes when sales variables are added to the equation – anyway, the cash flow pattern remains robust. When adding Q to that, the pattern is still existent. Table 8 in this paper makes clear that no coefficient on cash flow is significant any longer. Instead, it is the correlation between cash flow and sales that leads to significance of cash flow in class 2 in table 5. The effect of contemporaneous sales is approximately equally significant in economic terms across the three classes and statistically significant in the second class. The findings hold for the estimation that includes $M/B$ as well. The results indicate that cash flow does not seem to represent an additional supply of low-cost investment finance for those firms that must pay a premium for external capital.

7.2. Estimation Specifics

Table 9 presents the regression results of the basic equation 2, employing the ordinary least squares, fixed effects, random effects, and first differences estimation methods. Results are reported for the entire sample period. I find that across all tests, the pattern remains: robust statistical and small economic significance of the coefficient on cash flow is only present in the second class. Still, in class 2, there are differences in the magnitudes of the cash flow coefficient depending on the estimation method used. The magnitudes of the coefficients vary from 0.02–0.057. I also find that, in any payout class, the coefficient on $M/B$ strongly depends on the employed estimation method. For example, using OLS in class 3, the coefficient on $M/B$ is -0.006 (significant at the five-percent level), while it is 0.006 (significant at the one-percent level) using FE. Findings are approximately in line with those in FHP (1988, table 5), who find that across all estimation methods, differences in cash flow effects between class 1 and class 3 remain remarkably consistent, while there is clear variation in the magnitudes of $M/B$. Looking at the class-2 coefficient on cash flow estimated by the RE technique (0.032) in this paper, it gets clear that it is a bit closer to the FE estimate (0.04) than to the OLS estimate (0.02). Thus, the unobserved effect, $\alpha$, tends to be relatively important, which is quite common in practice (Wooldridge (2013), p. 494).

As expected, table 9 also reveals that FE and FD estimates might differ in ways that go beyond a sampling error, so that a potential violation of the strict exogeneity assumption should be considered. In absolute terms, estimation differences are negligible (0.04 vs. 0.057). However, differences are around 43 percent. If $u_{it}$ is correlated with $x_{it}$ for any $t$ and $s$, FE and FD generally have different probability limits. Simultaneity, or any other standard endogeneity problem, generally causes
### Table 9: Effects of Cash Flow and M/B on Investment: Consideration of Measurement Error, 1990-2015

Source: same like table 5.

a. The dependent variable is the investment-capital ratio \((I/K)_{it}\). All independent variables are as defined in table 5, note b. The constant is not reported. Cluster-robust standard errors appear in parentheses. *** \(p<0.01\), ** \(p<0.05\), * \(p<0.1\).

b. Estimation includes year effects. All variables expressed as first differences. Estimation includes year effects.

<table>
<thead>
<tr>
<th>Independent variable and summary statistic</th>
<th>Ordinary least squares</th>
<th>Fixed effects(^b)</th>
<th>Random effects</th>
<th>First difference(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>((CF/K)_{it})</td>
<td>-0.008</td>
<td>-0.007</td>
<td>-0.008</td>
<td>-0.024</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>((M/B)_{it})</td>
<td>-0.004</td>
<td>-0.003</td>
<td>-0.004</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.009)</td>
<td>(0.010)</td>
<td>(0.021)</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.003</td>
<td>0.004</td>
<td>0.0043</td>
<td>0.0123</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.020(^*)</td>
<td>0.040(^***)</td>
<td>0.032(^***)</td>
<td>0.057(^**)</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.015)</td>
<td>(0.012)</td>
<td>(0.024)</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.001</td>
<td>0.007(^*)</td>
<td>0.004</td>
<td>0.013(^**)</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.004)</td>
<td>(0.003)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.022</td>
<td>0.104</td>
<td>0.0777</td>
<td>0.0387</td>
</tr>
<tr>
<td>(R^2)</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.004</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>(R^2)</td>
<td>-0.006(^**)</td>
<td>0.005(^***)</td>
<td>-0.005(^*)</td>
<td>0.006(^***)</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.001)</td>
</tr>
</tbody>
</table>
| \(R^2\)                       | 0.015                | 0.016               | 0.0184         | 0.0194               

Contemporaneous correlation, so that FE and FD are inconsistent and have different probability limits. On top of that, correlation between \(u_{it}\) and \(x_{it}\) for \(s \neq t\) causes both, FD and FE, to be inconsistent. For example, it is possible that the true effect of cash flow on physical investment is zero. But, if lagged CapEx causes current cash flow, this would mean that high lagged CapEx feeds back to high current cash flow. Hence, the correlation between delta investment and delta cash flow is negative and will yield a spurious negative-estimated cash flow coefficient. However, the opposite seems to be true, given that the cash flow coefficient estimated by first differencing is more positive than the cash flow coefficient estimated by fixed effects (Wooldridge (2010), pp. 284–285).

#### 7.2.1. Choice of Estimation Method

In the investment-cash flow sensitivity literature, it is standard to work with the fixed effects estimation method (Brown and Petersen (2009), p. 972). However, given the focus on econometrics in this paper, several tests are conducted to evaluate the appropriateness of the various estimation methods. Table 10 presents the results of these tests. The Chow test is a test of whether the coefficients estimated over one group of the data are equal to the coefficients estimated over another (Wooldridge (2013), p. 453). In this case, two Chow tests are conducted. For the first test, the first group of the data is the sub-sample of observations prior to the dot-com bubble, while the second group is the sub-sample after the dot-com bubble. That is, the structural break is expected to have occurred right during the crisis. For the second test, the break date is right during the financial crisis of 2007–2008 (first group ex ante, second group ex post). Diagnostic statistics are quite similar. Both tests reject the null hypothesis of no structural change in the explanatory variables at the five-percent significance level. This does not come as a surprise, given that regression estimation results are different in the respective sample periods (see tables above, for example, table 5).

The next test is an F-test that serves to assess whether the null hypothesis that firm effects are jointly zero can be rejected. As the null hypothesis cannot be rejected, no firm fixed effects are necessary – implying that the pooled OLS method is sufficient to estimate equation 2. In contrast to that, the two F-tests assessing the need of time effects reject the null hypothesis that the time effects are jointly zero. That is, no matter whether the classification scheme is applied (splitting the sample into the three payout-classes), time fixed-effects are needed. In empirical research, it is still fairly common to use FE and RE, and then formally test for statistically significant differences in the coefficients on the time-varying explanatory variables. Concretely, quite frequently, the idea is that one uses RE unless the Hausman test (Hausman (1978)) indicates that it is more appropriate to use FE (Wooldridge (2013), p. 496). The Hausman
(1978) test is based on the difference between the RE and FE estimates. Since FE is consistent when \( a_i \) and \( x_{ij} \) are correlated, but RE is inconsistent, a statistically significant difference is interpreted as evidence against the assumption \( \text{RE.2, i.e., } \text{Corr}(x_{ij}, a_i) = 0 \). Hence, the key consideration in choosing between an RE and FE approach is whether \( a_i \) and \( x_{ij} \) are correlated.

When conducting the Hausman test, one should be aware of two caveats. First, assumption \( \text{FE.4, that is, strict exogeneity} \), is maintained under the null and the alternative. For any \( s \) and \( t \), correlation between \( u_{it} \) and \( x_{is} \) causes both, FE and RE, to be inconsistent – and generally their probability limits will differ. The Hausman test is of no importance when this assumption is violated. (This underlines the importance of the strict exogeneity chapters (5.2.1, 5.2.2, and 7.2.2) in this paper.) Second, implementation of the test assumes that assumption \( \text{RE.3, i.e., homoskedasticity, holds under the null hypothesis. This assumption is not being tested by the Hausman statistic. Violation of assumption \( \text{RE.3} \) causes the usual Hausman test to have a non-standard limiting distribution, which means that the result of the testing could have an asymptotic size that is larger or smaller than the nominal size (Wooldridge (2010), pp. 288–289). As table 10 reveals, the Hausman test rejects the null hypothesis of an unexplained difference in the coefficients at the one-percent level. Hence, the FE approach is preferred over the RE approach. In practice, a failure to reject means either that the RE and FE estimates are sufficiently close so that it does not matter which method is used, or statistically significant differences cannot be concluded to be statistically significant, because the sampling variation in the FE estimates is too large. In the latter case, one is left to wonder whether information in the data are sufficient in order to provide precise estimates of the coefficients (Wooldridge (2013), p. 496). Finally, the Breusch-Pagan Lagrange multiplier test is used to decide between RE and simple OLS regression. It is a test for heteroskedasticity across entities where the squared OLS residuals are regressed on the explanatory variables in equation 2 (Wooldridge (2013), p. 277). The test rejects the null hypothesis that the variances across entities are zero (homoskedastic) at the five-percent level. This implies that there are significant differences across firms – and, hence, there is a panel effect. In all, tests make clear that FE is preferred over RE (Hausman), RE is preferred over OLS (Breusch-Pagan), but OLS is preferred over FE (F). Time fixed effects should be included. Given these unclear test results, economic intuition suggesting the use of FE, and the literature employing FE, firm and year FE is the preferred estimation method in this paper.

7.2.2. Strict Exogeneity

As shown in section 7.2, when estimations are based on the unbalanced panel, differences in cash flow estimates between FE and FD are in the order of almost 50 percent. On top of that, when working with a balanced panel, differences in estimates even increase. For example, in class 1, the FE cash flow estimate is 0.075 (significant at ten percent level) vs. FD estimate of 0.144 (significant at one percent level); in class 2, coefficient on cash flow based on FE is 0.121 (significant at five percent level), while the FD estimate is 0.064 and statistically insignificant. This can be seen as further evidence in line with Grieser and Hadlock (2015). (The results based on the balanced panel are not reported in any table; the corresponding Stata commands can be found in the appendix.)

Table 11 presents the results of strict exogeneity tests based on the FE transformation. As is standard in this thesis and following other tests for strict exogeneity, test statistics are calculated with clustered standard errors at the firm level to allow for arbitrary autocorrelation and heteroskedasticity. When the test is for a model with cash flow as the only selected explanatory variable, i.e., equation 12, magnitude and significance (but not signs) of the coefficients on the one-period-ahead cash-flow variable are approximately in line with the lagged cash-flow coefficients across payout classes. For example, the coefficient on the cash-flow lag in class 2 is 0.066 (one percent significance) and its one-step-ahead counterpart has a magnitude of -0.04 (five percent significance). This indicates violation of strict exogeneity. The same is true when the equation is augmented with \( M/B \) and its first lag. Results on the cash flow coefficients are basically unchanged. The one-step-ahead \( M/B \) is insignificant in every payout class; however, this is not a surprise, as its first lag is economically insignificant as well. Still, controlling for investment demand today, it makes intuitive sense that physical investment does feed back to tomorrow’s investment demand. Exemplarily, due to promising investment opportunities today (high \( M/B \)), capital is used to buy a new machine (high CapEx). This new machine might cause better/more investment opportunities tomorrow, even when controlling for today’s investment demand. This is because this machine could, inter alia, differentiate the company from its competitors, so that it allows the company to take on projects it could not do before. The test for the model with total investment as the dependent variable does underline that the strict exogeneity assumption is not maintained. Clear significance of contemporaneous cash flow for class-2 firms is evidence for that. I use the total investment model for tests over the time periods 1990–2002 and 2003–2015 as well. (Test results are not reported in a table; Stata commands can be found in the appendix, however.) The strict exogeneity assumption does seem to hold over the smaller time periods 1 and 2. Contemporaneous cash flow coefficients are statistically insignificant at the five-percent level. However, given the smaller sample sizes involved in these tests, the p-values are generally somewhat higher than for the larger samples. Grieser and Hadlock (2015) experience the same issue.

Table 12 is similar to table 11, except for the test results being based on the FD transformation. The test on the first (pure) cash flow model indicates that the coefficient on contemporaneous cash flow is not as significant as the coefficient on the first-differenced cash-flow variable (if at all). Again, the test for the full model, i.e., including \( M/B \) and its first difference, does not impact effects of contemporaneous cash
Table 10: Various Tests on Estimation Methods, 1990-2015

Source: same like table 5.

a. Tests make use of equation 2.

<table>
<thead>
<tr>
<th>Test</th>
<th>H0</th>
<th>Diagnostic statistics</th>
<th>Probability</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chow</td>
<td>No structural change</td>
<td>( F = 3.04 )</td>
<td>0.028</td>
<td>Dot-com as break</td>
</tr>
<tr>
<td>Chow</td>
<td>No structural change</td>
<td>( F = 3.17 )</td>
<td>0.023</td>
<td>Financial crisis as break</td>
</tr>
<tr>
<td>F</td>
<td>Firm effects jointly zero</td>
<td>( F = 0.193 )</td>
<td>&gt;0.1</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Firm effects jointly zero</td>
<td>( F = 3.49 )</td>
<td>0.000</td>
<td>With classification scheme</td>
</tr>
<tr>
<td>F</td>
<td>Firm effects jointly zero</td>
<td>( F = 1.52 )</td>
<td>0.05</td>
<td>Without classification scheme</td>
</tr>
<tr>
<td>Hausman</td>
<td>Unsystematic difference in coefficients</td>
<td>Chi-square = 34.11</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Breusch-Pagan LM</td>
<td>Homoskedasticity across entities</td>
<td>Chi-square = 2.9</td>
<td>0.044</td>
<td></td>
</tr>
</tbody>
</table>

Table 11: Tests for Strict Exogeneity in FE: Various Specifications, 1990-2013

Source: the three models are based on the author’s estimates of variations of equation 12.

a. The dependent variable is the first lag of the ratio of physical investment (total investment in the third model) to the beginning-of-period stock of assets (capital in the third model). Equations are estimated with fixed firm and year effects (not reported). The constant is not reported. Cluster-robust standard errors appear in parentheses. *** \( p < 0.01 \), ** \( p < 0.05 \), * \( p < 0.1 \).

b. \((CF/K)_{lt-1}\) is the first lag of the ratio of cash flow, CF, to the beginning-of-period capital stock, K. \((M/B)_{lt-1}\) is the first lag of the market-to-book ratio. \((CF/A)_{lt}\) is the ratio of cash flow, CF, to the beginning-of-period asset stock, A. \((CF/A)_{lt-1}\) is the first lag of the ratio of cash flow, CF, to the beginning-of-period asset stock, A. \((M/B)_{lt}\) is defined like in table 5, note b.

<table>
<thead>
<tr>
<th>Independent variable and summary statistic</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>((CF/K)_{lt})</td>
<td>0.010*</td>
<td>-0.040**</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.017)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>((CF/K)_{lt-1})</td>
<td>-0.018*</td>
<td>0.066***</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.023)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Within (R^2)</td>
<td>0.012</td>
<td>0.126</td>
<td>0.016</td>
</tr>
<tr>
<td>((CF/K)_{lt})</td>
<td>0.010*</td>
<td>-0.039**</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.017)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>((CF/K)_{lt-1})</td>
<td>-0.017</td>
<td>0.066***</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.023)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>((M/B)_{lt})</td>
<td>-0.009</td>
<td>0.001</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.003)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>((M/B)_{lt-1})</td>
<td>0.045</td>
<td>0.006</td>
<td>0.005***</td>
</tr>
<tr>
<td></td>
<td>(0.029)</td>
<td>(0.005)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Within (R^2)</td>
<td>0.011</td>
<td>0.126</td>
<td>0.018</td>
</tr>
<tr>
<td>((CF/A)_{lt})</td>
<td>0.030</td>
<td>0.132***</td>
<td>0.080**</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
<td>(0.035)</td>
<td>(0.040)</td>
</tr>
<tr>
<td>((CF/A)_{lt-1})</td>
<td>-0.285**</td>
<td>0.185***</td>
<td>0.230*</td>
</tr>
<tr>
<td></td>
<td>(0.140)</td>
<td>(0.059)</td>
<td>(0.120)</td>
</tr>
<tr>
<td>Within (R^2)</td>
<td>0.271</td>
<td>0.311</td>
<td>0.121</td>
</tr>
</tbody>
</table>

flow and its first difference. Like with the FE transformation, there does not seem to be feedback from the dependent variable to the contemporaneous \( M/B \) variable. However, again, the delta \( M/B \) effect is very small as well. Surprisingly, the test for the total investment model leads to very high coefficients on cash flow in class 1; these coefficients are not statistically significant though. When I test the total investment model for strict exogeneity in the sub-periods 1 and 2, contemporaneous cash flow coefficients are close to their first-difference counterparts, including clearly significant co-
7.3. Robustness

Brown and Petersen (2009) have shown that a decline in the relative importance of physical investment has led to deterioration in the conventionally measured investment-cash flow sensitivity. However, because R&D intensity has risen strongly, they find that the sensitivity of investment to cash flow remains relatively strong for investment into R&D. The total investment-cash flow sensitivity has declined, but is still significant. The authors argue that this broad investment measure is less subject to the problem of changing composition of investment expenditures than CapEx and might, thus, be a more promising measure of the investment-cash flow sensitivity and thereby a better proxy for financing constraints. This is why I estimate variations of equation 2 regarding the type of investments undertaken and the scaling variable. The investment and cash flow variables are scaled by total assets in order to have a common scale factor for all regressions in this robustness check (and in some of the following). Results of these estimations are presented in table 13 for the entire sample period.

In the first model, the dependent variable is R&D expenditure. A sensitivity of R&D investment-cash flow is basically not present. One could argue that this is because of a potential measurement error in the key variables, especially in cash flow. This is because R&D is expensed and, as a consequence, cash flow measures are net of R&D expenditures (Brown and Petersen (2009), p. 975). But, when a gross cash flow measure, that is, cash flow with R&D added back, is employed instead of the “standard” cash flow measure, estimation results are basically unchanged. This lack of significance is in line with the findings of some of the recently written papers in the investment-cash flow literature, such as Chen and Chen (2012). They find that the sensitivity has declined and disappeared, even during the 2007–2009 credit crunch – and their results are robust to considerations of R&D.

In the second model, total investment is regressed on cash flow and the market-to-book ratio. The class-1 cash flow coefficient is, with -0.304, economically significant, but statistically significant only at the ten-percent level; cash flow is strongly significant for class-2 firms. Compared with that, when physical investment is the dependent variable (third model), the cash flow pattern resembles that of the second estimation, but is less pronounced.

This third model serves as a robustness check to the findings presented in table 5, as well as a comparison to the first two models discussed above. Estimation results are different to those with normalizations by capital stock in that the class-1 cash flow coefficient is significantly negative, while the second-class cash flow coefficient is more positive. When using the sales accelerator specification instead of M/B to capture the investment demand side, magnitudes of the coefficients on cash flow across the payout classes generally increase in all three equations. The only exception is the total investment equation, in which the class-2 coefficient on cash flow is no longer significant. (These results are not reported in any table; the corresponding Stata commands can be found in the appendix.)

Cornell and Shapiro (1988) have shown that R&D-intensive firms use little debt, inter alia, due to the poor collateral value of R&D and the fact that debt finance can lead to financial distress, which is especially severe for R&D-intensive companies. As a consequence, R&D investment by young firms, especially those with low or negative cash flows, may be heavily dependent on the availability of public equity finance. In addition to that, as explained above, a failure to control for external finance in the investment equation can lead to a downward omitted variable bias due to the correlation of external finance with cash flow, especially for those firms that make heavy use of stock issues. Therefore, I check the robustness of this paper’s findings by estimating equation 2, augmented by two external finance variables. These two external finance variables cover the equity and the debt side. Also, given the substantial theoretical importance of external (equity) finance for R&D-intensive firms, the R&D and total investment models presented above are augmented by the external finance variables as well.

Findings of the estimations over the total sample period are presented in table 14. The equation with R&D investment as the dependent variable does not undergo a significant change in the cash flow coefficients when the model includes external finance variables. It is against the outlined economic theory that public equity finance does not play a role for class-1 firms. Instead, long-term debt issuance is clearly relevant in explaining R&D investment for this subsample of firms. The downward omitted variable bias does not seem to be present in the data. When total investment is regressed on cash flow, M/B, and external finance, the second-class cash flow coefficient is less significant in explaining total investment than without external finance, but the pattern remains. Stock issuance does play a significant role, especially for class-2 firms. Its impact on cash flow is ambiguous, as the coefficient on cash flow is lower in the second class, while it is higher in the third class. For the third model and compared with table 5, the cash flow pattern is quite robust to the augmentation by external finance, while external finance generally has power in explaining variations in CapEx.

One purpose of this paper is to use the approach in Fazzari et al. (1988) and analyze how their findings have changed using the more current set of data (and methodology, e.g., clustering). A potential impact factor for the deviation in results from those in Fazzari et al. (1988) could be different definitions of key variables, as outlined above. In order to see whether findings are robust to different definitions of some variables that more closely resemble those used in Fazzari et al. (1988), sales accelerator and cash flow are defined differently. Sales accelerator, that is, sales plus finished

Source: the three models are based on the author’s estimates of variations of equation 12.
a. The dependent variable is the first difference of the ratio of physical investment (total investment in the third model) to the beginning-of-period stock of assets (capital in the third model). Estimation includes year effects. The constant is not reported. Cluster-robust standard errors appear in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
b. Δ denotes first-differenced variables. All independent variables are as defined in table 11, note b.

goods inventory, is employed as an independent variable instead of sales. Cash flow is defined without subtracting dividends – assuming that sticky dividends play a smaller role. In both specifications, results are basically indistinguishable from those with the “standard” set of variables, undermining the possibility that the different findings are, among other things, due to a different set of variables.

Another robustness check refers to clustering, which is relatively new, so that Fazzari et al. (1988) could not make use of it yet. When employing default standard errors instead of the cluster-robust version, the failure to control for within-cluster correlation leads to misleadingly small standard errors, narrow confidence intervals, large t-statistics, and low p-values. When working with cluster-robust standard errors instead, it does not matter too much what to cluster over. This is because there is basically no difference in the standard errors when they are clustered over firms compared with clustering over industries. As explained above, all outputs presented in this paper are based on standard errors that are clustered over firms. A different issue is financial distress. Financially distressed firms may experience lower investment-cash flow sensitivities. Coefficients are basically unchanged when all firm-year observations are excluded in which sales growth was not positive. Thus, findings are robust to trying to eliminate distressed firms (or firm-year observations during which companies were struggling). This is in line with Fazzari et al. (1988) who only work with companies that had grown their sales, but find that results do not change significantly when negative-sales-growth firms are included. Excluding some distressed firms this way is complementary to balancing the panel, which omits some financially distressed firms as well. (The results presented in this paragraph are not reported in any table; the corresponding Stata commands can be found in the appendix.)

A final issue is the potential discrepancy due to working with an unbalanced panel, as compared to working with a balanced panel, such as in Fazzari et al. (1988) among others. The mechanics of FE estimation with an unbalanced and a balanced panel are basically the same. If $T_i$ is the number of time periods for cross-sectional unit $i$, one simply uses these $T_i$ observations in doing the time-demeaning. Like in the balanced panel case, one degree of freedom is lost for every cross-sectional observation due to time-demeaning. However, the reason for an unbalanced panel, among other
Table 13: Effects of Cash Flow and M/B on Physical, R&D, and Total Investment, 1990-2015a

Source: the three models are based on the author’s estimates of variations of equation 2.

a. The dependent variable is the ratio of some form of investment to the beginning-of-period stock of assets. It is investments in R&D in the first model, investments in physical assets plus R&D in the second model, and investments in physical assets in the third model. Equations are estimated with fixed firm and year effects (not reported). The constant is not reported. Cluster-robust standard errors appear in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

b. (CF/A)it is the ratio of cash flow, CF, to the beginning-of-period asset stock. (M/B)it is defined in table 5, note b.

<table>
<thead>
<tr>
<th>Independent variable and summary statisticb</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model with R&amp;D investment as dependent variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(CF/A)it</td>
<td>-0.038*</td>
<td>0.059</td>
<td>-0.097</td>
</tr>
<tr>
<td></td>
<td>(0.022)</td>
<td>(0.045)</td>
<td>(0.061)</td>
</tr>
<tr>
<td>(M/B)it</td>
<td>0.114</td>
<td>-0.000</td>
<td>-0.000</td>
</tr>
<tr>
<td></td>
<td>(0.077)</td>
<td>(0.001)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Within R²</td>
<td>0.336</td>
<td>0.095</td>
<td>0.178</td>
</tr>
<tr>
<td>Model with total investment as dependent variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(CF/A)it</td>
<td>-0.304*</td>
<td>0.229***</td>
<td>-0.032</td>
</tr>
<tr>
<td></td>
<td>(0.171)</td>
<td>(0.068)</td>
<td>(0.094)</td>
</tr>
<tr>
<td>(M/B)it</td>
<td>-0.074</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.151)</td>
<td>(0.002)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Within R²</td>
<td>0.278</td>
<td>0.311</td>
<td>0.118</td>
</tr>
<tr>
<td>Model with physical investment as dependent variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(CF/A)it</td>
<td>-0.163**</td>
<td>0.198***</td>
<td>-0.020</td>
</tr>
<tr>
<td></td>
<td>(0.083)</td>
<td>(0.041)</td>
<td>(0.028)</td>
</tr>
<tr>
<td>(M/B)it</td>
<td>-0.107**</td>
<td>0.003*</td>
<td>0.002***</td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Within R²</td>
<td>0.145</td>
<td>0.283</td>
<td>0.054</td>
</tr>
</tbody>
</table>

Things can be that data in advanced years do no longer include those firms that have gone out of business or merged with other firms. This can be problematic if the reason a firm leaves the sample (attrition) is correlated with the idiosyncratic error, i.e., those unobserved factors that change over time and affect investment spending. A resulting non-random sample can cause biased estimators. Nevertheless, fixed effects analysis is useful here, as it allows attrition to be correlated with $\alpha_i$, the unobserved effect (Wooldridge (2013), p. 491). Also, attrition bias should not be a substantial issue here, given that the classification scheme requires companies to have firm-year observations, i.e., to be active, over the majority of the sample period.

The classification scheme might also (partially) impede an effect of balancing the panel on the firms’ degree of asymmetric information (and thereby investment-cash flow sensitivities): as firms mature and more observations of project realizations and balance sheets become available, asymmetric information problems should become less severe. It is striking that when comparing descriptive statistics between the balanced and the unbalanced panel, the number of observations is much lower (approximately factor of ten), there are much lower standard deviations of sales growth (approximately factor of 50 for class 1), investment-capital ratio, and cash flow-capital ratio, and there is less of a difference between mean and median values of capital stock and $M/B$.

These differences are likely to impact the estimation results, which are presented in table 15, and serve as an important test to see whether the very high standard deviations of key variables in the unbalanced case harm the credibility of the estimation results. Table 15 is just like table 5, except that the estimation is based on a balanced panel. Interestingly, the cash flow coefficient on class 1 is significant over 2003–2015, while economic theory would suggest it is more significant over 1990–2002 (asymmetric information). The balanced panel might show significant cash flow effects of the low-payout firms because financially distressed firms that went out of business or merged during the sample period were entirely omitted from the estimation – and were not omitted due to the classification scheme already. The class-2 coefficient on cash flow is more significant over 1990–2015 than in the unbalanced case. For the third class, the cash flow coefficient is still not economically significant. When different estimation methods are employed (just like in table 9), the cash flow pattern generally remains: a small effect in class 1, a more significant effect in class 2, and no effect in class 3. Only the FD estimation is slightly different in that the class-1 cash flow effect is more pronounced (0.144, significance at the one-percent level), while the class-2 coefficient is insignificant. In addition, just like in the case with an unbal-
Table 14: Effects of Cash Flow, M/B, and Externat Finance on Physical, R&D, and Total Investment, 1990-2015

Source: the three models are based on the author’s estimates of variations of equation 2.

a. The dependent variable is the ratio of some form of investment to the beginning-of period stock of assets (capital in the third model). It is investments in R&D in the first model, investments in physical assets plus R&D in the second model, and investments in physical assets in the third model. Equations are estimated with fixed firm and year effects (not reported). The constant is not reported. Cluster-robust standard errors appear in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

b. (CF/A)_{it} is the ratio of cash flow, CF, to the beginning-of-period asset stock, A. (CST/A)_{it} is the ratio of commons shares issued, CST, to beginning-of-period total assets. (LTD/A)_{it} is defined as the measure of the issuance of long-term debt, LTD, scaled by total assets at the beginning of the period. All other independent variables are as defined in table 5, note b.

<table>
<thead>
<tr>
<th>Independent variable and summary statistic a</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model with R&amp;D investment as dependent variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(CF/A)_{it}</td>
<td>-0.032*</td>
<td>0.017</td>
<td>-0.010</td>
</tr>
<tr>
<td></td>
<td>(0.019)</td>
<td>(0.054)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>(CST/A)_{it}</td>
<td>0.000</td>
<td>0.110</td>
<td>0.007***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.072)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>(LTD/A)_{it}</td>
<td>0.228***</td>
<td>0.028*</td>
<td>-0.000***</td>
</tr>
<tr>
<td></td>
<td>(0.077)</td>
<td>(0.015)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>(M/B)_{it}</td>
<td>0.122</td>
<td>-0.000</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(0.075)</td>
<td>(0.001)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Within R²</td>
<td>0.393</td>
<td>0.180</td>
<td>0.506</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model with total investment as dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>(CF/A)_{it}</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>(CST/A)_{it}</td>
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<tr>
<td></td>
</tr>
<tr>
<td>(LTD/A)_{it}</td>
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<tr>
<td></td>
</tr>
<tr>
<td>(M/B)_{it}</td>
</tr>
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<td></td>
</tr>
<tr>
<td>Within R²</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model with physical investment as dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>(CF/K)_{it}</td>
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<tr>
<td></td>
</tr>
<tr>
<td>(CST/A)_{it}</td>
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<tr>
<td></td>
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<tr>
<td>(LTD/A)_{it}</td>
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<tr>
<td></td>
</tr>
<tr>
<td>(M/B)_{it}</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Within R²</td>
</tr>
</tbody>
</table>

8. Conclusion

The sample in this study consists of annual data of US industrial firms between 1990 and 2015. I use Fazzari et al. (1988) as a guidance and comparison and analyze what has changed. I augment their research design with the findings from influential, other papers in the literature. In addition to that, throughout this paper, I focus on the econometrics involved, making this paper one of the first empirical finance papers to explicitly acknowledge and analyze the strict exogeneity assumption. The literature demonstrates that the investment-cash flow sensitivity has decreased over...

<table>
<thead>
<tr>
<th>Independent variable and summary statistic</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>((CF/K)_{it})</td>
<td>0.001*</td>
<td>0.044**</td>
<td>-0.001***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.017)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>((M/B)_{it})</td>
<td>0.004</td>
<td>0.015***</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.005)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Within (R^2)</td>
<td>0.032</td>
<td>0.147</td>
<td>0.223</td>
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<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>((CF/K)_{it})</td>
<td>0.100***</td>
<td>0.014</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.038)</td>
</tr>
<tr>
<td>((M/B)_{it})</td>
<td>0.038</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>(0.047)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Within (R^2)</td>
<td>0.274</td>
<td>0.075</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1990-2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>((CF/K)_{it})</td>
<td>0.075*</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
</tr>
<tr>
<td>((M/B)_{it})</td>
<td>0.028</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
</tr>
<tr>
<td>Within (R^2)</td>
<td>0.175</td>
</tr>
</tbody>
</table>

Source: author’s estimates of equation 2 based on a sample of firm data from Compustat database. See text.

a. The dependent variable is the investment-capital ratio \((I/K)_{it}\) where \(I\) is investment in property, plant and equipment and \(K\) is beginning-of-period capital stock. All independent variables are as defined in Table 5, note b. The equations were estimated using fixed firm and year effects (not reported). The constant is not reported. Cluster robust standard errors appear in parentheses. *** \(p<0.01\), ** \(p<0.05\), * \(p<0.1\).

time. This literature is also not without criticism. For example, some researchers criticize the conventional regression equations used, while others doubt that these equations serve as adequate measures of financing constraints. Given that much remains unsolved, the topic of financing constraints and investment-cash flow is still a vivid research field – and one of the largest in corporate finance. It is recently also being broadened. Finally, the literature section shows that testing for the violation of the strict exogeneity assumption in empirical panel data finance research is of critical importance.

Revisiting the hypotheses a, b, and c, this paper presents evidence that the investment-cash flow sensitivity has decreased and (mostly) disappeared over time. For that, I use two of the broad empirical specifications that encompass the most common approaches of constructing models’ investment demand side: models based on the \(M/B\) ratio, as well as models based on the sales accelerator. The estimation results basically do not change, no matter whether the \(M/B\) model is augmented with cash flow, with cash flow lags and lagged \(M/B\) ratios on top of that, or with cash stock in addition to cash flow. The sales accelerator model consists of three lags of sales, augmented with cash flow. An alternative specification adds \(M/B\) to that. When the sales accelerator specification is used instead of \(M/B\), there is no significant cash flow coefficient in any class. This suggests that the previous significance in class 2 is due to correlation of cash flow and sales. The results are also robust to employing different estimation methods, namely OLS, FE, RE, and FD. Depending on which of the estimation methods is used, magnitudes of the cash flow coefficient in equation 2 vary from 0.02–0.057. While the differences in absolute terms are negligible, the differences in, for example, FE and FD estimates are in the order of nearly 50 percent. Given this difference – which is even more pronounced when estimations are based on a balanced panel instead of an unbalanced panel –, I suspect that estimation differences are driven by the violation of the strict exogeneity assumption. (This is confirmed in explicit strict exogeneity tests, so that hypothesis e is not rejected.) The magnitude of the difference also suggests that the inconsistency caused by the violation of the assumption can be substantial (hypothesis f). Coefficients on \(M/B\) strongly depend on the choice of the estimation method.

In order to choose the optimal estimation method for the purposes of this research, I conduct several tests. Their results are ambiguous. FE is preferred over RE (Hausman test), RE is preferred over OLS (Breusch-Pagan test), but OLS is preferred over FE (F test). However, given that economic intuition suggests the use of FE and given that the literature mostly employs FE, firm and year FE is the preferred estimation method in this paper (hypothesis d). My results are unchanged in substance when the following robustness checks
are conducted: consideration of a changing composition of investment, consideration of the impact of external finance, different definitions of variables, various forms of clustering, exclusion of firm-years with negative sales growth, and estimations based on a balanced panel. Hence, evidence on a lack of significance of the sensitivity of investment to cash flow stands in stark contrast to the findings in . However, my evidence is in line with many recent papers (e.g., Chen and Chen (2012)).

This paper contributes to the literature by being an additional piece of evidence that the investment-cash flow sensitivity has decreased over time (and disappeared) – robust to a number of alternative specifications and robustness checks. In addition to that, it presents further evidence that the strict exogeneity assumption is quite commonly violated in empirical panel data finance research and that this violation can cause a substantial distortion in results.

This paper offers me a great gain in knowledge in empirical finance research, panel data estimation methods, and the use of Stata – and, hence, serves as a good preparation for my doctoral studies. However, the conclusions drawn in this paper do not come without caveats. Estimations are mainly based on an unbalanced panel. Descriptive statistics show very large standard deviations in sales growth, investment-capital ratio, and cash flow-capital ratio, especially for class-1 firms. This is worrying, as outliers can undermine the credibility of estimation results. However, I drop the two observations with a Cook’s distance greater one. Then, estimation results of OLS are very close to those of a robust regression. Furthermore, descriptive statistics of the payout classes show much lower standard deviations in the case of a balanced panel. Estimation results based on a balanced panel are approximately in line with the ones based on an unbalanced panel. This should indicate that the presented evidence is not impacted by outlier problems.

The same arguments can be applied against the criticism on employing a splitting criterion that sorts firms into sub-samples with differential outliers in growth rates, which can lead to finding a difference in the coefficients on cash flow. Therefore, dividend payouts as a broad splitting criterion are no longer without controversy. In line with that is that some recent papers use more direct proxies for capital market imperfections and financial constraints. For example, Chowdhury et al. (2016) use the bid-ask spread measure of information asymmetry. This measure is generally accepted in the market microstructure literature and might improve upon the broad proxy of dividend payout rates used in this paper. Another drawback of this paper is the theoretical ambiguity regarding the economic interpretations of some variables presented throughout this study. For example, a firm’s high cash stock can either signal that the firm has done well and is likely to continue doing well (thus, more liquid firms have better investment opportunities), or it means that a constrained firm hoards cash to protect against future downturns. This would then be a signal for poor performance.

With regards to the outline for future research, I can say that there is still room for research in areas in which financial constraints possibly play a role. Exemplarily, further research can be conducted on the efficiency of internal capital markets, the effect of agency on firm policies, and the influence of managerial characteristics. There is ongoing interest in the study of the relationship between investment and cash flow because of the importance of firm and aggregate investment and because of continuing innovation regarding alternative investment-cash flow regression equations, measures of financing constraints, usage of exogenous shocks, etc. These innovations can shed additional light on the issue of financing constraints. Also, research can try to work around the theoretical ambiguity of variables. Finally, econometrics can play a larger role, for example, by using dynamic instead of static models.
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Einfluss der Gestaltung von Büroräumlichkeiten auf die Arbeitsplatzzufriedenheit von Führungskräften - Eine Untersuchung anhand eines Schweizer Dienstleistungsunternehmens

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Universität Zürich

Abstract


Keywords: Arbeitszufriedenheit, Arbeitsplatzgestaltung, Bürogestaltung, Führungskräfte, Arbeitsräume

1. Einleitung

1.1. Zielsetzung


In dieser Arbeit wird näher auf die Wirkung von Büroräumlichkeiten auf die Arbeitszufriedenheit eingegangen. Arbeitszufriedenheit wird als multiattributives Konstrukt verstanden, das sich aus verschiedenen Teilzufriedenheiten zusammensetzt (vgl. Yukl und Wexley (1971), S.153). Unter Arbeitsplatzzufriedenheit versteht man denjenigen Teilspektrum der Arbeitszufriedenheit, der sich auf den physischen Arbeitsplatz und die unmittelbare Arbeitsumgebung bzw. das gebau-


1 In Kapitel 2.3. wird näher auf die einzelnen Zusammenhänge eingegangen.
Das Unternehmen ist mit verschiedenen Standorten schweizweit vertreten und beschäftigt über 2.200 Mitarbeiter. Dabei haben knapp 15% aller Mitarbeitenden eine Führungsfunktion. Dieses Unternehmen eignet sich gut für die Untersuchung im Rahmen dieser Arbeit, da sich die einzelnen Niederlassungen bezüglich ihrer Büroraumkonzepte unterscheiden. Es ist daher möglich, Führungskräfte aus unterschiedlichen Raumkonzepten an verschiedenen Standorten zu befragen.


2. Theoretischer Hintergrund

2.1. Typologie der Büroraumkonzepte


2.1.1. Das Zellenbüro (vgl. Abbildung 1)


2.1.2. Das Grossraumbüro (vgl. Abbildung 2)

Das Grossraumbüro ist eine Weiterentwicklung des Bürosaals, der aus der ursprünglichen Struktur einer nordamerika-


2.1.3. Das Gruppenbüro (vgl. Abbildung 3)


2.1.4. Das Kombibüro (vgl. Abbildung 4)


2.1.5. Das non-territoriale Büro

Im Unterschied zu den bislang vorgestellten Grundformen der Bürokonzepte, die sich hauptsächlich durch ihre räumlichen Eigenschaften unterscheiden lassen, basiert das non-territoriale Büro auf organisationstechnischen Ansätzen (vgl. Ehlers et al. (2003), S.133). Non-territoriale Bürokonzepte können auf Basis aller bisher beschriebenen Raumkonzepte umgesetzt werden, da sie nicht auf eine bestimmte Raumanordnung angewiesen sind (vgl. Ehlers et al. (2003), S.134).

Non-territoriale Bürokonzepte berücksichtigen die Tatsache, dass ein Teil der Arbeitsplätze aufgrund von Abwesenheiten nicht besetzt ist. Die feste Zuordnung der Arbeitsplätze wird aufgehoben, was dazu führt, dass die Anzahl der Arbeitsplätze in den meisten Fällen geringer als die Anzahl der effektiven Nutzer ist. Büros, Arbeitsplätze und Bürowirtschaft werden von mehreren Mitarbeitern genutzt und bei Bedarf den Kollegen zur Verfügung gestellt. Unternehmen stellen ihren Angestellten mobile Aufbewahrungsmöglichkeiten zur Verfügung, in denen sie ihre persönlichen Arbeitsmittel und Dokumente an den aktuellen Arbeitsplatz transportieren können (vgl. Ehlers et al. (2003), S.134).

Da bei non-territorialen Bürokonzepten in der Regel nur für rund 60% der Mitarbeitenden ein physischer Arbeitsplatz benötigt wird, weisen sie im Vergleich zu anderen Konzepten die geringsten Kosten pro Arbeitsplatz auf (vgl. Favre (2011),
2.1.6. Das Multi-Space-Büro (vgl. Abbildung 5)


2.2. Grundlagen der Arbeitszufriedenheit

Das Konstrukt der Arbeitszufriedenheit gehört zu den häufig erforschten Themengebieten der Arbeits- und Organisationspsychologie (vgl. Dormann und Zapf (2001), S.483). Die Auffassung, was unter Arbeitszufriedenheit zu verstehen ist, ist in der Fachliteratur weit gefächert. Dies widerspiegelt sich besonders in der Vielzahl vorhandener Definitionen und Entstehungstheorien.


Da in der Literatur für das Konstrukt der Arbeitszufriedenheit teilweise unterschiedliche Begriffe verwendet werden, wird zu Beginn dieses Abschnittes eine begriffliche Abgrenzung zwischen Arbeitszufriedenheit und Arbeitsmotivation sowie Arbeitszufriedenheit und Mitarbeiterzufriedenheit vorgenommen.

2.2.1. Begriffliche Abgrenzung

**Arbeitszufriedenheit vs. Arbeitsmotivation**

Die beiden Konstrukte Arbeitszufriedenheit und Arbeitsmotivation stehen in enger Beziehung zueinander und weisen teilweise inhaltliche Überschneidungen auf.


Arbeitszufriedenheit vs. Mitarbeiterzufriedenheit


2.2.2. Der Begriff Arbeitszufriedenheit

In der Fachliteratur findet man eine Vielzahl unterschiedlicher Definitionen der Arbeitszufriedenheit, welche nachfolgend auszugsweise vorgestellt werden.


Dieser Zusammenhang lässt sich durch die Kombination zweier Wirkungsmodelle darstellen. Das Wirkungsmodell...


Nachfolgend werden bisherige empirische Erkenntnisse zu den Zusammenhängen zwischen den einzelnen Charakteristika des Raumes und der Zufriedenheit mit der Arbeitsumgebung vorgestellt. Dazu werden sie folgendermassen thematisch gegliedert:

- Raum- und Arbeitsplatzanordnung
- Physikalische Grössen
- Soziale Interaktion
- Privatheit

Die Betrachtung inhaltlich ähnlicher Teildimensionen soll dem Leser zudem die Lektüre erleichtern.

2.3.1. Raum- und Arbeitsplatzanordnung


In offenen Raumstrukturen wird das vorhandene Gestaltungspotential häufig nicht ausgeschöpft (vgl. Moleski und Lang (1982), S.319 ff.), was zur Folge hat, dass der Grossraum, trotz zahlreicher Möglichkeiten zur Flexibilisierung, über mehrere Jahre relativ statisch bleibt und weder auf personeller noch auf organisatorischer Ebene Veränderungen stattfinden (vgl. Hedge (1982), S.519 ff.).


2.3.2. Physikalische Grössen

Es gibt zahlreiche Erklärungsansätze, die sich mit der Wirkung von physikalischen Grössen auf die Zufriedenheit mit dem Arbeitsplatz beschäftigen. Physikalische Grössen umfassen die Geräusch- und Lärmbelastung, die Beleuchtung des Arbeitsplatzes, die Temperatur sowie die optimale Büromöblierung im Sinne einer ergonomischen Gestaltung.


2.3.3. Soziale Interaktion


2.3.4. Privatheit

verschlechtert. Dabei wird die visuelle Privatheit als weni-
ger wichtig wahrgenommen als die akustische. Dennoch hat
ein Mangel an visueller Privatheit einen grossen Einfluss
auf das Wohlbefinden der Angestellten (vgl. Nemecek und
Grandjean (1973), zit. in Wineman (1982), S.271 ff.).
Zalesny und Farace (1987) (S.240 ff.) untersuchen in ih-
rer Studie die Privatheit in Büoräumen unter den Aspekten
Funktion und Stellung im Unternehmen. Dabei stellen sie
fest, dass für Angestellte das Empfinden von Privatheit in Zel-
nenbüros und offenen Raumkonzepten gleich bleibt. Die un-
tersuchten Angestellten schätzen dabei besonders die Mög-
lizkeiten zur Interaktion mit Kollegen über die eigene Stel-
lung und Funktion hinaus. Bei den untersuchten Führungs-
personen sieht es anders aus. Sie sind nach dem Wechsel von
Zellenbüros in ein offenes Bürokonzept signifikant unzufrie-
der mit der Arbeitsumgebung.

Becker (1981), zit. in Favre (2011), S.31 f.) interpret-
tiert diesen negativ veränderten Zufriedenheitsgrad der Füh-
rungspersonen als Konsequenz der subjektiv geänderten Stel-
lung im Unternehmen. Der Verlust des Einzelbüros und dem
damit verbundenen Recht auf Privatheit – ein traditionelles
Symbol von organisationalem Status – wird von Führungsperso-
en in der Regel als Statusverlust erlebt. Führungspersonen
weisen jedoch in offen gestalteten Arbeitsräumen eine höhere Identifikation mit ihrer Arbeit auf (vgl. Zalesny und
Farace (1987), S.240 ff.). Durch den offenen Raum und die
fehlenden räumlichen Grenzen erhalten sie mehr Informationen
darüber, inwiefern ihre Arbeit mit derjenigen der anderen Mitarbeiter zusammenhängt, was sich positiv auf die Identifikation mit ihrer eigenen Arbeit auswirkt (vgl. Favre

Bei einer Untersuchung der Zufriedenheit der Mitarbei-
tenden bezüglich der Privatheit und Dichte des Arbeitsplatzes stellt Oldham (1988) (S.253) fest, dass Büronutzer wei-
ter auseinanderliegende Arbeitsplätze (eine tiefe Dichte) ei-
ner Abgrenzung durch Trennwände (einer höheren Dichte) vorziehen.

Laut Sundstrom et al. (1980) (S.101 ff.) korrelieren die Arbeitsplatzmerkmale "Private" bzw. "Private workspace" und Arbeitszufriedenheit mit Korrelationen von \( r = 0.32 \)
bzw. \( r = 0.38 \) (p<0.05). Für die Unterschiede zwischen "Visible to supervisor" und Arbeitszufriedenheit werden von den genannten Autoren Korrelationen zwischen \( r = -0.30 \)
und \( r = -0.52 \) (p<0.05), für "Distance to path" (gemeint ist der Durchgang) und Arbeitszufriedenheit von \( r = -0.52 \)
(p<0.05) und für "Crowded workspace" und Arbeitszufrie-
denheit von \( r = -0.40 \) (p<0.05), ermittelt.

Eine unzulängliche Privatshäre kann beim Mitarbeiter
Stress und Konzentrationsstörungen hervorrufen. Demnach
können sich häufige Ablenkungen oder das Gefühl beobach-
tet zu werden, negativ auf die Zufriedenheit des Mitarbeiters
auswirken (vgl. De Croon et al. (2005), S.119).

Fasst man den Tenor der vorgestellten Studien zusam-
men, so wird der positive Zusammenhang zwischen der Zu-
friedenheit mit der Arbeitsumgebung bzw. der Arbeitsplatz-
zufriedenheit und der Arbeitszufriedenheit bekräftigt. Nach-
dem in den vorangegangenen Kapiteln die theoretischen Hin-

3. Empirischer Teil

3.1. Methodisches Vorgehen

In dieser Arbeit wird der Einfluss der Gestaltung von Bü-
oräumlichkeiten auf die Arbeitsplatzzufriedenheit von Führungspersonen anhand eines Schweizer Versicherungsunter-
nehmens analysiert. Dieses Unternehmen eignet sich gut für
 diese Arbeit, da es möglich ist, Führungskräfte aus unter-
schiedlichen Raumkonzepten an verschiedenen Standorten
t zu befragen.

Eine Fallstudie bietet sich für diese empirische Erhebung
an, da sie ein Phänomen innerhalb eines realen Kontextes
untersucht, bei dem die Trennung zwischen Phänomen und
Kontext nicht eindeutig möglich ist (vgl. Yin (1994), S.9). Die
analytische Tiefe einer Einzelfallstudie ermöglicht es, zahlrei-
che Variablen und Dimensionen zu erfassen und zu beschrei-
ben, um dadurch detailliertes und kontextabhängiges Wis-
zen zu erzeugen (vgl. Flyvbjerg (2011), S.303 ff.; vgl. Blatter
et al. (2007), S.124).

Für das Forschungsdesign wurde vom Autor eine quali-
tative Forschungsmethode gewählt, da diese versucht, in die
Tiefe des Einzelfalls einzudringen (vgl. Kühl et al. (2009), S.
18) und sich am Alltagsgeschehen und –wissen der Beforsch-
ten orientiert (vgl. Flick et al. (2000), S.23). Qualitative Forsch-
ungsmethoden sind näher an den zu untersuchenden Phä-
nomenen dran als Forschungsstrategien, die mit grossen Zah-
len, standardisierten Methoden und normativen Konzepten
arbeiten (vgl. Wilson (1973); zit. in Flick et al. (2000), S.17).
Sie ergänzen quantitative Studien und verleihen bestehenden
Daten durch eine subjektive Sichtweise mehr Tiefe (vgl. Flick
et al. (2000), S.25 f.).

3.1.1. Angewendete Methode

In dieser Studie wird die Erklärung menschlicher Empfin-
dungen angestrebt. Als Methode der Datensammlung wur-
de daher das Interview gewählt, da es die Rekonstruktion
subjektiver Empfindungen erlaubt (vgl. Hopf (1995), S.177)
und für Fallstudien eine wichtige Datenquelle darstellt (vgl.
Yin (1994), S.8). Der Forscher nimmt während des Inter-
views aufgrund seiner Aussenperspektive eine Besucherrol-
le im zu untersuchenden Feld ein. Dadurch können Routi-
nen und Selbstverständlichkeiten, die dem Befragten längst
normal erscheinen, hinterfragt werden (vgl. Flick (1995), S.
154). Die Daten werden dabei in ihrem natürlichen Kon-
text erhoben und Aussagen des Gesprächspartners im Kon-
text einer längeren Antwort oder Erzählung analysiert (vgl.
Flick et al. (2000), S.23).

Für die Durchführung der Befragung wurde die Methodik
des Experteninterviews gewählt. Sie eignet sich für die Er-
fassung und Analyse subjektiver Perspektiven der Befragten
den systematisierenden, teilstandardisierten und leitfaden-
basierten Interviewtechniken mit mehrheitlich offenen und

3.1.2. Beschreibung der Interviewpartner


- Sie arbeiten beim betrachteten Unternehmen dieser Arbeit
- Sie haben mehrjährige Führungserfahrung
- Ihnen sind mehrere Personen unterstellt

Bei der Auswahl der Interviewpartner wurde, im Sinne der Mehrperspektivität, auf eine ausgeglichene Verteilung der Geschlechter und auf die Vertretung unterschiedlicher Führungsebenen geachtet. Vom Autor wurden zwölf Personen angeschrieben, die alle Kriterien erfüllen, wovon folgende fünf für ein Interview gewonnen werden konnten (Siehe Tabelle 1).


3.1.3. Interviewleitfaden


3.1.4. Interviewablauf

Die Gespräche fanden, sofern dies die Umstände zulassen, in gewohnter Umgebung der Befragten statt, um ihnen dadurch mögliche Unannehmlichkeiten zu ersparen. Sie waren auf ca. 70 Minuten angelegt, wovon die Interviews im Durchschnitt ca. 55 Minuten in Anspruch nahmen. Vor dem Beginn der Interviews wurden den Forschenden das Interviewthemengebiet, die Rolle des Forschenden und die Interviewart erläutert. Allen Interviewpartnern wurde mittels Einverständniserklärung (Anhang 2), welche ebenfalls die Einwilligung der Befragten mit der Tonaufnahme beinhaltet, ein vertraulicher Umgang mit den gewonnenen Daten versichert. Allfällige Fragen der Probanden wurden noch vor
### Tabelle 1: Übersicht der Interviewpartner

<table>
<thead>
<tr>
<th>Befragter</th>
<th>Führungstufe</th>
<th>Persönliches Büro</th>
<th>Büroräumlichkeitskonzept¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Teamleiter</td>
<td>Einzelbüro</td>
<td>Zellenbüros</td>
<td></td>
</tr>
<tr>
<td>B Teamleiter</td>
<td>Gruppenbüro</td>
<td>Gruppenbüro</td>
<td></td>
</tr>
<tr>
<td>C Abteilungsleiter</td>
<td>Einzelbüro</td>
<td>Gruppenbüro</td>
<td></td>
</tr>
<tr>
<td>D Direktion</td>
<td>Einzelbüro</td>
<td>Kombibüro</td>
<td></td>
</tr>
<tr>
<td>E Direktion</td>
<td>Einzelbüro</td>
<td>Multi-Space-Büro</td>
<td></td>
</tr>
</tbody>
</table>


³Im Anhang 4 ist der für den Pretest verwendete Leitfaden zu finden.

Der Pretest zeigte, dass der Leitfaden das Feld gut exploriert und mögliche Antworten auf die Forschungsfrage gibt. Von der Testperson wurde besonders die Skizzierung ihrer Büroräumlichkeiten als gutes Mittel empfunden, sich auf das Thema zu fokussieren und ins Gespräch zu kommen. Anmerkungen der Testperson und zusätzliche Themen, die sich aus dem Gesprächsverlauf ergaben, flossen in die Überarbeitung des Interviewleitfadens und des -ablaufs mit ein. So wurde den Probanden noch vor dem eigentlichen Beginn der Interviews die Begriffe Arbeitszufriedenheit und Arbeitsplatzzufriedenheit erläutert. Es stellte sich heraus, dass "Zufriedenheit mit dem Arbeitsplatz" von den Probanden besser verstanden wird als "Arbeitsplatzzufriedenheit".

Im Pretest wurde ebenfalls ersichtlich, dass gewisse Bedenken bezüglich der Anonymität bestehen. Um diese Un sicherheit auszuräumen, wurde in der Einverständniserklärung und zu Beginn des Interviews nochmals ausdrücklich zugesichert, dass die nicht-anonymisierten Daten ausschließlich dem Forscher zugänglich sind. Im Kurzfragebogenden soziodemographischen Merkmalen wurde zudem die genaue Angabe des Alters durch Altersspannen ersetzt.

Da der Pretest sonst keine Verständnisschwierigkeiten zeigte und die Dauer des Interviews in etwa der vorgestellten Dauer entsprach, waren weitere Modifikationen nicht notwendig.

#### 3.1.6. Datenauswertung

demnach völlig themenfremde Passagen der Interviews nicht
verschrifft. Diese hatten weder einen Bezug zu Büroram-
llichkeiten, noch zu Arbeitszufriedenheit oder der Zufrieden-
heit mit der Arbeitsumgebung. Größtenteils handelte es sich
dabei um Gedankengänge über konkrete Arbeitsinhalte, die
aus Gründen der Anonymität ohnehin nicht hätten verwen-
det werden dürfen. Bei der Transkription wurde der Inter-
vie, mit einem "T" und die Befragten mit dem ihnen in der
Tabelle 1 zugeordneten Buchstaben gekennzeichnet.

Die Experteninterviews wurden anhand der qualitativen
Inhaltsanalyse nach Mayring (2008) ausgewertet. Sie dient
zur systematischen Bearbeitung von Kommunikationsmate-
rial und unterscheidet dabei drei inhaltsanalytische Analyse-
techniken, die unterschiedliche Ziele verfolgen (vgl. Mayring
(1985), S.193 ff.):

Die Expikation verfolgt das Ziel, unklare Texteite mit
zusätzlichem Textmaterial zu versehen, um sie dadurch ver-
ständlich zu machen. Ziel der Zusammenfassung ist es, das
Interviewmaterial so zu reduzieren, dass die wesentlichen
Inhalte erhalten bleiben und ein abstrahiertes Abbild des
Grundmaterials geschaffen wird.

Um aus dem umfangreichen Datenmaterial der Inter-
views die relevanten Aspekte zu gewinnen, wurde für die
Auswertung die dritte Analysetechnik der Strukturierung an-
gewandt. Sie hat das Ziel, bestimmte Inhalte und Themen
dem Material herauszufiltern und zusammenzufassen
(vgl. Mayring (2008), S.89 f.). Dafür werden die relevanten
Aspekte der Interviews mittels Kategoriensystem extrahiert
und anschliessend nach den für die Auswertung wesentlichen
Kriterien sortiert und auf Redundanzen und Widersprüche
geprüft (vgl. Gläser und Laudel (2009), S.199 ff.). Deduk-
tiv entwickelte Haupt(HK) und Unterkategorien (UK) des
Kategoriensystems geben bei der Strukturierung vor, welche
Inhalte aus dem Textmaterial gewonnen werden sollen (vgl.
Mayring (2008), S.89 f.). Unter welchen Voraussetzungen
ein Textbestandteil einer Kategorie zugeordnet wird, ist ent-
sprechend des von Mayring (1985) (S.198) vorgeschlagenen
Vorgehens ebenfalls im Kategoriensystem festgelegt. Dabei
wird für jede Kategorie definiert, welche Textbestandteile
unter diese fallen. Des Weiteren werden je Kategorie konkre-
te Textstellen aufgeführt, die als Ankerbeispielen gelten. Dort,
wo Abgrenzungsprobleme zwischen Kategorien bestehen,
werden Codierregeln formuliert, um eindeutige Zuordnun-
gen zu ermöglichen.

Nachfolgend wird schrittweise dargestellt, welche Pro-
zessschritte der Entwicklung des Kategoriensystems in dieser
Arbeit durchlaufen wurden. Der Autor orientierte sich dafür
an den Werken von Mayring (1985)1 und Kuckartz (2012),
wo eine Kombination der Vorschläge beider Autoren um-
gesetzt wurde:

1. In einem ersten Schritt wurden die grundlegenden
Strukturierungsdimensionen aus der Fragestellung ab-
geleitet und theoretisch begründet.

2. Die Dimensionen wurden anschliessend weiter diffe-
renziert, indem sie in die einzelnen Ausprägungen unter-
teilt wurden. Danach konnte aus den Dimensionen
und Ausprägungen ein Kategoriensystem zusammen-
gestellt werden, wofür vier deduktive Hauptkategorien
verwendet wurden. Diese wurden bereits während der
Darstellung der theoretischen Hintergründe entwickelt
und finden sich auch im Interviewleitfaden wieder. Sie
bilden eine Art Suchraster, mit dem das Datenmaterial
inhaltlich thematisch durchsucht und kategorisiert wer-
den kann (vgl. Kuckartz (2012), S.69). Dabei gilt es
zu beachten, dass die Kategorien weder zu umfassend

3. Um sicherzustellen, dass die einzelnen Textstellen
den richtigen Kategorien zugeordnet werden, wurden
zunächst Voraussetzungen für Zuordnungen zu den
einzelnen Kategorien definiert. Anschliessend wurden
für alle Kategorien Ankerbeispiele und je nach Bedarf
Dabei können Textstellen, die verschiedene Themen
enthalten, mehreren Kategorien zugeordnet werden

4. Bei einem ersten Materialdurchlauf wurde das Katego-
riensystem mit den deduktiv gebildeten Hauptkatego-
rion angewendet und alle im Material relevanten Text-
stellen provisorisch bezeichnet.

5. Die gefundenen Textstellen wurden extrahiert und ge-
prüft, ob die gebildeten Hauptkategorien sowie die da-
zugehörigen Definitionen, Ankerbeispiele und Codier-
regeln eine eindeutige Zuordnung ermöglichen (vgl.
Mayring (2010), S.93).

6. Die Hauptkategorien wurden durch deduktiv gebil-
dete Unterkategorien verfeinert, die ebenfalls mit zu-
dehörigen Definitionen, Ankerbeispielen und falls nö-
tig, mit Codierregeln versehen wurden. Es folgte eine
Überarbeitung aller Kategorien und Definitionen, bei
welcher ausserdem rückgeprüft wurde, ob alle Unter-
kategorien den richtigen Hauptkategorien zugeordnet
wurden (vgl. Mayring (2010), S.94).

Zwei Unterkategorien wurden aus dem Interviewma-
terial induktiv gebildet. Alle Aspekte, die unter diesen
Kategorien zusammengefasst sind, wurden von den In-
terviewten am Ende des Interviews – bei den Fragen
nach Punkten, die nicht angesprochen wurden und wie
der Büroraum aussehen würde, wenn man ihn selbst
gestalten könnte – erwähnt und enthalten wertvolle In-
formationen für diese Untersuchung. Diese Kategorien
wurden vollständigkeitshalber ebenfalls ins Kategori-
ensystem aufgenommen und sind farbig markiert.8

7. Vor der endgültigen Codierung des Datenmaterials
wurden mehrere Analyseeinheiten festgelegt. Dafür
wurden minimale (Codiereinheiten) und maximale
(Kontexteineheiten) Textbestandteile definiert, die ei-
er Kategorie zugeordnet werden dürfen. Ausserdem

\footnotesize{1 Eine Grafik des Ablaufmodells der strukturierenden Inhaltsanalyse nach Mayring (1985) ist im Anhang 8 zu finden.

\footnotesize{8 Das finale Kategoriensystem mit den Definitionen, Ankerbeispielen und Codierregeln befindet sich im Anhang 9.}
wurde festgelegt, in welcher Reihenfolge die Texteinheiten ausgewertet werden (vgl. Mayring (2010), S.59).


8. Zum Schluss konnten, basierend auf der vollzogenen Codierung des Interviewmaterials, die Ergebnisse je Kategorie aufbereitet und zusammenfassende Schlusse über die Kategorien gezogen werden.

Nachdem die methodischen Grundlagen dieser Studie aufgezeigt wurden, werden in den folgenden Abschnitten die Ergebnisse vorgestellt und anschliessend diskutiert.

3.2. Präsentation der Ergebnisse

In diesem Kapitel werden die Ergebnisse der ausgewerteten Interviews vorgestellt. Sie sind nach den Haupt- und Unterkategorien gegliedert, die für die Erstellung des Kategoriensystems ausgearbeitet wurden. Die Präsentation der Ergebnisse wird durch besonders aussagekräftige Interviewpassagen untermauert.

3.2.1. Ergebnisse zur Raum- und Arbeitsplatzanordnung

Diese Hauptkategorie umfasst alle Aspekte zum Arbeitsraum und Grundriss der Büroräumlichkeiten sowie Auswirkungen zur Bedeutung einer personalisierbaren Arbeitsumgebung. Nachfolgend werden die Ergebnisse der dazugehöri gen Unterkategorien präsentiert.

Individuelle Anpassungen


Zwei Führungskräfte gaben an, praktisch keine persönlichen Anpassungen an ihren Arbeitsumfeldern vorgenommen zu haben. In ihren Büros bzw. an ihren Arbeitsplätzen befanden sich nur vereinzelte persönliche Gegenstände.


Bedeutung eines personalisierten Arbeitsplatzes

Über die Bedeutung einer personalisierbaren Arbeitsumgebung liegen unterschiedliche Aussagen vor. Für die beiden Befragten, die praktisch keine Personalisierungen vorgenommen haben, hat diese keine grosse Bedeutung.

"Ich denke sogar, dass ich in einer nicht zu persönlichen Arbeitsumgebung besser arbeite." (I. B, 91-92)

Ein anderer Befragter schilderte die Wichtigkeit eines personalisierbaren Arbeitsplatzes unklar. Er habe nicht das Bedürfnis, sein Büro anzupassen, schätze aber trotzdem die Möglichkeit dazu und habe diese auch genutzt.

Zwei Personen schreiben dem personalisierbaren Umfeld eine grosse Bedeutung zu. Es sind dies die beiden Direktionsmitglieder D und E, die individuelle Anpassungen an ihren Arbeitsplätzen vorgenommen haben.


Eine personalisierte Arbeitsumgebung wirkt sich bei den beiden Direktionsmitgliedern positiv auf deren Arbeitsweise und Leistungsfähigkeit aus.

"Ich habe auch das Gefühl, dass ich in einer vertrauten Umgebung effizienter arbeite. Ich kann mich so auf die Arbeit konzentrieren und verliere nicht noch zusätzlich Zeit, mich an die Umgebung zu gewöhnen." (I. D, 67-69)

Proband E betonte die positive Wirkung für das Unternehmen, wenn er in der personalisierten Umgebung seine beste Leistung erbringen könne. Er arbeite effizienter und kreativer, wenn er sich wohl fühle in seiner Umgebung. Das sei gut fürs Unternehmen und für ihn persönlich, da er mit sich

9Das Kategoriensystem mit dem codierten Textmaterial ist im Anhang 10 zu finden.
self zufrieden sei. Könnte er nicht so effizient arbeiten, wie er sich vorstelle, wäre er unzufriedener.

In Schilderungen der Befragten D und E wird die Rolle der personalisierten Umgebung hinsichtlich eines Rückzugsortes ersichtlich. Demnach schafft die – durch persönliche Anpassungen entstandene – vertraute Umgebung einen beruhigenden Rückzugsort in Stresssituationen.

Fehlende Anpassungsmöglichkeiten
Zwei Interviewte äusserten sich zur Situation, wenn es keine Möglichkeiten geben würde, die Arbeitsumgebung an individuelle Bedürfnisse anzupassen. Dabei sind sie unterschiedlicher Meinung. Der Befragte A sieht kein Problem darin, wenn er keine Anpassungen vornehmen könne, wohlgegrenzt sich E nicht mehr wohlfühlen und eine verringerte Leistungsfähigkeit verzeichnen würde.

Proband E argumentierte wiederum mit dem Nutzen für das Unternehmen:

"Schlussendlich hat ja auch die Firma mehr davon, wenn jeder Mitarbeiter seine beste Leistung erbringen kann. Da dies bei mir der Fall ist, wenn ich ein paar Anpassungen machen kann und mich dadurch wohl fühle, sollte dies auch gefördert werden." (I. E, 65-68)

Grundriss und Anordnung der Büroräumlichkeiten

Einflüsse des Arbeitsraumes
Person B, die in einem Gruppenbüro arbeitet, schätzt die Nähe und den Blickkontakt zu ihrem Team. Trotzdem ist sie froh, dass ihr Arbeitsplatz zuhinterst an der Wand und nicht in der Mitte des Raumes liegt. Zwei Führungspersonen, die in Einzelbüros arbeiten, gefällt die Nähe ihrer Arbeitsplätze zu den Teams, die sich in den Räumen nebenan befinden.

Besonders die Direktionsmitglieder sind mit ihren grossen Bürorräumen zufrieden. Die Möglichkeit, Besprechungen an einem Sitzungstisch im eigenen Büro abhalten zu können, wird von genannten Personen sehr geschätzt.

Proband A äusserte sich negativ zu seinem Einzelbüro. Er beklagte sich über fehlende Pausen, in denen er von der Arbeit wegkomme. Da er jeden Tag in seinem Einzelbüro arbeite, habe er das Gefühl, einen Tunnelblick entwickelt zu haben.

"Ich finde, dass ich diesen Tunnelblick erst bekommen habe, seit ich alleine in einem Büro arbeite." (I. A, 79-80)

In seinem Büro fühle sich A zwar wohl, er wisse aber nicht genau, was sein Team über ihn denke oder spreche, wenn er nicht in ihrem Büro sei. Führungsperson D hingegen hat dank einer für sie optimalen Raumordnung nicht das Gefühl, etwas zu verpassen, wenn sie in ihrem Büro ist. Wenn sie jedoch mehr abgeschottet wäre vom Team, dann hätte sie ein Problem damit. Gerade in Bezug auf die Konzentration spielt die Abschottung für Proband A eine zentrale Rolle.

"Mit dem Einzelbüro bin ich zwar abgeschottet, was aber auch wichtig ist, da ich diese Zeit für mich brauche um mich zu konzentrieren." (I. A, 237-239)

Hinsichtlich seiner Produktivität äusserte sich Proband B, der zuvor in einem Einzelbüro gearbeitet hatte, wie folgt:

"Natürlich habe ich das Gefühl, dass ich nicht mehr gleich produktiv bin, wie als ich in einem Einzelbüro sass." (I. B, 59-60)

Ein anderer Interviewer sieht in seinem Einzelbüro den Vorteil, dass er dank dem Besprechungstisch viel Zeit bei der Planung von Besprechungen oder sonstigen organisatorischen Arbeiten einspart.

Die befragten Führungspersonen sind überzeugt, dass sie ihre beste Leistung erbringen, wenn sie ihre Führungsaufgaben so ausführen können, wie sie sich das vorstellen. Dabei unterstützen sie ihre Büros. Der Interviewte D zieht die Wirkung auf seine Zufriedenheit noch mit ein.


Individuelle Kontrolle über den Arbeitsplatz / Arbeitsraum
Zwei Probanden erklärten, dass ihre Einzelbüros ihnen erlauben, die Lichtverhältnisse und die Geräuschbelastungen individuell zu kontrollieren. Sie können die Sonnenstoren selber bedienen und dadurch eine zu starke Sonneneinstrahlung verhindern. Zudem haben sie die Möglichkeit, ihre Türe zu schliessen und damit den Geräuschpegel im Arbeitsraum zu steuern.
Ein Interviewer hätte sogar noch die Möglichkeit, die Raumtemperatur selbst zu regulieren, was er jedoch bisher noch nie getan hat. Im Gruppenbüro hat Führungsperson B keine Möglichkeiten zur individuellen Steuerung einzelner Faktoren.

Ein Befragter schilderte, dass er trotz seines Einzelbüros nicht die vollständige Kontrolle über die Lichtverhältnisse habe und daher gewisse Anpassungen nicht vornehmen könne.


3.2.2. Ergebnisse zu physikalischen Größen

Bei den unter dieser Hauptkategorie aufgeführten Aussagen handelt es sich um Beschreibungen der klimatischen Aspekte sowie um Äusserungen zur ergonomischen Gestaltung des Arbeitsraumes und deren Wirkungen auf die Befragten. Die Ergebnisse der einzelnen Unterkategorien werden nachfolgend präsentiert.

Geräusch- und Lärmbelastungen

Für alle Befragten stellt ein ruhiges Arbeitsumfeld eine Vor aussetzung dar, um sich optimal konzentrieren zu können. Dabei sei besonders für schwierige Arbeiten eine geringe Geräuschbelastung unerlässlich. Führungspersonen, die in Einzelbüros arbeiten, erzählten, dass es in ihren Büros sehr ruhig sein könne, wenn sie ihre Türe schliessen. Eine Person äusserte auch ihre Bedenken, wenn sie in einem Mehrpersonen Büro arbeiten müsste:

"Wenn ich mit mehreren Personen in einem Raum arbeite, dann wäre der Geräuschpegel höher und ich – aber auch die anderen – könnte mich nicht mehr gleich gut konzentrieren." (I. D, 154-156)

Die Führungskraft B ist zeitweise einer störenden Geräuschbelastung ausgesetzt. Wenn in ihrem Gruppenbüro mehrere Personen gleichzeitig telefonieren, hat dies einen hohen Geräuschpegel zur Folge. Unter diesen Umständen fällt es B schwer, sich zu konzentrieren, was zur Folge hat, dass sie weniger produktiv ist. B relativierte diese Umstände jedoch damit, dass es sich dabei nur um einzelne Phasen und nicht um einen dauerhaften Zustand handle.

Lichtverhältnisse


Zwei Personen betonten, dass ein gut belichteter Arbeitsplatz zu den Grundvoraussetzungen gehöre, um konzentriert arbeiten zu können und sich wohl zu fühlen.

Zwei Probanden berichteten, dass ihnen die Sonne teilweise direkt auf den Bildschirm scheine. Eine Person hat die Möglichkeit, den Bildschirm zu drehen und damit das Problem zu lösen. Der andere Proband hat hingegen keine solche Möglichkeit, sodass die Sonneneinstrahlung zeitweise störend wirkt.

Temperatur

Vier Personen beklagten sich über hohe Raumtemperaturen im Sommer. In allen Büros, ausgenommen im Büro von E, gibt es weder eine Lüftung noch eine Klimaanlage, die dazu beitragen, dass die Räume im Sommer gekühlt werden können. Der Wunsch nach einer Klimaanlage oder einer Lüftung konnte aus den Aussagen der Interviewten herausgehört werden. Die hohen Temperaturen beeinflussen die Konzentration und damit die Arbeitsweise der Probanden, wie folgende Aussage beispielhaft verdeutlicht:

"Im Sommer kann es wirklich sehr heiss werden im Büro. (. . . ). Ich konnte mich nicht mehr wirklich konzentrieren. Es wäre daher sicherlich sinnvoll, eine Lüftung oder eine Klimaanlage einzubauen." (I. B, 55-58)

Einzig Führungsperson E, deren Einzelbüro sich in einem Multi-Space-Bürokonzept befindet, beklagte sich nicht über zu warme Temperaturen im Sommer, da in ihrem Büro eine gute Lüftung verbaut wurde.

Ergonomie und Möblierung

Zwei Probanden erzählten, dass sie für ihre Arbeit relativ viel Ablagefläche benötigen und daher die vorhandenen Möbel, in denen sie ihre vertraulichen Unterlagen ablegen oder einschliessen können, besonders wertschätzen. Die Interviewten beschrieben auch die ergonomische Gestaltung des Arbeitsplatzes und deren Bedeutung.


Alle Befragten schilderten die Wichtigkeit einer guten Körperhaltung, die besonders während der Arbeit am Arbeitsstisch relevant sei. Vier der fünf Probanden haben einen höhenverstellbaren Tisch. Im Büro des Befragten ohne höhenverstellbaren Tisch gibt es allerdings andere Möglichkeiten, die Arbeitsposition zu wechseln.

Ein Befragter beklagte sich über körperliche Beschwerden aufgrund einer falschen Körperhaltung während der Arbeit, was primär auf die ergonomische Gestaltung der Arbeitsplätze zurückzuführen sei.
"Besonders gut finde ich, dass ich einen höhen-
verstellbaren Tisch habe. Ich wechsle meine Hal-
tung immer wieder. Seit ich hier arbeite, habe ich
keine Rückenschmerzen, weil ich zu viel sitze." (I. C, 94-96)

Für ein Direktionsmitglied stellt die ergonomische Ge-
staltung des Arbeitsplatzes eine Grundvoraussetzung dar, um
sich während der Arbeit konzentrieren zu können. Zudem
bildet die Ergonomie am Arbeitsplatz eine Basis für das per-
sönliche Wohlbefinden.

3.2.3. Ergebnisse zur sozialen Interaktion
Unter diese Hauptkategorie fallen Aussagen, die Einbli-
cke in die Interaktion zwischen Individuen in ihren Büro-
räumlichkeiten geben. Die Ergebnisse der dazugehörigen
Unterkategorien werden in der Folge präsentiert.

Orte und Themen der Gespräche
Der Kontakt zwischen den Probanden und ihren Teams findet
in den Büros der Führungskräfte und auch in den Räumlich-
keiten der Teams statt. Allerdings unterscheiden sich die
Gesprächsinhalte je nach Ort. Die Befragten gaben an, dass
in den Räumlichkeiten der Teams hauptsächlich arbeitsbezo-
gene Themen bilateral oder im Plenum besprochen werden.
Der Anteil an privaten und vertraulichen Themen sei bei Ge-
sprächen in diesen Räumlichkeiten minimal. Führungsperso-
nen mit einem Einzelbüro schilderten, dass alle vertraulichen
und persönlichen Gespräche ausschließlich in ihren Büros
stattfinden würden. Diese Befragten betonten auch, dass ge-
nerell die Mehrheit der Gespräche in ihren Arbeitsräumen
stattfinde. Demnach komme das Team für vertrauliche An-
gelegenheiten und für fachliche Fragen zu ihnen ins Büro.
Zwei Befragte empfanden dies als optimale Lösung, da sie
alle nützlichen Hilfsmittel in ihren Büros zur Verfügung haben.
Die beiden Direktionsmitglieder berichteten, dass praktisch
alle Gespräche in ihren Büros abgehalten werden.

"Darum, dass ich im Vergleich zu meinem Team
das grösste Büro habe, finden die meisten Be-
sprechungen in meinem Büro statt" (I. E, 115-
116)

Aus den Äusserungen der Probanden wurde ersichtlich,
dass in den Gängen der Bürogebäude keine Gespräche statt-
finden, da sich die Räume der Führungskräfte jeweils sehr
nahe am jeweiligen Team befinden. Führungsperson B, die im
Gruppenbüro arbeitet, berichtete, dass ihr Team für arbeits-
bezogene Fragen jeweils zu ihr an den Arbeitsstisch komme.
In der Pause gehe sie zusammen mit ihrem Team in einen
Pausenraum und spreche dort über private Themen.

Personen, Anzahl und Länge der Gespräche
Häufigen und sehr guten Kontakt mit ihrem Team hat beson-
ders die Führungsperson B im Gruppenbüro. Während der
Arbeit interagieren die Befragten zum grössten Teil mit den
eigenen Teams. Ein Proband gab jedoch an, dass mit einer
räumlich benachbarten Abteilung ebenfalls ein bereichern-
der Austausch stattfinde. Alle Führungskräfte haben neben
spontanen Gesprächen auch feste Besprechungs- oder Team-
sitzungstermine mit ihren Teams eingeplant. Diese geplanten
Gespräche finden täglich oder wöchentlich statt und dauern
jeweils zwischen einer halben und einer ganzen Stunde.
Die beiden Direktionsmitglieder betonten, dass sie haupt-
sächlich im Voraus geplante Besprechungen mit ihren Teams
haben, da sich diese aus Abteilungsleitern mit eigenen Teams
zusammensetzen. Dennoch finden auch diese Gespräche re-
gelmässig statt:

"Bei uns gibt es weniger den spontanen Kontakt.
Jeder Abteilungsleiter ist auch wieder mit seinem
Team beschäftigt. Daher haben wir aber auch je-
den Tag diese kurze Besprechung, in der wir uns
gegenseitig informieren." (I. D, 92-94)

Sozialer Zusammenhalt
Mehrere Probanden schilderten, dass ihre persönliche Zu frie-
denheit massgeblich von derjenigen ihrer Teams abhänge.
Insgesamt wurde der Teamzusammenhalt von allen Proban-
den als sehr gut beschrieben. Zwei Befragte gaben an, dass
gerechterweise die räumliche Trennung zwischen ihnen und ihren
Teams den Teamzusammenhalt fördere. Eine Person begrün-
dete dies damit, dass sich sein Team überwacht fühlen würde,
bei der Vorgesetzten in den Raum gesänge. Zudem würde
sich die Kommunikation innerhalb des Teams verschlechtern,
bei der sie und ihr Vorgesetzten gehört würden.
Ein anderer Befragter äusserte sich folgendermassen dazu:

"Ich glaube, es wäre auch für den Zusammenhalt
weniger förderlich, wenn wir alle im gleichen Bü-
ro sässen. Keiner könnte seine Aufgabe in diesem
Fall so wahrnehmen, wie er es eigentlich möchte.
Dann sind alle unzufriedener." (I. E, 201-203)

Eine Führungsperson unterstrich die Wichtigkeit der
räumliche Nähe für den Teamzusammenhalt. Sie sei über-
zeugt, dass sich die schnellen und kurzen Kommunikations-
wege, die aus den unmittelbar nebeneinander angeordneten
Räumen resultieren, positiv auf den Zusammenhalt zwischen
ihm und ihrem Team auswirken.

Ein anderer Befragter gab an, dass der soziale Zusammen-
halt zwischen ihm und seinem Team über die Zeit gewachsen
sei, in der sie sich regelmässig in seinem Büro getroffen ha-
ben. Durch die zahlreichen Gespräche in einer vertraulichen
Umgebung sei zwischen ihm und seinem Team ein Vertrauen
gewachsen. Zwei andere Befragte erzählt, dass sie mög-
lichst immer ihre Türen offen lassen, um damit den Teams zu
signalisieren, dass sie jederzeit kommen dürfen. Eine weite-
re Äusserung unterstreicht die Hilfsbereitschaft der Befragten
gegenüber ihren Teammitgliedern:

"Der Raum sollte möglichst grosse Türen haben,
die einen grossen Eingang bilden, wenn sie offen
sind. So soll jeder Mitarbeiter das Gefühl haben,
er könne sich an mich wenden." (I. E, 223-224)


**Büro als Interaktionsförderer**

Von den Befragten mit Einzelbüros wurde besonders häufig erwähnt, dass sie dank ihren Büros die Möglichkeit haben, vertrauliche und spontane Gespräche mit anderen Mitarbeitern zu führen, ohne dabei auf räumliche oder zeitliche Hindernisse zu stossen. Mehrere Befragte sind der Meinung, dass durch die Einzelbüros spontane Gespräche mit ihren Mitarbeitern zustande kommen, die in separaten Sitzungszimmern nicht entstehen würden. Ein anderer Proband sprach den Aspekt der Arbeitseffizienz an, da er kein separates Besprechungszimmer organisieren müsse:


Einen weiteren Vorteil der Einzelbüros sehen zwei Probanden darin, dass sie bei Besprechungen in ihren Büros alle Unterlagen und technischen Hilfsmittel jederzeit zur Hand haben. Dadurch können sie auch spontane Meetings durchführen, ohne einen Zeitverlust durch das Organisieren von Sitzungszimmern oder das Zusammensuchen von Unterlagen verzeichnen zu müssen.

Ein Befragter berichtete davon, dass er dank eines Glasfensters in der Bürortüre trotz geschlossener Türe visuell nicht vom Team getrennt sei und dadurch auch mitbekomme, was im Team vorgehe und gegebenenfalls handeln könne.

Direktionsmitglied D sieht die Grösse seines Einzelbüros als kommunikationsfördernd an, da es für das ganze Team Platz bietet und daher in allen möglichen Situationen einen Kommunikationsort darstellt. Für Führungsperson E stellt das Einzelbüro die optimale Lösung dar, da praktisch alle Besprechungen im Voraus geplant werden. So kann sie in Ruhe arbeiten und muss nicht das Gefühl haben, dass die Kommunikation darunter leidet.

Proband B betonte die kurzen Kommunikationswege im Gruppenbüro. Er könne von seinem Tisch aus das ganze Team ansprechen und ihnen Informationen weiterleiten. Im Gruppenbüro seien keine räumlichen Hindernisse vorhanden, die die Kommunikation einschränken könnten. Dies fördere die fachliche Kommunikation untereinander.

"Dass ich inmitten meines Teams sitze, ist auch im Hinblick auf fachliche Fragen nützlich. Es kommt häufig vor, dass sich Personen zu einer fachlichen Diskussion dazusetzen, wenn sie diese hören." (I. B, 117-119)

Dadurch, dass Proband B seine Mitarbeiter permanent sieht oder hört, weiss er, wie sie arbeiten und hat dadurch eine gewisse Kontrolle. Zudem erkennt er Schwierigkeiten sehr schnell und kann entsprechend darauf reagieren.

**Büro als Interaktionshemmer**


"Wenn ich dann das Gefühl habe, dass alle mitreden sollten, dann müssen wir das Büro wechseln. Das ist manchmal schon mühsam." (I. A, 211-212)

**Routinen und kulturelle Einflüsse**


Alle Interviewpartner betonten die Rolle von Routinen und kulturellen Einflüssen, die gerade in der Kommunikation eine unabdingbare Rolle einnehmen. Mehrere Befragte gaben an, dass sich durch vorhandene Routinen die Kommunikation über mehrere Räume hinweg organisieren lasse.

"Ich möchte nochmals die Bedeutung von eingespielten Routinen herausheben. Ich denke, dass man mit einer offenen Kommunikationskultur und eingespielten Routinen auch in Einzelzimmern eine funktionierende und effiziente Kommunikation erreichen kann." (I. D, 196-198)


"Im Moment sehe ich keinen Grund, dass ein anderes Bürokonzept meine Arbeit besser unterstützen könnte als mein aktuelles. Es haben sich persönliche Routinen entwickelt, die sehr gut funktionieren." (I. D, 147-149)

Einen Wechsel des Bürorraumkonzeptes beurteilten die Befragten negativ. Als besondere Problematik sehen sie den Verlust aller Routinen, die sich über Jahre entwickelt haben und aktuell gut eingespielt sind. Sie betonten, dass sie sich
3.2.4. Ergebnisse zur Privatheit

Unter diese Hauptkategorie fallen alle Aussagen zur akustischen und visuellen Privatsphäre in Büroräumlichkeiten. Nachfolgend werden die Ergebnisse der einzelnen Unterkategorien des Kategorienystems präsentiert.

**Akustische Privatsphäre**

Alle Interviewten schilderten die Wichtigkeit der akustischen Privatsphäre hinsichtlich der vertraulichen Gespräche, die sie mit ihren Mitarbeitern führen. In eigenen Büros können sie sich akustisch abschotten und ungestört über wichtige Angelegenheiten sprechen. Proband A erklärte, dass Emotionen in Gesprächen erst dann sichtbar werden, wenn zwischen den Gesprächspartnern eine vertrauliche Situation herrsche. In seinem Büro wisse alle Teammitglieder, dass sie niemand hören könne. Mehrere Interviewte erwähnten, dass es für sie wichtig sei, vertrauliche Gespräche führen zu können, um dadurch möglichst viel von den Mitarbeitern zu erfahren. Proband E betonte:


Die beiden Direktionsmitglieder gaben an, dass sie jeden Tag zahlreiche Telefonate und Besprechungen haben, deren Inhalte nicht für andere bestimmt seien. Daher sei die akustische Privatsphäre in ihren Einzelbüros für ihre Tätigkeiten unabdingbar. Der Befragte E findet es wichtig, dass er jederzeit eine schalldichte Besprechungszone zur Verfügung hat. Hätte er keine Besprechungszone, die akustische Privatsphäre garantiert, würden die spontanen Besprechungen mit seinen Mitarbeitern nicht mehr zustande kommen. Proband C muss für sehr heikle Themen und für Jahresgespräche ein anderes Besprechungszimmer aufsuchen, da sein Büro trotz geschlossener Türe nicht vollständig schalldicht ist. Er unterstrich die Wichtigkeit der akustischen Privatsphäre mit folgender Aussage:

"Für mich wäre es sehr wichtig, wenn ich zu 100 Prozent wüsste, dass mein Büro schalldicht ist. Das würde mir bei vertraulichen Gesprächen auch mehr Sicherheit geben und vor allem auch als Schutz für meine Mitarbeiter dienen." (I. C, 229-232)

Führungsperson B im Gruppenbüro äusserte den Wunsch nach mehr akustischer Privatsphäre. Sie brauche einen schalldichten Raum, in dem sie die vertraulichen Gespräche mit ihren Mitarbeitern abhalten könne. B schrieb der akustischen Privatsphäre einen höheren Stellenwert zu als der visuellen. Was teilweise aus den Äusserungen der anderen Befragten herauszuhören war, schilderte Proband B wie folgt:

"Die akustische Privatsphäre ist mir aber vor allem im Hinblick auf meine Führungsfunktion wichtig und nicht aus persönlichen Gründen." (I. B, 189-190)

**Visuelle Privatsphäre**

Alle Befragten gaben an, dass es für sie wichtig sei, dass niemand auf ihre Computerbildschirme schauen könne, da sie häufig vertrauliche Arbeiten erledigen. Grundsätzlich sei der Grossteil ihrer Arbeitsinhalte ausschliesslich für sie bestimmt und dürfe daher nicht von den anderen Mitarbeitern gesehen werden. Proband C äusserte sich folgendermassen dazu:

"Ich könnte nicht in der Mitte des Raumes sitzen, wo alle auf meinen Bildschirm sehen. Da würde es doch relativ viele Sachen geben, die ich deshalb nicht erledigen könnte." (I. C, 43-45)

Führungsperson B schafft sich die visuelle Privatsphäre selber, indem sie morgens früh ins Büro kommt, wenn noch niemand im Gruppenbüro anwesend ist. Da sie keine abgetrennten Bereich hat, erledigt sie die vertraulichen Arbeiten jeweils dann, wenn sie alleine im Büro ist. Sie betonte jedoch, dass es trotzdem Orte geben sollte, an denen sie Unterlagen studieren könne, die niemand anderes sehen dürfe. Der Befragte C, der in einem Einzelbüro arbeitet, gab an, dass er im Falle eines Wechsels zu einem offenen Raumkonzept die vertraulichen Arbeiten zuhause erledigen würde, da er dort mit Sicherheit visuell abgeschottet wäre. Dieser Proband schreibt, über den ganzen Tag gesehen, der visuellen Privatsphäre daher einen höheren Stellenwert zu als der akustischen. Für drei Interviewte nimmt die visuelle Privatsphäre daher einen höheren Stellenwert zu als der akustischen. Für drei Interviewte nimmt die visuelle Privatsphäre daher einen höheren Stellenwert zu als der akustischen. Für drei Interviewte nimmt die visuelle Privatsphäre daher einen höheren Stellenwert zu als der akustischen. Für drei Interviewte nimmt die visuelle Privatsphäre daher einen höheren Stellenwert zu als der akustischen. Zur visuellen. Was teilweise aus den Äusserungen der ande-
Proband A beschrieb, dass er ein Einzelbüro brauche, um seine Führungsaufgabe bestmöglich erfüllen zu können. Zudem arbeite er auch effizienter, wenn er alleine in einem Raum sei. Durch die Privatsphäre im Einzelbüro könne er mit seinen Teammitgliedern vertrauliche Themen besprechen und sie dadurch vorstellungsgemäß führen. Hätte Proband A die Möglichkeit für individuelle Gespräche in seinem Büro nicht mehr, so könne er sein Team nicht mehr gleich gut führen wie bisher. Führungsperson B unterstrich ebenfalls die Wichtigkeit eines abgeschotteten Raumes.

"Um meine Mitarbeiter möglichst gut führen zu können, brauche ich einen Raum, indem man akustisch abgeschottet sprechen kann." (I. B, 190-192)

Der Befragte D beschrieb den Zusammenhang zwischen den Anforderungen, die seine Arbeit an sein Büro stellt, seiner Führungsaufgabe und seiner Zufriedenheit:


Die Probanden sprachen ebenfalls den Aspekt der Arbeitseffizienz an. Ihnen sei nicht nur die Privatsphäre wichtig, sondern auch, wie sie jene erreichen. Alle Personen, die in Einzelbüros arbeiten, betonten, dass sie durch das Suchen und Organisieren eines separaten Raumes für vertrauliche Gespräche viel Zeit verlieren würden und dadurch nicht gleich effizient arbeiten könnten wie bisher. Dadurch, dass sie eigene Büros haben, in denen sie sich abschotten können und die nötigen Hilfsmittel und Unterlagen zur Hand haben, können sie die sonst verlorene Zeit produktiv nutzen. Die Führungsperson, die kein Einzelbüro hat, bestätigte die zeitlichen Ineffizienzen durch das Suchen eines Raumes, wenn sie ein vertrauliches Gespräch führen muss:

"Das einzige, was mich stört ist, dass das Suchen eines Raumes jedes Mal ziemlich viel Zeit in Anspruch nimmt." (I. B, 196-197)

Diese Führungsperson berichtete auch, dass sie besser mit ihrem Team zusammenarbeiten, wenn sie mit allen Mitgliedern akustisch und visuell in Kontakt sei.

Auswirkungen auf die Zufriedenheit und das Wohlbefinden

Die Interviewten beschrieben den Einfluss der Privatsphäre auf ihre Zufriedenheit und ihr Wohlbefinden in der Arbeitsumgebung. Diese hänge aber nicht direkt von der akustischen und visuellen Privatsphäre selbst ab, sondern von den Möglichkeiten, die sie zur Wahrnehmung ihrer Arbeitsaufgaben mit sich bringe. Dieser Zusammenhang wird durch folgende Aussage besonders deutlich dargestellt:

"Es erlaubt mir, meine Aufgabe bestmöglich wahrzunehmen und sehr effizient auszuführen, (...) Wenn ich meine Arbeit wie gewünscht ausführen kann, hat das zur Folge, dass ich auch zufriedener bin, als wenn dies nicht der Fall wäre. Mein Büro leistet ein grosser Beitrag dazu. Daher bin ich auch mit meinem Büro sehr zufrieden, weil es auf meine Arbeitstätigkeit abgestimmt ist und seine Funktion als Arbeitsort erfüllt." (I. D, 171-176)

Führungsperson A fühlt sich in den vertraulichen Gesprächen mit ihren Teammitgliedern wohler, wenn sie weiss, dass niemand sehen und hören kann. Proband B berichtete, dass er sich im Gruppenbüro wohlfühle und kein Problem damit habe, sich visuell nicht abgrenzen zu können.

Büro im Kontext der Führungsposition im Unternehmen


"Ich lege mehr Wert darauf, dass wir einen guten Teamzusammenhalt haben und wir gute Teamergebnisse präsentieren können, als dass ich ein möglichst grosses und exklusives Einzelbüro habe." (I. B, 225-228)

Aufgrund der Nähe zum Team ist auch er sich seiner Aufgabe im Team bewusst. Zudem weiss er zu jeder Zeit, wo es Probleme gibt und wie es seinem Team geht.

Störungen und Massnahmen

Die beiden Direktionsmitglieder haben zusätzlich noch die Möglichkeit, ihre Telefone auf eine andere Person umzuleiten, um eine absolute Störungsfreiheit zu erlangen. Dadurch können sie sich vollständig abschotten und sehr konzentriert und in Ruhe arbeiten.

Führungsperson B im Gruppenbüro hat hingegen keine Möglichkeit, sich physisch von Störungen zu schützen. Sie gab an, dass sie arbeitsorganisatorische Massnahmen einge führt habe. Diese Massnahmen zeigen die gewünschte Wirkung:

"Eigentlich funktioniert das nicht schlecht. Ich werde dadurch weniger unterbrochen in meiner Arbeit." (I. B, 105-106)

Das Team kommt nur noch bei sehr dringenden Angelegenheiten zu ihr an den Arbeitstisch. Die restlichen Fragen werden in den geplanten Besprechungen geklärt.

**Planungsempfehlungen**

Diese Unterkategorie umfasst Aussagen der Befragten, die sie auf die Frage gegeben haben, wie ihr Büro aussehen würde, wenn sie es selber gestalten könnten. Da alle Probanden mit ihren aktuellen Büros zufrieden sind, wurden nur einzelne Verbesserungsvorschläge genannt.


Ein Direktionsmitglied könnte sich vorstellen, mit seinem Team in einem grossen Raum zu arbeiten. Dieser müsste aber für jeden eine Besprechungsbox zur Verfügung stellen, sodass niemand eine Besprechungszone suchen bzw. organisieren muss. Dadurch kann gegebenenfalls eine effizientere Kommunikation erreicht werden. Andererseits kann es aber auch sein, dass sich durch die Gespräche alle gestört fühlen. Ausserdem ist es wichtig, dass die Arbeitsinhalte der Personen im selben Raum in etwa übereinstimmen.

3.3. Diskussion der Ergebnisse

Nachfolgend wird die Forschungsfrage dieser Arbeit beantwortet, indem die empirisch ermittelten Ergebnisse (Kapitel 3.2.) diskutiert und mit Forschungsergebnissen der theoretischen Auseinandersetzung (Kapitel 2.3.) in Beziehung gesetzt und verglichen werden. Dadurch soll festgestellt werden, inwiefern die Ergebnisse der Führungspersonen aus der Fallstudie mit denen der gesamten Mitarbeiterbelegung aus der Literatur übereinstimmen.

**Diskussion der Kategorie Raum- und Arbeitsplatzanordnung**


Ferner zeigen die Ergebnisse der Fallstudie eine konträre Sichtweise betreffend der Prämisse für personalisierbare Arbeitsumgebungen. Befragte Führungspersonen, die ihren Arbeitsplatz nicht personalisiert haben, schreiben diesem keine Bedeutung zu und sind deswegen nicht unzufriedener. Teilweise wird ein personalisierter Arbeitsplatz sogar als negativer Einfluss auf die Arbeitsausführung klassifiziert. Die Erkenntnisse der Fallstudie widersprechen in dieser Hinsicht sämtlichen befundenen Ansätzen aus der Literatur, die der personalisierten Umgebung positive Wirkungen auf das Wohlbefin-


Diverse Schilderungen der Befragten deuten auf eine höhere Effizienz in Einzelbüros hin, die durch die vorhandene Infrastruktur und den daraus folgenden Zeiteinsparungen bei organisatorischen Arbeiten entsteht. Für die befragten Führungspersonen sind große Einzelbüros mit vorhandener Infrastruktur und Platz für einen Besprechungstisch entscheidend für eine effiziente Ausführung ihrer Arbeit. Nach Meinung des Autors müssen jedoch hinsichtlich der Arbeitseffizienz in Einzelbüros noch weitere organisatorische Aspekte untersucht werden, bevor auf diese Erkenntnisse geschlossen werden kann.


Die unterschiedlichen Ergebnisse bezüglich der Wirkung von Personalisierungen auf die Zufriedenheit können demnach aufgrund individuell verschiedener Präferenzen jedes Individuums zustande kommen und nicht infolge unterschiedlicher Bedürfnisse von Führungspersonen. Ob allerdings auf diese Schlussfolgerung geschlossen werden kann, ist fraglich und sollte unter Berücksichtigung aller dafür notwendigen Faktoren untersucht werden.

**Diskussion der Kategorie Physikalische Grössen**


Die aus den Schilderungen der Fallstudie ermittelte positive Auswirkung von hellen Lichtverhältnissen und Tages-


Hinsichtlich der Wirkungen von physikalischen Grössen auf die Zufriedenheit der Führungspersonen sind zwischen den Erkenntnissen aus der Fallstudie und den Ergebnissen in der Literatur keine Unterschiede auszumachen.


**Diskussion der Kategorie Soziale Interaktion**

Diese Kategorie deutet darauf hin, dass die Interaktion mit dem Team ebenfalls einen Einfluss auf die Zufriedenheit der befragten Führungspersonen hat. Entscheidend dabei ist, ob das Bürokonzept die Interaktion mit den Teammitgliedern unterstützt.


Die Aussagen der Befragten lassen den Schluss zu, dass die Zufriedenheit der Führungspersonen massgeblich von derjenigen ihrer Teams und damit auch vom Teamzusammenhalt abhängt. Dabei wurde aufgezeigt, dass die räumliche Trennung den Teamzusammenhalt fördert, da sich die Teammitglieder nicht überwacht fühlen. Für den Teamzusammenhalt und die Zufriedenheit der Führungspersonen spielen schnelle und kurze Kommunikationswege eine entscheidende Rolle, was nahe an den Grundgedanken der von Windliger und Zäch (2007) (S.77 ff.) beschriebenen barrierefreien Kommunikation zur Erhöhung des sozialen Zusammenhaltes herankommt. Im Vergleich zur Erkenntnis von genannten Autoren, wonach grössere Bürostrukturen die Erhöhung der sozialen Unterstützung und des sozialen Zusammenhaltes ermöglichen, wird in der Fallstudie jedoch
eine konträre Ansicht erkenntlich. Aus den Äusserungen der Befragten konnte allerdings nicht ermittelt werden, dass in offenen Raumkonzepten das Schliessen neuer Freundschaften erschwert wird (vgl. Oldham und Brass (1979), S.267 ff.).

Die Fallstudie deutet noch auf zwei weitere Aspekte des sozialen Zusammenhaltes hin, die in der Literatur nicht explizit erwähnt werden. Es sind dies die Hilfsbereitschaft der Führungspersonen gegenüber ihren Teams und die vertraulichen Gespräche in einer vertrauten Umgebung, die den Zusammenhalt über die Zeit wachsen lassen. Ob aufgrund dieser Faktoren ein sozialer Zusammenhalt entstehen und sich positiv auf die Zufriedenheit auswirken kann, oder ob dafür noch weitere Faktoren einbezogen werden müssen, ist fraglich und sollte in einer weiterführenden Untersuchung ermittelt werden.


Daher, dass in der Fallstudie mehrmals die Bedeutung von Routinen und kulturellen Einflüssen für die Interaktionen angespochen wurde, sollten alle Aspekte dieser Kategorie vor diesem Hintergrund betrachtet werden. Der Autor hält dies für wichtig, um ein vollständiges Verständnis zu erlangen.

Es ist ausserdem nicht auszuschliessen, dass die Abweichungen zwischen der Fallstudie und der Literatur von Routinen und kulturellen Einflüssen verursacht werden. Ob dies jedoch zutrifft, ist fraglich und sollte in einer folgenden Studie untersucht werden.

**Diskussion der Kategorie Privatheit**

In der Fallstudie wird der Zusammenhang zwischen Anforderungen, die der Arbeitsspiel von Führungspersonen an ihr Büro stellt, ihrer Führungsaufgabe und ihrer Zufriedenheit ersichtlich. Aus den Äusserungen kann geschlossen werden, dass die Zufriedenheit und das Wohlbefinden der Befragten nicht direkt von der akustischen und visuellen Privatsphäre abhängen, sondern vom Effekt und den Möglichkeiten, die sie zur vorstellungsgemässen Ausführung ihrer Führungsaufgaben und Arbeitsaufgaben mit sich bringen. Je besser das Bürokonzept den Aufgaben der jeweiligen Führungspersonen gerecht wird, desto effektiver und effizienter können sie ihre Tätigkeit ausführen und sind dementsprechend zufriedener mit ihren Büros. Es kommt ebenfalls zum Ausdruck, dass die Privatsphäre für Führungspersonen vor allem im Hinblick auf ihre Arbeitstätigkeit und Führungsfunktion, nicht aber aus persönlichen Gründen von Bedeutung ist.

Die Zufriedenheit mit der akustischen Privatsphäre hängt davon ab, wie das Bürokonzept die Befragten bei ihrer Tätigkeit unterstützt. Die Ergebnisse der Interviews weisen darauf hin, dass die Führungspersonen die akustische Privatsphäre hauptsächlich hinsichtlich des Wohlbefindens ihrer Teams wichtig erscheinen. Dadurch wird der aufgezeigte positive Zusammenhang zwischen dem Wohlbefinden der Teams und...
der Zufriedenheit der Führungspersonen nochmals verdeutlicht.


In der Fallstudie kommt zum Ausdruck, dass die Befragten die visuelle Privatsphäre auch hinsichtlich eines Rückzugsortes schätzen und unzufriedener wären, wenn sie dafür einen anderen Raum aufsuchen müssten. Somit kann der in der Literatur aufgezeigte negative Einfluss eines Mangels an visueller Privatheit auf das Wohlbefinden auch in den Ausserungen der Fallstudie erkannt werden (vgl. Nemecek und Grandjean (1973), zit. in Wineman (1982), S.271 ff.).


Bezüglich Privatheit und Dichte am Arbeitsplatz kommt in der Fallstudie zum Ausdruck, dass von den Befragten eine geringere Dichte und damit eine höhere Privatheit bevorzugt wird. Demnach decken sich die Erkenntnisse von Oldham (1988) (S.253) mit den Ergebnissen der Fallstudie. Auch die in der Literatur aufgezeigten negativen Auswirkungen von Ablenkungen und mangelnder Privatsphäre auf die Zu-

Auch aus Verbesserungsvorschlägen der Befragten lässt sich erkennen, dass die räumliche Nähe zum Team für die Probanden von grosser Wichtigkeit ist. Besonders die von der Führungsperson im Gruppenbüro vorgeschlagene Lösung, wonach der Team mit Glaswänden unterteilt werden soll, erscheint dem Autor sinnvoll. Die dadurch entstehende akustische Privatsphäre würde sich positiv auf die Arbeitseffizienz und demnach auch auf die Zufriedenheit der Führungspersonen auswirken. Der Autor begrüsst diese Lösung auch hinsichtlich der bestehenden Routinen, die dank der praktisch nicht vorhandenen Abgrenzung durch die Glaswände grösstenteils beibehalten werden könnten und dadurch keine zusätzlichen Aufwendungen oder Effizienzverluste verursachen würden. Ein anderer Vorschlag der Fallstudie, wonach das ganze Team in einem Raum arbeiten und für jeden eine Besprechungskabine zur Verfügung stehen würde, erlaubt eine räumliche Nähe und eine verbesserte Kommunikation. Der Autor ist der Auffassung, dass dadurch die Vorzüge des öffentlichen Raumes mit der dennoch vorhandenen visuellen und akustischen Privatsphäre kombiniert werden könnten.


4. Fazit und Ausblick

4.1. Fazit


Es können ermittelt werden, welche Aspekte des Arbeitsraumes zu Zufriedenheit der Führungskräfte führen und auf welchen Wirkungszusammenhängen diese Zufriedenheit basiert. In der Fallstudie hat sich gezeigt, dass die Führungskräfte mit ihren Bürokonzepten zufrieden sind. Allerdings liegen der Zufriedenheit teilweise unterschiedliche Faktoren zugrunde, verglichen mit denen, in der Literatur für alle Angestellten und spezifisch für Führungspersonen aufgezeigt werden.

Hinsichtlich der gesammelten Aspekte der Raum- und Arbeitsplatzanordnung und der physikalischen Grössen, die sich auf die Arbeitsplatzzufriedenheit auswirken, zeigt die Fallstudie insgesamt eine Übereinstimmung mit der Literatur. Vereinzelte Unterschiede bezüglich dieser Aspekte könnten auch den individuell verschiedenen Präferenzen jedes Individuums und damit nicht den systematisch verschiedenen Bedürfnissen von Führungspersonen zugeschrieben werden. Es konnte ermittelt werden, dass die Zufriedenheit der Führungskräfte mit ihren Arbeitsräumen massgeblich davon abhängt, ob die Büros ihre Arbeitsinhalte und ihre Arbeitstätigkeiten unterstützen, damit sie von der Privatheit ausgenutzt werden und mit ihren Teams interagieren können. Besonders die Nähe zum Team und die damit einhergehenden schnellen Interaktionswege wirken sich ebenfalls positiv auf die Zufriedenheit der Führungspersonen in dieser Fallstudie aus. Hinsichtlich der Aspekte der sozialen Interaktion wurden zwischen der Fallstudie und der Literatur keine gravierenden Unterschiede ersichtlich.

Es konnte ausserdem ermittelt werden, dass Routinen und kulturelle Aspekte in Büroräumen einen massgeblichen Einfluss auf die Arbeitsplatzzufriedenheit haben. Dabei spielen diese besonders hinsichtlich Interaktionen mit anderen Mitarbeitern eine wichtige Rolle. Mehrmals konnte erkannt werden, dass Routinen und kulturelle Einflüsse in enger Beziehung mit der Arbeitseffizienz und daraus folgend mit der Zufriedenheit stehen. In diesem Zusammenhang wurde ansatzweise auch die Rolle von arbeitsorganisatorischen Massnahmen hinsichtlich der Effizienz und der Interaktion mit dem Team und daraus folgend bezüglich der Zufriedenheit ersichtlich.

Auch die verschiedenen Aspekte der Privatheit in der Fallstudie weisen grösstenteils Übereinstimmungen mit bestehenden Erkenntnissen auf. Die positive Wirkung der Privatsphäre im Büro auf die Arbeitsplatzzufriedenheit konnte in der Fallstudie ebenfalls aufgezeigt werden. Allerdings unterscheiden sich die zugrundeliegenden Faktoren, die schlussendlich zu Zufriedenheit führen, grundlegend. Es wurde ersichtlich, dass von den befragten Führungspersonen dem innerbetrieblichen Status durch Privatheit keine Bedeutung für die Zufriedenheit zugewiesen wird. Eine akustisch und visuell geschützte Arbeitsumgebung dient Führungspersonen hingegen vorwiegend als Mittel zum Zweck bezüglich ihres Arbeitsinhaltes und zur wunschgemässen Ausführung ihrer Arbeit. Ausserdem konnte ermittelt werden, dass sich Büros positiv auf die Arbeitsplatzzufriedenheit von Führungsperso-
nen auswirken, wenn sie hinsichtlich der Privatsphäre auf die Arbeitsitätigkeit abgestimmt sind und dadurch die effektive und effiziente Ausführung dieser ermöglichen.

4.2. Relevanz

Die Erkenntnisse aus der Fallstudie zeigen, dass der Grossteil der aufgezeigten Wirkungen von Bürowirkonzepte n auf die Zufriedenheit von Mitarbeitern auch bei den untersuchten Führungspersonen zu finden ist.


4.3. Methodische Reflexion


Die leitfadensubitierte Interviewform des Experteninterviews erwies sich als äusserst wertvoll. Der Autor erlebte die Interviews mit allen Gesprächspartnern als sehr spannend und es machte den Anschein, dass die Befragten gerne über ihre Situation berichteten. Von den Interviewten wurden zahlreiche Aspekte angesprochen, die in die Analyse mit einbezogen werden konnten. Für den Forschenden war es jedoch aufgrund der fehlenden Erfahrung im ersten Interview eine Herausforderung, sowohl dem Leitfaden, als auch dem Gespräch zu folgen. Dies hätte durch ein zusätzlich neben dem Pretest vorgängig durchgeführtes Testinterview vermieden werden können.

Die sinngemäße Transkription nahm insgesamt sehr viel Zeit in Anspruch, was jedoch vom Autor einkalkuliert wurde. Rückblickend hat es sich gelohnt, die unterschiedlichen Arten der Transkription zu studieren und sich für die sinngemäs Varianten zu entscheiden, da sie den inhaltlichen Ansprüchen dieser Untersuchung gerecht wird und gleichzeitig effizient erstellt werden kann.

Für die Auswertung der Interviews hat sich die qualitative Inhaltsanalyse als geeignete systematische Methode zur Strukturierung und Sortierung des Interviewmaterials erwiesen. Die Differenzierung in einzelne Analyseschritte und die Orientierung an Ablaufmodellen, die von der Verfahrensweise der qualitativen Inhaltsanalyse ermöglicht, erlaubten eine methodisch kontrollierte Erstellung des Interviewleitfadens sowie des Auswertungsablaufs und tragen ausserdem zur Erfüllung wissenschaftlicher Gütekriterien bei (vgl. Mayring (2010), S.123).


Häufig erläuterten die Befragten beispielsweise, was ihnen "gefällt", was sie "wichtig finden" oder "schätzen" und was für sie von "Bedeutung" ist. Das Wort "Zufriedenheit" wird nur selten so direkt verwendet. Hinsichtlich der kommunikativen Validierung spielen in Interviews individuelle und wechselseitige Interpretationen von Aussagen eine grosse Rolle. Um falsche Interpretationen zu vermeiden und sicherzustellen, dass die Erläuterungen der Interviewten im Zusammenhang mit der Zufriedenheit stehen, spielte der Forschende die transkribierten Interviews den jeweiligen Füh-
4.4. Limitationen


Eine vollumfängliche Analyse sämtlicher Wirkfaktoren hätte allerdings den Rahmen dieser Arbeit sprengen.

4.5. Ausblick


Literatur


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Explaining the Success of User-Centered Design - An Empirical Study across German B2C Firms

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Abstract

This study focuses on the widely spread concept of User-Centered Design (UCD) and tries to answer the question why it is so popular. On the one hand, it is of interest to reveal the nature of UCD, especially in terms of the methods used, the types of users involved and the stages the involvement takes place. On the other hand, this paper aims to find out about the success of UCD projects as well as the organizational context that is beneficial for UCD. To do so, several streams of scientific literature in the field of UCD as well as organization theory are reviewed and the results of an empirical study conducted among UCD experts in Germany are analyzed. The theoretically derived characteristics could mainly be confirmed by the insights of the study. Moreover, several hypotheses concerning the influence of the organizational context using established constructs (IT competence, UCD competence, customer orientation, innovativeness, exploration and exploitation as well as the top management team) towards the project success in an UCD setup are proposed and tested by the means of a multiple factor analysis. By analyzing open comments concerning the facilitators and obstacles of UCD activities deeper insight into the daily business of UCD experts can be gained. A comparison between two subsamples split according to their project success score yield interesting results concerning different motives, types of integrated users and the locus of the user integration. This study has been created in collaboration with the user research and user experience (UX) consulting agency ‘Facit Digital’ who are based in Munich, Germany.

Keywords: User-Centered Design, User Integration, Exploration, Exploitation, Empirical Investigation

1. Introduction

1.1. Motivation

Many times in life we have to deal with everyday objects that are not intuitive to use so that we are being left behind frustrated and without having completed a putatively easy task. This everyday object could be a door which does not say if it has to be pushed, pulled or slid to get through. It could also be a hard disk recorder that we fail to record our favorite TV show with. Or, it could be the website of a fashion store we wanted to place an order with but simply could not get to the checkout. “Far too many items in the world are designed, constructed, and foisted upon us with no understanding – or even care – for how we will use them” (Norman (2002), p. vii). Even if these problems might seem trivial, they can have a fatal impact on businesses because “products that have unacceptable usability typically do not survive” (Vredenburg et al. (2002b), p. xxvii). Therefore, it is necessary to adopt “a philosophy based on the needs and interest of the user, with an emphasis on making products usable and understandable” (Norman (2002), p. 188). The author of this quote, Donald A. Norman, called this philosophy “User-Centered Design” (UCD) (Norman and Draper (1986)).

Over the years, more and more companies have started to adopt UCD into their internal processes and philosophy: according to the trade association of the German Usability and User Experience Professionals UPA, the number of members has risen from 39 in their foundation year 2002 to 1448 in 2016 (German UPA (2016)) which indicates a massive increase of individuals and companies that are in charge of UCD-related topics. Big enterprises like ‘Oracle’ started to build in-house consultancies that focus on UCD (Desmond (2009)). Popular handbooks for soon-to-be entrepreneurs like "The Startup Owner's Manual" (Blank and Dorf (2012)) advise the founders to do iterative user testing and use other usability methods in order to achieve maximum economic success with their business.
However, Norman's (Norman (2002)) definition of UCD is very broad and gives much leeway for interpretation. Several methods can be used as well as different types of users can be involved at different stages of the product lifecycle and in varying degrees of participation (e.g. Abras et al. (2004), Preece et al. (2002), Vredenburg et al. (2002a), Kujala (2003)). Moreover, UCD can be applied to any kind of product or service (Norman (2002), Vredenburg et al. (2002a)). Karat (Karat (1997), p. 38) suggests that "we consider UCD an adequate label under which to continue to gather our knowledge of how to develop usable systems. It captures a commitment the usability community supports – that must involve users in system design – while leaving fairly open how this is accomplished". This lack of a holistic, specific definition of UCD might implicate that "in practice, [it] becomes a concept with no real meaning" (Gulliksen et al. (2003), p. 397).

Therefore, it is very interesting and important to learn more about this ‘mysterious’ concept. In the context of this thesis, the following research questions will be investigated:

- **RQ1.** What is User-Centered Design? What is the state-of-art of this concept in Germany? What methods are used, what type of users are being involved and at which stage of the product lifecycle does the integration take place?

- **RQ2.** What makes User-Centered Design projects successful? What are the success indicators in that context?

- **RQ3.** What kind of organizational context is most beneficial for conducting User-Centered Design?

To answer these questions it is necessary to survey companies that are actually doing UCD. Doing this in a comprehensive way including all countries as well as all products and services available would exceed the scope of this thesis. It will therefore be focused on German companies that are in charge of products which feature so called user interfaces (UIs). These are “the aspects of a computer system or program which can be seen (or heard or otherwise perceived) by the human user, and the commands and mechanisms the user uses to control its operation and input data”

1. By making use of UIs, the user can enter commands into websites or applications which are main components of the increasingly digital world we live in (vor dem Esche and Hennig-Thurau (2014)), with internet penetration in Germany at 88% of the overall population and constantly rising (Internet Live Stats (2016)). A recent study of the insurance company ‘Gothaer’ in cooperation with the market research company ‘forsa’ on the degree of digitalization in Germany states that 75% of the Germans between 16 and 69 use a smartphone, 70% use a laptop or notebook and 44% own a tablet (Gothaer (2015)). All of these products feature UIs. Therefore, and due to the cooperation in this thesis with ‘Facit Digital’, a Munich-based user research and user experience (UX) consulting agency and an expert on optimizing UIs, it is highly appealing and reasonable to focus this study on this area of interest.

1.2. Composition of the Thesis

To address the earlier stated research questions, first of all, the theoretical framework and the existing theoretical and practical literature concerning UCD (also sometimes called Human-Centered Design (HCD) or User-Centered System Design (UCSD)) will be presented. Furthermore, the established methods and procedures will be illustrated. In a next step, UCD will be related to the organizational theory well-established approach of customer involvement to show its significance and importance from an economic point of view. In addition, the exploration-exploitation framework (March (1991)) will be used to explain the success of UCD. Based on these theoretical findings, a research model and several hypotheses will be established. The empirical part of this study will cover the description of the used methodology and the discussion of the results. The thesis concludes with implications for theory and management as well as limitations and an outlook for future research.

2. Theoretical Background

In this chapter, important aspects of UCD and its success will be discussed. First, relevant literature relating to the origin and characteristics of UCD will be reviewed and summarized to refine the concept. Second, UCD, which is mainly derived from praxis than from science, will be classified into the field of organizational theory and the importance of it within an organizational context will be shown. And finally, the exploration-exploitation framework (March (1991)) will be explained and linked to the concept of UCD.

2.1. Refining the Concept of User-Centered Design

Although UCD can be applied to the design of any product or service, literature research indicates that the concept is mainly used for the design of computerized systems (e.g. Norman and Draper (1986), Abras et al. (2004), Gulliksen et al. (2003), Hartson and Pyla (2012), Lowdermilk (2013), Vredenburg et al. (2002a)). According to Landauer (1999), this is due to the fact that computer technology has the greatest opportunity for usability improvements. Therefore, this focus will also serve as a frame for further investigations in this thesis.

2.1.1. Classification of User-Centered Design for Computerized Systems

Already in 1969, Nickerson (Nickerson (1969)) found that “the need for the future is not so much computer oriented people as for people oriented computers” (p. 515). Since then, many different fields of research that recognize this idea and try to improve the interaction of people with computers like Human-Computer Interaction (HCI), UCD

\[ \text{http://foldoc.org/user%20interface, last accessed: 29.04.2016} \]
and UX have evolved (Ritter et al. (2014), p. 33). Lowdermilk (Lowdermilk (2013), p. 6) highlights and explains the relationship between these fields as shown in Figure 1.

The starting point is usability (also called human factors) which is “the extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO (2010)). It is associated with positive outcomes like reduction of the number of errors, enhanced accuracy, and increased usage of a system due to a more positive attitude towards it (Agarwal and Venkatesh (2002)). “Usability practices could be implemented in everything from a toaster to a doorknob, and even the packaging of both” (Lowdermilk (2013), p. 5). This is very similar to the original definition of UCD in a wider context relating to the design of everyday things by Norman (2002).

Lowdermilk (2013) sees HCI to be rooted in usability “but it focuses on how humans relate to computing products” (p. 6). This goes in line with the Association for Computing Machinery (ACM) who define HCI as “a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them” (Hewett et al., p. 5).

UCD is considered to be one part of the broad field of HCI. Lowdermilk (2013) narrows it down to be “a software design methodology for developers and designers [which] helps them make applications that meet the needs of their users” (p. 6).

The overall goal of these fields is to improve the User Experience (UX) which is defined in ISO 9241-210 as “a person’s perceptions and responses that result from the use or anticipated use of a product, system or service” (ISO (2010)). Therefore, UX concerns the user’s “emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviors, and accomplishments that occur before, during and after use” (Ritter et al. (2014), p. 44). UX is especially important for the design of websites and other UIs because they require immediate understanding by the user since there are no manuals or trainings available (Garrett (2012), p. 10). As UCD is a way of ensuring the UX of an application it is an essential concept (Lowdermilk (2013), p. 6).

Having shown the relevance of UCD by classifying it into a bigger context, it is also interesting to know what makes this approach revolutionary in Systems Design. This will be done below.

2.1.2. User-Centered Design as Revolutionary Approach in Systems Design

Vredenburg et al. (2002a) explain the main differences between the traditional approach of computerized system design and the main characteristics of UCD. They are summarized in Figure 2.

Traditionally, the design process was inside-out which means that “the internal architecture is defined first and then a user interface is created for users to get access to the system functions” (Vredenburg et al. (2002a), p. 2). The view of an application as a “collection of components” (Vredenburg et al. (2002a), p. 3) was stressed. UCD, in contrast, has “a greater emphasis on the user and less of a focus on formal methods for requirements gathering and specification, and [there is] a move from linear, rigid design processes to a more flexible iterative design methodology” (Ritter et al. (2014), p. 43). Another revolutionary asset of UCD is its openness to other disciplines and departments on the one hand, and, of course, the user on the other hand. This fact also involves a new distribution of power within an organization and the creation of new positions (Vredenburg et al. (2002a), p. 3). In addition, the competitive focus is stressed for UCD. By competition, Vredenburg et al. (2002a) mean “the ways in which the majority of customers currently accomplish the specified tasks” (p. 4). That means that competition will be defined according to the distribution of market shares and the other options available to solve a problem. In line with other researchers like Nielsen (1993), Good-man et al. (2012) and Ritter et al. (2014), Vredenburg et al. (2002a) point out that UCD, in comparison to the traditional approach, focuses on the users, their view of quality and their validation. It is especially noteworthy that measuring their feedback can and should be conducted “at various points throughout a design and development cycle as input to design and as in-process indicators for project management” (Vredenburg et al. (2002a), p. 5). Instead of just focusing on current customers when gathering their feedback, potential customers and the ones using a competitor’s product should also be taken into account.

2.1.3. Key Principles for User-Centered Design

After having classified UCD in the context of computerized systems and having explained the revolutionary assets of this concept, there is still no answer on how to implement UCD into business processes. For that matter and to better understand the nature of UCD, key principles will be revealed by presenting existing guidelines2 and standards3.

In his bestseller “The Design of Everyday Things” (2002), Norman suggested seven principles of design which can be subsumed to the six features of visibility, feedback, constraints, mapping, consistency and affordances (Preece et al. (2002)). Visibility refers to the positioning of objects on UI. Feedback “is about sending back information about what action has been done and what has been accomplished, allowing the person to continue with the activity” (Preece et al. (2002), p. 21). Restricting the number of options of action by constraints should help the users to orientate themselves. Using graphics is a way of mapping the relationship between

2Note: The terms ‘guideline’ and ‘principle’ will be used synonymously in this thesis and refer to prescriptions that specify general theoretical ideas that can underpin design decisions” (Ritter et al. (2014), p. 46). In contrast, a ‘standard’ refers to formal prescriptions generated by experts to offer common vocabulary for designers and developers and to produce safe, acceptable designs within the user’s capabilities (Ritter et al. (2014), p. 46).

3For a comprehensive overview of the principles and standards, please see Appendix 1.
controls and their effects which also make a system more usable. Consistency across several interfaces, i.e. determined actions will have determined effects, will help the user to handle the designed UI. Affordance refers “to an attribute of an object that allows people to know how to use it” (Preece et al. 2002, p. 25). These principles are very similar to the “Eight Golden Rules of Interface Design” (Shneiderman and Plaisant 2010 [1987]). In 1995, Jakob Nielsen (Nielsen 1995) adapted these principles and turned them into ten “Usability Heuristics”.

Instead of focusing on actual design principles, Vredenburg et al. (2002a) established “Six Principles of User-Centered Design” which grant a more general and holistic set of guidelines for the UCD process. They claim to set business goals by determining the target market, the intended users as well as the competition. Moreover, the user should be understood and the total customer experience should be designed by a multidisciplinary team. Designs should then be evaluated and competitiveness should be assessed. Another principle is to “manage for users” (Vredenburg et al. 2002a, p. 28) which means that their feedback should be central to product plan, priorities and decision making. Gulliksen et al. (2003) conducted a review on existing theory and experiences from several software development projects and came up with twelve “Key Principles for User-Centered Systems Design”. They can basically be considered a very detailed synopsis of the earlier stated principles but on a more personal level than the others.

ISO 9241-210, “Human-Centered Design for Interactive Systems”, (ISO 2010) offers six basic principles that represent the basic essence of UCD which can to some extent only implicitly be understood from the other principles: the

Note: This book was originally already published in 1987.
design should be based on an explicit understanding of users and tasks and environments, and the users themselves should be involved throughout the design and development process. Moreover, the design is driven and refined by user-centered evaluation and addresses the whole user experience. In addition, the UCD process is supposed to be iterative and should be designed by a multidisciplinary team in terms of skills and perspectives.

All these principles help to better understand the nature of UCD in terms of the overall setup and the required mindset. However, it still remains a vague concept without defining the prevailing methods that are used during the product development process which will be presented below.

2.1.4. Prevailing Methods for User-Centered Design

To identify the prevailing methods used along the UCD process, a selection of highly renowned books and papers concerning the implementation of this philosophy have been reviewed (e.g., Goodman et al. (2012), Hudson (2001), Nielsen (1993), Preece et al. (2002), Rubin and Chisnell (2008), Shneiderman and Plaisant (2010), Usability Professionals’ Association (2000), Vredenburg et al. (2002a), Vredenburg et al. (2002b)). Also, the above discussed key principles (see chapter 2.1.3) provide clues regarding this context.

Table 1 summarizes the identified methods that are used in the different stages of the systems design and development process (analysis, design, implementation and deployment).

The first step in the systems design process is the analysis stage. Meeting with stakeholders and the assembling of a multidisciplinary project team are the basic tasks when conducting a UCD project. “UCD requires that specialists from several disciplines create the total customer experience. These roles can be organized into a conceptual team structure, which includes individuals who design, those who are architects, those who provide information, and those who lead” (Vredenburg et al. (2002a), p. 41).

Nielsen (Nielsen (1993), pp. 75-76) stresses the importance of the task analysis in the early stages of the system design. The outcome of this method is “a list of all the things the users want to accomplish with the system (the goals), all the information they will need to achieve these goals (the preconditions), the steps that need to be performed and the interdependencies between these steps, all the various outcomes and reports that need to be produced, the criteria used to determine the quality and acceptability of these results, and finally the communication needs of the users as they exchange information with others while performing the task or preparing to do so”.

Surveys as well as interviews are the most important and most common means in market research to collect reliable and valid information and the subjective opinion from a pre-selected target group on an object of investigation (Koch et al. (2009), p. 48). These methods can be used at any stage of the product development process, except for the actual implementation of the system, to capture the customer satisfaction and possible anxieties with the product before launching it onto the market (Hom (1998), Nielsen (1993)).

“Focus groups are structured, attentively moderated group discussions that reveal a target audience’s conscious preferences, recalled experiences, and stated priorities” (Goodman et al. (2012), p. 141). With this UCD method which can be used throughout the development process, the most valued features for users can be revealed.

Usability testing during the process of product development has gained wide acceptance as a strategy for improving the quality of the product (Ruthford and Ramey (2000)). According to (Dumas and Redish, p. 22), five goals should be achieved by this method: improve the product’s usability, involve real users in testing, give users real tasks to accomplish, enable testers to observe and record the actions of the participants, and enable testers to analyze the data obtained and make changes accordingly. Usability testing is focused on user needs, is measured empirically and fosters iterative design (Nielsen (1994)). Users are usually required to perform typical standardized tasks in a typical task environment in order to collect data on how much time the users need to learn a specific function, how fast they perform a task, which types and at what rate errors are conducted, the retention of commands as well as the subjective user satisfaction (Shneiderman and Plaisant (2010), Abras et al. (2004)).

Heuristic evaluations are most commonly conducted during the analysis as well as the deployment stage of the product design. A small group of evaluators independently examines the system against established usability principles (see chapter 2.1.3). This method provides relatively fast and inexpensive feedback to the design team (Sripathi and Sandru (2013)).

Considering competitive products and services and creating profiles or personas, i.e. fictional characters derived from market research to understand the needs of the different users (Goodman et al. (2012), p. 482), are low-cost methods in the analysis stage of the process.

When it comes to designing the system or product, brainstormed for design concepts and metaphors should be conducted first and screen flows and/or navigation models should be developed accordingly. This process is also sometimes called storyboarding and refers to the “practice of sketching an experience point by point” (Lowdermilk (2013), p. 87). By doing so, the developer gets a better idea of the system and can evaluate the design.

“Prototyping is the process of building low- or high-quality mockups of your application’s design to have something tangible to test with users” (Lowdermilk (2013), p. 89). Beginning design with paper and pencil makes sense from an economic point of view because paper prototypes can verify the product requirements without any investments in technology or development (Kangas and Kinnunen (2005),...
Table 1: User-Centered Design Methods in the Course of Systems Design; Source: Own illustration

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Design</th>
<th>Implementation</th>
<th>Deployment</th>
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</thead>
<tbody>
<tr>
<td>Meeting with stakeholders</td>
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<tr>
<td>Multidisciplinary Project Team</td>
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<td>Task Analysis</td>
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<td>Surveys</td>
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<td>Interviews</td>
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<tr>
<td>Focus Groups</td>
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<tr>
<td>Usability Testing</td>
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<td>x</td>
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<tr>
<td>Heuristic Evaluations</td>
<td>x</td>
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<tr>
<td>Considering Competitive Products/Services</td>
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<tr>
<td>Profiles/Personas</td>
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<tr>
<td>Brainstorming for Design Concepts and Metaphors</td>
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<td>Screen flow and/or Navigation Model</td>
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<tr>
<td>Beginning Design with Paper and Pencil</td>
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<tr>
<td>Prototypes</td>
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<tr>
<td>Walkthroughs of Design Concepts</td>
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<tr>
<td>Documenting Standards and Guidelines</td>
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<tr>
<td>Card Sorting/ A/B testing</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Participatory Design</td>
<td>x</td>
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<tr>
<td>Ethnographic Observation</td>
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</table>

p. 59). In general, it is recommended by research to start prototyping early in the design stage of the system development (Nielsen (1993), Gulliksen et al. (2003)). This is due to the fact that prototypes help to “support the creative process, elicit requirements and visualize ideas and solutions” (Gulliksen et al. (2003), p. 402).

Walkthroughs of design concepts should be conducted right away once the prototypes have been developed. This method can be explained as “meetings where users, developers, and usability professionals step through a task scenario, discussing and evaluating each element of interaction” (Hom (1998)). Alternative designs will be evaluated against each other and therefore more information on user needs and expectations can be gained (Sripathi and Sandru (2013)).

Documenting standards and guidelines throughout the design stage will enable the company conducting UCD to optimize their internal UCD processes over time (Goodman et al. (2012), p.72, Shneiderman and Plaisant (2010), pp. 122-125).

Card sorting as well as A/B testing are techniques that help to understand how people organize information. Depending on the context, it can be used at any stage of the development process. The difference between the two methods is that while A/B testing evaluates two designs against each other, card sorting can represent many different concepts that users have to sort into categories. “How cards get organized - and what labels participants give to each group - can tell you a lot about how participants relate and categorize concepts. That, in turn, can help you create visual and structural relationships that make sense to users” (Goodman et al. (2012), pp. 201-202).

In recent years, the integration of the users not only at the design but also at the implementation stage of the system development process has been discussed. The most common approach of it is participatory design (PD) which emerged in Scandinavia and treats the users as a kind of “co-designers” (Abras et al. (2004), p. 452). PD is an evolving practice among design professionals and has become a field of research on its own (Kensing and Blomberg (1998), Muller and Kuhn (1993)). It involves several techniques and principles itself which would exceed the scope of this thesis. In this context, it is yet relevant because researchers have found it to be common practice in UX and UCD environments (e.g. Vredenburg et al. (2002b)).

Ethnographic observation can be seen as an extension to usability testing and is becoming more and more important (Shneiderman and Plaisant (2010), pp. 129-130). “Observing users in the field is often the best way to determine their usability requirements. Traditional usability testing, while providing a laboratory environment that makes data collection and recording easy, also removes the user and the product from the context of the workplace. Sometimes, it’s best to see exactly how things are done in the real world” (Hom (1998)). This method is recommended once the system is already deployed to get feedback on actual usage.

2.1.5. Benefits and Drawbacks of User-Centered Design

“The major advantage of the user-centered design approach is that the deeper understanding of the psychological, organizational, social and ergonomic factors that affect the use of computer technology emerges from the involvement of the users at every stage of the design and evaluation of the product” (Abras et al. (2004), p. 768). Therefore, the products of companies following the principles of UCD will satisfy

6For further information see Schuler and Namioka (1993).
the user’s needs and expectations and will therefore evoke customer satisfaction (Nussbaum (1991)). This is great from a user’s point of view, of course, but implementing UCD also makes sense for companies from an economic standpoint: by following the UCD philosophy, companies can save a great amount in labor cost and lost sales opportunities (Nielsen (1993), p. 2). This is especially important for companies concerned with Information Technology (IT). The amount of money spent worldwide in IT is estimated to be around one trillion US-Dollars a year. Of these projects, about 15% are abandoned because they are inadequate to satisfy the requirements (Charette (2005)). Lederer and Prasad (1992) found that 63% of large software projects exceed their cost estimates significantly. Reasons for that were mainly derived from a lack of user understanding which can be prevented by UCD (Nielsen (1993)). About 50% of the working time of programmers is spent on reworking preventable errors. The price for recovering an error after implementation is 100 times higher than fixing it before the development is completed (Charette (2005)). Moreover, Usability.gov (2016), a website run by the U.S. Department of Health and Human Services’ Office of the Assistant Secretary for Public Affairs which is considered the leading resource for UX best practices and guidelines in the United States, list a number of further positive outcomes. They named improved performance (less user errors, better ease of use and learning), increased exposure (more traffic, more retain, higher user attraction and more visits) and credibility (high user satisfaction, trust in the system and more referrals) as well as reduced resource burden (reductions in cost and time for development, maintenance, redesign, support, training and documentation) and increased sales as main benefits of UCD.

However, there are a couple of drawbacks to UCD that prevent management from implementing this concept into business strategy. First of all, despite the major benefits derived from decreasing costs as described above, the implementation and execution of UCD can be very costly in terms of time as well as financial and human resources (Preece et al. (2002), Abras et al. (2004)). The UCD principle of multidisciplinary teams also implicates that communication problems might occur. To overcome this problem, ethnographers and other additional team members for enhancing team work might have to be hired. Moreover, another cost factor could be evoked by the fact that the products resulting from UCD are too specific and therefore not transferable to other customers (Abras et al. (2004)). The value of these additional costs might be questioned by management, especially if deadlines are approaching (Dix et al. (2010), Preece et al. (2002)). However, Bias & Mayhew and Bias (2005) find that the benefits of usability and UCD are also cost-justifying from an economic point of view.

2.1.6. Synopsis of Key Characteristics

In this chapter, several handbooks and papers have been reviewed in order to get a good understanding of the concept of UCD. First of all, the scope of research was narrowed down to the field of computerized systems since this concept is mostly used for this type of product. Then, the concept itself was classified into a bigger context of usability, HCI and UX and key principles developed over time have been revised. In addition, the prevailing methods used along the product development process in IT systems have been explained. From these insights it can be concluded that UCD is a concept characterized by an iterative process to constantly integrate users into the development process of a computerized product by several means of market research (e.g. surveys and interviews) as well as IT (e.g. screen flows and prototypes) to build usable products granting good UX. Moreover, the benefits and drawbacks of applying UCD have been presented. Satisfying the user’s needs and therefore producing more cost efficiently outweighs the possible costs that implementing UCD would involve.

However, the literature taken into account in this chapter is mainly based on IT knowledge, research and praxis. To bridge the gap to management science, UCD will be linked to well-established concepts in organizational theory.

As explained in this chapter, UCD is rooted in the idea of integrating the user into the respective company’s value creation process and therefore opening up firm boundaries. This approach is also very common in organizational theory and will be explained in chapter 2.2.

From previous chapters it was learned that UCD focuses on current as well as future customers. This concept is very similar to the exploration-exploitation framework which will be presented in chapter 2.3.

2.2. User-Centered Design as Type of User Integration

The idea of integrating the user or customer7 into the value creation process of a company is nothing new. User integration is associated with competitive advantages due to access to scarce and valuable information on customer solutions as well as needs (Reichwald and Piller (2009)). Organizational theory has therefore given many impulses towards an “interactive value creation”, i.e. the distribution of a former intra-company task to an undefined, great network of customers, users and other external stakeholders by an open request (Reichwald and Piller (2009), p. 51). In the following section, the most important milestones and theories regarding this context will be reviewed.

2.2.1. Introduction to User Integration

The first researcher that treated the customer like a part of the organization rather than an external stakeholder was Barnard (1948). He stressed the importance of the customer (as well as the employees) to deliver input for goods and services. Over the years, Barnard’s (1948) ideas have been further developed. With the emergence of the internet, Normann & Ramirez (Normann and Ramirez (1993), Normann

7Note: The terms „user“ and „customer“ will be used synonymously in this thesis. In line with Reichwald and Piller (2009), a customer (respectively user) will be understood as the consumer and user of a company’s product or service (p. 1).
and Ramirez (1993)) and Wikström (Wikström (1996a), Wikström (1996b)) came up with the idea of an “interactive strategy”. Therefore, Reichwald and Piller (2009) consider these researchers the initiators of a modern way of discussing the interactive value creation between firms and customers (p. 4). By claiming to abrogate the differentiation between products and services and calling them “offerings” instead, because they are all “grounded in activity” (Normann and Ramirez (1993), p. 68), the researchers challenge Michael Porter’s (Porter (1985)) model of the company-centric view of the value chain (Reichwald and Piller (2009)). Instead of following a preset schedule of activities to create value and be successful in terms of competition, the company in focus needs to figure out how to effectively manage the relationship to all stakeholders involved in the value creation process. Picot and Reichwald (1994) found that due to new conditions concerning market, competition and opportunities derived from information and communication technology innovations the classic cooperation with business hierarchies and borders towards the external stakeholders started to dissolve. Instead of relatively enclosed and integrated entities new organization forms between firms and markets like network organizations, cooperation networks and virtual organizations emerge. With respect to the possibilities of the internet, Prahalad & Ramaswamy (Prahalad and Ramaswamy (2000), Prahalad and Ramaswamy (2002), Prahalad and Ramaswamy (2003)) have further developed the ideas of their colleagues. Thanks to the internet “companies can become much more astute about what consumers like and don’t like, and that knowledge will greatly improve companies’ ability to be innovative and to anticipate consumer needs” (Prahalad and Ramaswamy (2002), p. 6). This feedback is not only relevant for the firm, but also for influencing product choice by user generated content like consumer recommendations, ideas and critiques.

2.2.2. User Innovation

In the discussion of user integration, Eric von Hippel (von Hippel (1978a), von Hippel (1978b)) took a step further and started another very important research stream. He divided the methods of user integration into active and passive integration depending on the level of user involvement. Passive methods include measures of market research like the “voice of the customer” approaches (Griffin and Hauser (1993)) such as surveys and focus groups to gain information on customers’ needs. Von Hippel’s (von Hippel (1978a), von Hippel (1978b)) new and important approach was to also actively engage with the users. Instead of only passively integrating them as indicated in the classical definition of innovation⁸, he claims that users have the ability to innovate because they can “develop exactly what they want, rather than relying on manufacturers to act as their (often very imperfect) agents” (von Hippel (2005a), p. 1). This is a very relevant aspect from an economical point of view since innovation has long been accepted as the source of growth and economical success (Schumpeter (1934)). Moreover, it is important to distinguish between product and process innovation. Product innovations refer to either improvements for existing products (incremental) or completely new products (non-incremental), whereas process innovations are novel factor combinations within the firm (Reichwald and Piller (2009), pp. 120-121). The interactive value creation in any innovation context is also called “open innovation” (Reichwald and Piller (2009)). The foundation for this approach can be explained by von Hippel’s (von Hippel (1978a), von Hippel (1978b)) models of the “Customer-Active Paradigm” (CAP) in contrast to the traditional “Manufacturer-Active Paradigm” (MAP) as presented in Figure 3.

The MAP on the one hand is characterized by only passive customer integration from a manufacturer’s point of view. That means that companies are asking for information on users’ needs to add them to existing solution information and to create innovation (Reichwald and Piller (2009)). In this context, the user is “speaking only when spoken to” (von Hippel (1978b), p. 243). The manufacturer is in charge of generating ideas by only consulting the customers on their opinion on existing products and analyzing the data. The CAP on the other hand puts the customer in the role of the idea generator. The role of the manufacturer in the CAP is rather passive as they basically wait for users to come up with ideas for new products and subsequently screen them to select the most promising ones for development (von Hippel (1978a), von Hippel (1978b)). This approach can be interpreted as an extreme form of labor division between companies and customers (Reichwald and Piller (2009), p. 6).

Generally speaking, there are two main categories of user-innovators: intermediate users, i.e. “users such as firms that use equipment and components from producers to produce goods and services” (Bogers et al. (2010), p. 859), and consumer users, i.e. “users of consumer goods” and “typically individual end customers or a community of end users” (Bogers et al. (2010), p. 859). Recent research shows that users often freely reveal their innovations to other users as well as manufacturers (Henkel and von Hippel (2005)). By doing so, property rights are voluntarily given up and the information becomes a public good (Harhoff et al. (2003)). This makes sense from a user’s point of view because, on the one hand, keeping the information on the innovation to one self would require protecting intellectual property which involves high costs and very uncertain outcomes (Harhoff et al. (2003)). On the other hand, research shows that users may benefit more from personal rewards like the perfect fit of the developed product to their needs than from the benefits that are practically obtainable from other courses of action like licensing (Henkel and von Hippel (2005)). In addition, innovation process benefits like the joy and learning during the development of a product are great benefits for the users (Raasch and von Hippel (2013)).

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⁸Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace” (Baregheh et al. (2009), p. 1334).
While the CAP claims for users to play a more active part in the innovation process, there are ways for companies to proactively involve users (Bogers et al. (2010), p. 865). Users that “are ahead of the majority of users in their populations with respect to an important market trend, and they expect to gain relatively high benefits from a solution to the needs they have encountered there” (von Hippel (2005a), p. 4) are called “lead users” and are part of the consumer users. They are relevant in the context of collecting information on needs and solutions from users at the leading edges of the target market as well as users from other markets facing similar problems (Bogers et al. (2010), Lilien et al. (2002)). Thomke and von Hippel (2002) suggest that users can also be turned into innovators by granting them user-friendly toolkits that “enable people to complete a series of design cycles followed by learning by doing” (p. 7). These toolkits should “contain information about the capabilities and limitations of the production process that will be used to manufacture the product” by having “libraries or useful components and modules that have been tested and debugged” (p. 7).

To put it in a nutshell, organizational theory has long acknowledged the need of user integration to enhance a company’s competitive advantage and therefore grant economic success and survival (e.g. Bogers et al. (2010)). The maximum level of customer integration is user innovation by which the companies are granted a greater pool of solution options (Reichwald and Piller (2009), p. 121). These ideas are basically in line with the UCD approach. However, the gap between organizational theory and IT best practices in product development in terms of UCD has not explicitly been bridged so far, which will be attempted below.

2.2.3. User Integration in an Information Technology Environment

Due to the emergence of IT-related, groundbreaking innovations like the internet and technical trends like innovation toolkits (von Hippel (2005b), p. 64, Thomke and von Hippel (2002)) the discussion on user integration in an organizational context has automatically shifted towards IT. Even so, the concept of user integration from a managerial and research-driven point of view has not been compared with the mainly practical orientated approach of UCD. To do so and to present the similarities of these two important concepts from two distinct disciplines, Figure 4 will be used as a generic example. Taken from UCD literature (Zühlke (2011), p. 41), it shows the schematic setup of basically every product development process in an IT environment.

On one side, there is a company and its developers to create a product or device. On the other side, there is the user who should use the developed product (here: device). Firm boundaries characterized by spatial differences, different levels of knowledge and different intentions as well as conditions on the developers’ side have to be overcome by the users when handling this device based on their own imagination and conditions. This is very similar to the view of the manufacturer and the customer in von Hippel’s (von Hippel (1978a), von Hippel (1978b)) MAP. According to the UCD literature, the firm boundaries can only be overcome by a holistic view on the HCI (Zühlke (2011), p. 40) which can be facilitated by means of UCD (see chapter 2.1). Also, organizational theory acknowledges the need of user integration to overcome the boundaries between the firm and the customer (Reichwald and Piller (2009)). In addition, many UCD measures are the same ones that are used for customer integration in organizational theory like the “voice of the customer” methods (Griffin and Hauser (1993)). In line with von Hippel’s (von Hippel (2005a)) logic most of these measures are means of passive customer integration. (Pro-)actively integrating the user as suggested in the CAP (1978a, 1978b) is relevant in the context of UCD when it comes to the types of users that are being involved in product development. Especially relevant are lead users that could be involved in the design stage of this process.

This chapter granted insight into the parallels of the two concepts of user integration in organizational theory and UCD, which is mainly based on best practices, and gave insights into the benefits of these concepts from a managerial point of view. Therefore, UCD can be considered relevant for management theory as well. However, as technology costs decline and the need for production flexibility rises, competition also intensifies (Schulze et al. (2008), Volberda (1996)). To ensure long-term survival, companies need to balance the exploitation of their existing assets as well as the exploration of new ones in order to create new competitive advantages.

Figure 3: The Manufacturer-Active vs. the Customer-Active Paradigm; Source: Own illustration based on von Hippel (von Hippel (1978b), p. 242)
advantages (March (1991)). How this framework works, will be explained below.

2.3. The Relationship between User-Centered Design and Ambidexterity

2.3.1. The Exploration-Exploitation Framework

In 1991, James G. March published an article about “Exploration and Exploitation in Organizational Learning”. In this article, the author claimed that there are two concepts - exploration and exploitation - which are central in organizational learning, i.e. “the capability for organizations to create, disseminate, and act upon generated knowledge” (Auh and Menguc (2005), p. 1652), and therefore important to sustain a firm’s competitive advantage (Barney (1991)). “Exploration includes things captured by terms, such as search, variation, risk taking, experimentation, flexibility, discovery, and innovation” (March (1991), p. 71). Its returns are “uncertain, distant, and often negative” (p. 85). “Exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, and execution” (p. 71). It therefore yields “positive, proximate, and predictable” (p. 85) results. The author acknowledged the importance of both learning approaches for organizational performance and competitive advantage but states that there will always be trade-offs between the two because of limited organizational resources, which is also supported by recent research (e.g. Ancona et al. (2001), Floyd and Lane (2000), Lavie et al. (2010)). March (1991) concludes that keeping a balance between the two concepts that can be considered two ends of a continuum is “a primary factor in system survival and prosperity” (p. 71). Moreover, exploration and exploitation are “iteratively self-reinforcing” (Gupta et al. (2006), p. 695) because of the “traps of learning” (Levinthal and March (1993), p. 105): when exploration leads to failure, the search for new ideas via more exploration will be fostered so that a “failure trap” will be created (pp. 105-106). In contrast, when exploitation leads to quick success, it will further be reinforced which leads to a “success trap” (p. 106). Therefore, it is necessary for firms to “engage in enough exploitation to ensure the organization’s current viability and to engage in enough exploration to ensure future viability” (p. 105). Based on the ideas of March (1991) much research
in various fields like (technological) innovation, organizational design and adaptation, organizational learning, entrepreneurship, competitive advantages and organizational survival has been conducted (Gupta et al. (2006), p. 693, Jansen et al. (2006), p. 1661). Among others, main research questions concern the nature of exploration and exploitation (e.g. Gupta et al. (2006)), the relationship between the two concepts (e.g. Benner and Tushman (2003)), their effectiveness under different contextual conditions (e.g. Auh and Menguc (2005)) as well as antecedents and moderators (e.g. Jansen et al. (2005), Jansen et al. (2006)).

In the context of this study it is especially relevant to understand the relationship and interplay between exploration and exploitation and how this affects organizations. In line with March (1991), Tushman and O'Reilly (1996) started a discussion on so called ambidextrous organizations which will be explained below.

2.3.2. Organizational Ambidexterity

Based upon earlier work by Duncan (1976) who was the first to use the term of ambidextrous organizations and claimed that firms have to shift structures to initiate and execute innovation, Tushman and O'Reilly (1996) were the first to come up with a theory of organizational ambidexterity (Raisch et al. (2009), p. 685). The term refers to the Latin words ambo (= double/both) and dexter (= (right) hand) and is therefore relating to doing two things at the same time equally well. For organizational theory, the two researchers defined this concept as “the ability to simultaneously pursue both incremental and discontinuous innovation and change results from hosting multiple contradictory structures, processes, and cultures within the same firm” (Tushman and O'Reilly (1996), p. 24). Due to the ability of following explorative and exploitative approaches at the same time, firms can achieve superior performance and achieve long-term survival (Gupta et al. (2006), He and Wong (2004), Smith and Tushman (2005), Tushman and O'Reilly (1996)). Being ambidextrous, however, requires organizations to “reconcile internal tensions and conflicting demands in their task environments” (Raisch and Birkinshaw (2008), p. 375). In recent years, researchers’ attention towards this topic has led to refinements as well as extensions of ambidexterity (Raisch et al. (2009)).

One topic of interest is how to achieve ambidexterity. Tushman and O'Reilly (1996) initially proposed that organizational ambidexterity can only be achieved through architecturally separate units within a company. This approach is called structural ambidexterity, whereas this “entails not only separate structural units for exploration and exploitation but also different competencies, systems, incentives, processes, and cultures – each internally aligned” (O'Reilly and Tushman (2008), p. 192). Other proposed approaches to ambidexterity are sequential ambidexterity (e.g. Duncan (1976)), i.e. shifting focus and resources from exploration to exploitation and back from time to time, and contextual ambidexterity, defined as “the behavioral capacity to simultaneously demonstrate alignment and adaptability across an entire business unit” (Gibson and Birkinshaw (2004), p. 209). O'Reilly and Tushman (2013) conclude after a review of all available modes of ambidexterity that all three of them are viable and “the different ways of achieving ambidexterity may be more or less useful contingent on the nature of the market faced” (p. 330).

Another important field of research for organizational ambidexterity is its effect on firm performance. Several researchers like Auh and Menguc (2005), Gibson and Birkinshaw (2004), He and Wong (2004), Lubatkin et al. (2006), and Uotila et al. (2009) conducted empirical research finding a positive effect of organizational ambidexterity towards firm performance in terms of sales growth, subjective ratings of performance, innovation, market valuation and firm survival (O'Reilly and Tushman (2013), p. 325). The positive effect of ambidexterity was especially beneficial “under conditions of uncertainty and when sufficient resources are available, which is often the case with larger rather than smaller firms (O'Reilly and Tushman (2013), p. 326).

Moreover, several scholars like O'Reilly and Tushman (2008) connected organizational ambidexterity to the concept of dynamic capabilities (Teece et al. (1997)). This link will be explained subsequently.

2.3.3. Dynamic Capability through Explorative and Exploitative Innovations

Dynamic capabilities are “the firm’s ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments” (Teece et al. (1997), p. 516) or “the firm’s processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match or even to create market change” (Eisenhardt and Martin (2000), p. 1107). Literature suggests that it is the responsibility of the senior management to effectively adapt, integrate and reconfigure new and existing assets (Eisenhardt and Martin (2000), O'Reilly and Tushman (2008), 2013, Teece et al. (1997)). Over the years, the relationship between this approach and the logic of ambidexterity has been explored. For example, Vogel and Güttel (2013) found in their bibliometric review on dynamic capability literature that it is highly correlated with ambidexterity. Other empirical findings found that the conditions in which dynamic capabilities are most valuable are basically the same as for simultaneously exploiting and exploring which, again, reinforces the importance of ambidexterity as a dynamic capability (O'Reilly and Tushman (2013), p. 196).

2.3.4. Exploration and Exploitation in User-Centered Design

When comparing the features of exploration (experimenting with new alternatives and markets, innovation) and exploitation (refining existing competencies, competing in mature markets) with the concept of UCD, it can be seen that the core assets of UCD (chapter 2.1) are definitely in
line with the two learning approaches, respectively ambidexterity. UCD basically aims at designing usable systems by integrating the user into the product development process. On the one hand, this approach does require the company to explore in that sense that external stakeholders, especially the users, are the source of incremental and non-incremental innovations. This goes in line with the dynamic capability approach linked to ambidextrous organizations as outlined above. Another major feature of UCD is the multidisciplinary team as proposed in various principles (chapter 2.1.3). This is also relevant when following Tushman and O’Reilly (1996) approach that ambidexterity has to be conducted simultaneously but in different subunits (structural ambidexterity). Moreover, when distinguishing between product and process innovations as suggested by Reichwald and Piller (2009), there is also an exploratory notion, i.e. incremental and non-incremental innovation by user integration and user innovation, as well as an exploitative one due to the recombination of already existing firm assets and capabilities.

To conclude, it can be stated that the exploration-exploitation framework which has been subject to much research within different domains in management theory perfectly fits to the concept of UCD. This rather practical approach and its success can be (at least partially) explained by the theoretical considerations outlined above.

After having given insight into the concept of UCD and all its facets (chapter 2.1) and having supported this practical approach with highly relevant theories from organizational theory, the research model of this study will be outlined below. Moreover, several hypotheses concerning the influence of the organizational context towards the project success in an UCD context will be shown in the following chapter.

3. Research Model and Hypotheses Elaboration

Prior research has made great efforts in the respective domain towards the antecedents, moderators and effects of UCD, user integration and ambidexterity as presented above. However, to the knowledge of the author of this thesis, there has not been any study that brings all these important and interrelated research streams together. This gap should be filled with the research model described below.

3.1. Construction of the Research Model

Based on the theoretical insights presented in chapter 2 and in order to answer the research questions outlined in chapter 1.1, a two-step research model was established.

On the one hand, it is of interest to reveal the nature of UCD, especially in terms of the methods used, the types of users involved and the stages the involvement takes place (RQ1). Chapter 2.1 has given theoretical insight into the wide range of possibilities of how to conduct UCD. However, there is evidence that not all of the theoretically recommended features are really practiced. For example, a study across major companies found that many of the methods that are discussed in the literature are neither effective nor practical for different reasons (Vredenburg and Butler (1996)). To confirm the theoretically obtained characteristics and evaluate the state-of-the art of UCD empirically, UCD experts across Germany have to be surveyed on the nature and setup of this approach.

On the other hand, this study aims to find out about the success of UCD projects (RQ2) as well as the organizational context that is beneficial for UCD (RQ3). Following research on the success of user integration in the product development process and taking into account the influence of various factors within the organizational context, a relationship between the organizational context and the project success in an UCD setup will be explored. Figure 5 summarizes the research model that will be followed in the context of this thesis.

The blue construct in the middle of the model relates to the confirmative and also explorative part of this study in order to find out about the UCD state-of-the-art in Germany. The green part refers to the organizational context which represents the independent variable in this thesis. Derived from existing literature, six constructs in particular will be investigated: IT and UCD competence, innovativeness, customer orientation, exploration and exploitation, and top management team. They will be further explained below.

The green part represents the outcome of the respective UCD project. It will serve as the dependent variable for this study. In contrast to former research concerning the effects of user integration as well as ambidexterity which mainly considered a macro-view of firm performance (e.g. Gibson and Birkinshaw (2004)) or single key performance indicators like sales growth (e.g. He and Wong (2004)), the dependent variable in this study will be measured on a project basis in seven dimensions that are derived from management theory and UCD literature. Hence, a more holistic view to the UCD success dimensions and the interrelatedness between earlier described concepts should be achieved. Not only the general overall success of a project will be captured but also the innovativeness of the outcome and the process, the efficiency, the customer satisfaction, the employee morale and the productivity.

“...one valid definition of business purpose: to create a customer. [...] It is the customer who determines what the business is. [...] Because it is its purpose to create a customer, any business enterprise has two - and only these two - basic functions: marketing and innovation” (Drucker (1954), p. 37). As this quote shows, innovation has long been considered a crucial success factor. In line with Reichwald and Piller (2009) it is important to explicitly differentiate between product (here: outcome) and process innovation, which will also represent an important element of the
dependent variable in this study.

Efficiency as well as customer satisfaction are both explicit goals of UCD (e.g. ISO (2010)). Also IT related research (e.g. DeLone and McLean (1992)) finds that this is a crucial element of success. Moreover, customer satisfaction is a vital construct in management theory, especially marketing research, because it usually involves higher economic returns (Anderson et al. (1994)).

According to Adams et al. (2006) who aimed at finding a holistic measure for innovation, employee morale plays an essential part in the innovation’s process. Moreover, since multidisciplinary teams with different backgrounds are usually involved in UCD projects (see chapter 2.1) which requires coordination and communication skills (Vredenburg et al. (2002a)) it is interesting to find out more about this aspect.

Productivity is considered to be the key measure of organizational effectiveness (Deshpandé et al. (1993)) and therefore another important aspect to UCD project success.

In contrast to other studies, financial performance was not assessed in this context because this would require knowledge that is mostly only available to the top management which was not the target group of this study.

Taken together, these dimensions should represent important success factors from various fields to UCD projects.

3.2. Development of the Hypotheses

In the following chapters, several hypotheses concerning the influence of the organizational context towards the UCD project outcome will be proposed.

3.2.1. Expected Influence of IT and UCD Competence on Project Success

“Embedded in the general stream of research that seeks to understand how firm resources and capabilities are combined to produce some form of competitive advantage, the study of how IT affects the strategic management of organizations continues to demand considerable attention” (Tippins and Sohi (2003), p. 746). Already in the introduction of this study the relevance of IT in today’s world was stressed. However, there is the urgent need to also have the competency to effectively use IT tools and processes. As explained in chapter 2 of this thesis, UCD is a concept which is mainly used for computerized systems.

Therefore, the influence of IT competency towards a UCD project’s success is highly relevant. Tippins and Sohi (2003) define IT competency as “the extent to which a firm is knowledgeable about and effectively utilizes IT to manage information within the firm” (p. 748). It refers to the three dimensions of IT knowledge (i.e. “the extent to which a firm possesses a body of technical knowledge about objects such as computer based systems” (p.748)), IT operations (i.e. “the extent to which a firm utilizes IT to manage market and customer information” (p. 748)) and IT objects (i.e. “computer-based hardware, software, and support personnel” (p. 749)).

Since other studies concerning the influence of IT competence have found a positive impact towards firm performance (e.g. Wu et al. (2006)), also in terms of competitive advantages (e.g. Pavlou and El Sawy (2006)) and dynamic capabilities (e.g. Cepeda and Vera (2007)), the first hypothesis is established as follows:

H1a: IT Competence has a positive influence on the project success.

It was stated earlier that the know-how of effectively doing IT is a crucial element to success. Naturally, this is not only relevant for the IT aspect but also the UCD competence in a UCD project. Therefore, another hypothesis which is closely related to H1a is proposed as follows:

H1b: UCD Competence has a positive influence on project success.
3.2.2. Expected Influence of Customer Orientation on Project Success

As outlined in chapter 2, UCD as well as the connatural concept of user innovation are based on the idea to actively involve the customer in the product development process. Even before these concepts had the popularity that they do now, customer orientation (also called market orientation) in terms of market research was of interest in management theory (Deshpandé et al. (1993), Reichwald and Piller (2009)). Based on the definition of market orientation by Kohli and Jaworski (1990), Narver and Slater (1990) define customer orientation as “the organization culture that most effectively and efficiently creates the necessary behaviors for the creation of superior value for buyers and, thus, continuous superior performance for the business” (p. 21). In line with this argumentation, the following hypothesis is proposed:

H2: Customer orientation has a positive influence on project success.

3.2.3. Expected Influence of Innovativeness on Project Success

“Innovation, and how it is managed, is a key strategic issue. It is of interest to both practitioners and researchers across a range of business and management disciplines” (Baregheh et al. (2009), p. 1334). However, the existing research most often only focuses on innovation and innovativeness as a dependent variable (Deshpandé et al. (1993), p. 28). Although being innovative is a crucial factor to firm performance, the relationship between innovativeness and business performance has not been studied adequately (Capon et al. (1990)). Also in the context of UCD projects, and due to their exploitative but especially exploratory nature it is relevant to be innovative. Therefore, the following is hypothesized:

H3: Innovativeness has a positive influence on project success.

3.2.4. Expected Influence of Exploration and Exploitation on Project Success

Chapter 2.3 presented a broad explanation of the twin concepts of exploration and exploitation in organizational learning. Research has suggested that following these two contradictory approaches simultaneously is essential to firm survival (e.g. March (1991), O'Reilly and Tushman (2008), 2013). Since the concept is highly related to the ideas of customer integration and therefore UCD, the following relationship is proposed:

H4: Ambidexterity, i.e. exploration and exploitation, has a positive influence on project success.

3.2.5. Expected Influence of the Top Management Team on Project Success

In several studies treating firm performance as dependent variable, the influence of the top management team was considered (e.g. Gibson and Birkinshaw (2004), Lubatkin et al. (2006), and Raisch and Birkinshaw (2008)). Research in the field of ambidexterity as well as dynamic capabilities claims that the top management team is responsible for the adaptation, integration and reconfiguration of new and existing assets (see chapter 2.3). Providing the employees with a clear vision is an important factor in ambidextrous organizations (O'Reilly and Tushman (2013), p. 194). Moreover, when reviewing conducted surveys on the current status of UCD practice in other countries (e.g. Gulliksen et al. (2006), Vredenburg and Butler (1996), Vredenburg et al. (2002b)) it becomes obvious that the support of the top management team as well as their appreciation and knowledge concerning UX and usability have an influence on the UCD activities and their outcome. Therefore, the following will be proposed:

H5: The top management team’s support and guidance has a positive influence on project success.

The research model was evaluated by an empirical analysis. The methodology will be discussed in chapter 4.

4. Methodology

4.1. General Approach

In order to answer the previously defined research questions and to collect data for testing the stated research model and the implicated hypotheses, a descriptive approach was chosen. Such an approach is suitable for describing facts and behaviors and is used for hypothesis testing (Koch et al. (2009), Fantappiè Altobelli (2011)). This form of data collection is part of the structured survey methods which are characterized by a direct, i.e. a non-disguised approach. It leaves the purpose of the study either disclosed or obvious to the respondents from the questions asked. It represents a formal questionnaire with questions in a prearranged order regarding behavior, intentions, attitudes, awareness, motivations as well as demographic and lifestyle characteristics. Major advantages of surveys are that the questionnaire is easy to administer and that the collected data is reliable because of limited response choices. Moreover, coding, analysis and data interpretation are relatively simple. The main disadvantage of survey is the risk of non-response due to inability or unwillingness to answer the questions in the questionnaire (Malhotra (2010), p. 211).

4.2. Survey Design

The questionnaire was composed of four parts as to be seen in Figure 6. The first part contained a short introduction to the survey and the topic of UCD as well as the first filter question (“Do you apply this concept in your company?” with screen out for answers “No” and “Do not know”). In addition, a couple of questions concerning the organizational setup of UCD, the objectives of UCD and the user involvement during

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11For full questionnaire please see Appendix 2.
different stages of the design and development process of a product or service were asked. These questions can be considered ice-breakers or contact questions that should help to overcome mistrust and to motivate to participate in the survey because they are assumed to be easy and effortless to answer (Fantappiè Altobelli (2011), p. 63). Moreover, these questions are relevant for redefining the concept of UCD according to chapter 2.1.

The second part of the questionnaire was concerned with the recently conducted UCD projects. Participants were asked to tell the number of UCD projects performed during the last 12 months (by them personally and in the whole company). This was the second filter question, so that people without having at least participated in one project within the last 12 months were screened out and could not continue with the survey. Other questions in this part concerned the project type, the key performance indicators for successful UCD projects and detailed questions on the course of UCD projects in the respective participant’s company. These questions were particularly interesting for the descriptive part concerning UCD of this study. Open questions on facilitators and obstacles for the conducted projects were asked as well. Furthermore, the success of projects was evaluated on a seven-point scale from „very bad” to „very good” with a „not available”-option for each of the seven items (overall success, innovativeness of the outcome, innovativeness of the process, efficiency, customer satisfaction, employee morale and productivity). This construct was used as dependent variable for the hypotheses testing of this thesis.

The third part of the survey contained several constructs that evaluate the organizational context the respective UCD projects are taking place in. These constructs were used as independent variables for the analysis part of this study. Table 2 provides an overview of them.

In line with Churchill (1979) the literature was searched for existing and relevant scales, that were adapted and adopted if no appropriate scales were available and new scales were developed. The IT Competence-construct developed by Tippins and Sohi (2003) (p.760) covers four items on IT knowledge, six items on IT operations and five items on IT objects. Seven out of the 15 items were adjusted in the way that the word „IT” in the wording of the item was replaced by „UCD” to reflect the construct UCD Competence. The items of the constructs of Customer Orientation (Deshpandé et al. (1993), pp. 33-34), Innovativeness (Capon et al. (1987)) as well as Exploration and Exploitation (Lubatkin et al. (2006), p. 656) were adopted but, instead of measuring them on a five-point scale, a seven-point scale was used in this thesis. Sarstedt & Mooi (Sarstedt and Mooi (2014), p. 69) point out that seven-point scales in comparison to five-point ones produce more differentiated answers and are yet not too confusing for the participants due to too many response options. To overcome position bias, the order of a construct’s items was randomized for every participant (Malhotra (2010), p. 344).

The fourth and final part of the survey contained demographical questions concerning the participants and their company. Since sensitive data like income was evaluated in this part, it makes sense to place these questions at the end of the survey because participants have by then already overcome the initial mistrust and a relationship has been established so that they are more likely to answer them (Fantappiè Altobelli (2011), p. 47).

4.3. Data Collection

The participants of the study were asked to complete the questionnaire, which was programmed in ‘Questback Enterprise Feedback Suite’, online. A great advantage of online surveys is that the interviewer cannot influence the course of the study, which means that the interviewer effect (Glantz and Michael (2014)) as well as the social desirability effect (Wagner and Hering (2014)) are minimized. Also sensitive questions, for example those on the subject of salary, are more likely to be answered truthfully because the perceived anonymity is considered higher compared to other methods (Malhotra (2010), p. 222). In addition, online surveys are less time consuming than, for example, paper-based surveys and are independent from location and time (Koch et al. (2009), pp. 59-61). Therefore, respondents can be contacted even across great spatial differences at the same time which counteract the methods effect (Wagner and Hering (2014), p. 662). Moreover, no mistakes due to manual data entry can arise because the data will be directly saved to a server. This means that data can be exported at any point of time and even before the end of the survey for data cleansing or interim reports (Wagner and Hering (2014), p. 663).

However, literature also mentions a number of disadvantages of online surveys. Foremost, researchers state that this type of survey lacks representativeness because the population is limited to the people with internet access (e.g. Fantappiè Altobelli (2011), p. 38). This problem can be disregarded because on the one hand, the internet access rate for Germany in 2015 was 88% (Eurostat (2015)) and on the other hand the target group of this study is UCD experts who are mostly in charge of websites and applications. Another drawback of online surveys in general is self-selection of the participants which leads to selection bias (Malhotra (2010), p. 256). However, the majority of the sample was personally addressed via e-mail so that this problem does not affect this study so much. The problem of low return rates is also very common for online surveys (Koch et al. (2009), p. 61). To overcome this issue, the questionnaire has to be designed in an appealing way and a respectable appearance as well as informative and motivating announcement have to be granted (Wagner and Hering (2014)). Therefore, participants had the possibility to choose between German and English for filling out the questionnaire and recommended design features like a progress bar (Wagner and Hering (2014), p. 668) and visual features (Fantappiè Altobelli (2011), p. 37) were implemented.

To see all items and the complete questionnaire, please see Appendix 2.

12 The detailed sampling strategy will be presented in chapter 4.4.
4.4. Sampling Strategy

The target group of this study is UCD experts in Germany. Someone can be considered an expert due to his or her position or function for example in an organization. The experts have to be in charge of a certain task and have to have a privileged access to the required information (Scholl (2009), p. 67). Meuser and Nagel (Meuser and Nagel (1991), p. 443) state that the expert status is of relational nature and will be granted by the researcher according to a specific research question. Since it is of interest to learn about the in-house UCD activities in German companies, it makes sense to question persons who are actually working in such a setup. In addition, persons working in business-to-consumer (B2C) instead of business-to-business (B2B) industries were targeted because they rather focus on end-users than other entities and are therefore more applicable to this subject.

To find an appropriate sample for this study a two-step sampling procedure was chosen.

First, a manual keyword search on the career-oriented social networking sites 'Xing' and 'LinkedIn' was conducted between the 16th of January and the 1st of February 2016. For both networks, the same search pattern was followed: the country of interest was set to Germany, and the search term “user centered design” was written in the free text search field. These steps yielded 2501 hits for Xing and 4528 hits for LinkedIn. Since it is possible to cluster the results according to the industry they are working in, the result list was split into different subgroups and random members were chosen to be contacted. The respective people were recorded in an Excel sheet to ensure that they were not contacted a second time. Due to Xing’s policy restrictions, only 20 persons who are not in one’s direct network can be contacted per mail a month. In addition, 100 people can be sent a contact request which can include an invitation text of 600 digits. For LinkedIn, only 30 messages, so called “InMails” can be sent to people outside one’s network. If the contacted persons respond to the mail, one will be given another free mail to send. In total, 192 people were contacted via the two networks with a short introduction of the researcher and the object of the study and the link to the online survey. In

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**Table 2: Used Constructs to Measure Organizational Context; Source: Own illustration**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Number of Items</th>
<th>Scale Type</th>
<th>Source</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT Competence</td>
<td>15</td>
<td>Tippins and Sohi (2003) (p. 760)</td>
<td>&quot;I strongly disagree&quot; = 1</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>I strongly agree = 7</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>n/a = 8</td>
<td></td>
</tr>
<tr>
<td>UCD Competence</td>
<td>7</td>
<td>Own development in accordance to Tippins and Sohi (2003)</td>
<td>&quot;I strongly disagree&quot; = 1</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>I strongly agree = 7</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>n/a = 8</td>
<td></td>
</tr>
<tr>
<td>Customer Orientation</td>
<td>9</td>
<td>Seven-point Likert scales with &quot;not applicable&quot;-option</td>
<td>Deshpandé et al. (1993) (1993, pp. 33-34)</td>
<td>&quot;I strongly disagree&quot; = 1</td>
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<td></td>
<td></td>
<td></td>
<td>&quot;I strongly agree&quot; = 7</td>
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<td></td>
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<td></td>
<td>n/a = 8</td>
<td></td>
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<tr>
<td>Innovativeness</td>
<td>5</td>
<td>Capon et al. (1987)</td>
<td>&quot;Never&quot; = 1</td>
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<td></td>
<td></td>
<td></td>
<td>&quot;Always&quot; = 7</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>&quot;n/a&quot; = 8</td>
<td></td>
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<tr>
<td>Exploration</td>
<td>6</td>
<td>Lubatkin et al. (2006) (p. 656)</td>
<td>&quot;I strongly disagree&quot; = 1</td>
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<td></td>
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<td>&quot;I strongly agree&quot; = 7</td>
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<td>n/a = 8</td>
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<tr>
<td>Exploitation</td>
<td>6</td>
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<td>&quot;I strongly disagree&quot; = 1</td>
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<td>n/a = 8</td>
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<tr>
<td>Top Management Team</td>
<td>4</td>
<td>Own development</td>
<td>&quot;I strongly disagree&quot; = 1</td>
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<td></td>
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<td>I strongly agree = 7</td>
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<td>n/a = 8</td>
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</table>

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addition, digital forums on Xing and LinkedIn were used to post a request to participation.

As a second step, the customer database of Facit Digital was used to filter out relevant study participants. A list of 436 potential participants was put together by reviewing the overall database together with the CEO of the company, Christian Bopp. The selected persons were contacted with an email containing the same information as the other recruited people on the 4th of February 2016.

Overall, the survey was opened between the 15th of January and the 1st of March 2016.

4.5. Sample Description

In total, 245 participants accessed the link to the survey and 205 started it. 101 of them passed the two filter questions (“Do you apply this concept in your company?” with screen out for answers “no” and “do not know” and “How many UCD projects have you conducted within the last 12 months?” with screen out for less than one project) and were therefore eligible for the study. However, only 69 people finished the survey completely. In the following, the descriptive statistics of the two samples in comparison referred to as “Overall” (n=101) and “Sample” (n=69) will be shown.

The overall sample (n=101, sample: 70) consisted of 74.3% men (sample: 74.6%, n=70) and 25.7% women (sample: 25.4%). Women being underrepresented among the UCD experts goes in line with prior findings (e.g. Diefenbach et al. (2015)). Most of the participants answered the survey in Germany (overall: 92.1%, n=91, sample: 91.3%, n=69). The distribution of age is shown in Figure 7.

The majority of the sample was in the age range of 30 to 39 years (overall: 50.7%, n=71, sample: 50.0%, n=68). None of the participants was younger than 20 or older than 60. Figure 8 shows the distribution of educational levels in the sample. Most of the participants of the survey had a postgraduate or professional degree (overall: 65.7%, n=70, sample: 64.2%, n=67). Diefenbach et al. (2015) also find that the majority of UX and Usability experts in Germany fall under that category. The lowest educational level of the sample was an intermediate secondary school-leaving certificate which was represented by a small percentage of 4.23% in the overall sample, respectively 4.41% in the calculation sample.

The high level of education is also represented in the income distribution as to be seen in Figure 9. It shows that the monthly net income of the majority of the sample (overall: 45.3%, n=53, sample: 45.1%, n=51) is between 3000€ and 4999€.

In comparison to the average monthly net income in Germany which was 1807€ in 2015 (Statistisches Bundesamt (2016)) this is a relatively high value. However, these values are in line with the findings of Diefenbach et al. (2015). In their industry report they claim that the height of the income is highly correlated with the tenure and work experience of the UX and Usability experts. In this study, 33.8% of the participants in the overall sample (n=71) as well as the calculation sample (n=68) indicate that they have been working between one to three years in their current position. Another great share’s tenure (overall: 29.6%, sample: 29.4%) is more than five years. These findings are also in line with the ones by Vredenburg et al. (2002).

The majority of the participants indicated to be working in the Marketing department (overall: 29.6%, n=71, sample: 26.5%, n=68), followed by IT (overall: 19.7%, sample: 20.6%) and Design (overall: 16.9%, sample: 17.7%). As shown in Figure 10, several industries were covered in this thesis.

Except for a slightly higher percentage for Financial Services and Insurance (overall: 26.8%, n=71, sample: 25.0%, n=68), the sample shows a balanced distribution across industries. Since it was a goal to mainly focus on B2C firms, this distribution indicates a good representativeness of the required sample.

By trend, the participants seemed to work in large companies with 10000 and more employees (overall: 42.0%, n=69, sample: 43.3%, n=67). Companies with 1000 to 4999 employees were represented by 21.7% in the overall sample and 22.4% in the calculation sample. Diefenbach et al. (2015) mainly surveyed persons working in small to medium sized companies with 16-50 and 101-1000 employees. Therefore, this study will also give further insight on a so far rather uncharted sample.

4.6. Data Analysis

To analyze the collected data IBM Statistical Package for the Social Sciences (SPSS) version 20 was used. As a first step, the syntax was programmed for intuitive understanding of the variables. Then, the missing values were set for all questions that have not been seen or answered by the participants as well as for the option “not applicable” which was available for Likert-scaled data and demographics.

For questions that allowed checking more than one item the entries were counted and the percentage of the respective valid sample was calculated.

To test the hypotheses established in chapter 3 an ordinary least square regression analysis was conducted. This technique “is used to determine the causality between one dependent interval- or ratio-scaled variable (the explained variable) and one or more independent interval- or ratio-scaled variables (the explanatory variables)” (Janssens et al. (2008), p. 137). To conduct this type of analysis several assumptions have to be met (Sarstedt and Mooi (2014), pp.

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17 For SPSS outputs please Appendix 3
18 Note: This refers to the valid cases in “Overall”.
19 Note: This refers to the valid cases in „Sample“.
First, a sufficiently large sample size is required. This is because the sample size has an effect on the statistical power of the significance testing and the generalizability of the result in a multiple regression (Hair et al. (2014), p. 170). In terms of generalizability, a general rule is that the number of observations should at least be five times the number of independent variables (Hair et al. (2014)). Since this study focuses on six independent variables, a minimum sample size should be 30. Hair et al. (2014) state however, that the desired level is rather between 15 and 20 observations (p. 171). In this study, only 29 observations could have been included in the regression analysis. When it comes to statisti-
cal power, a value of 0.8 is an acceptable level (Sarstedt and Mooi (2014), p. 197) and will be followed in this study. Hair et al. (2014) provide a table showing the “interplay among the sample size, the significance level $\alpha$ chosen and the number of independent variables” (p. 170) which is to be seen in Table 3 for a significance level of $\alpha =0.05$.

According to the table, a sample size of 50 and five independent variables at a 0.05 significance level will detect $R^2$ values of 23% and greater. Another assumption for conducting regression analyses is that the variables, especially the dependent variable, have to show variation. This is given here since the standard deviation (SD) of the dependent variable is 0.73. In addition, the dependent variable has to be interval or ratio scaled. In this study, the dependent variable was measured on a seven-point Likert scale which are, strictly speaking, ordinal scales. However, “the assumption of equal appearing intervals permits Likert scales with five or more possible answers to be treated as interval scales” (Janssens et al. (2008), p. 151). Moreover, the assumption of no or only little collinearity has to be met. For that matter, the tolerance as well as the Variance Inflation Factor (VIF) were calculated. The tolerance should be below 0.10 and the VIF should not exceed a value of ten (Sarstedt and Mooi (2014), p. 199). In this study, none of the values for the tested constructs undercut, respectively exceeded, the threshold values so that no problems due to (multi)collinearity have to be assumed.

Most of the questions included the option “Other” in case the participant could not find a suitable answer within the item list. This option included a free-text field that had to be filled out if the item was chosen. The open comments were analyzed according to Mayring’s (Mayring (2008)) qualitative content analysis. This is a common mean to treat open questions in a standardized questionnaire (Fantappiè Altobelli (2011), p. 344). By applying this method a certain structure will be filtered from the material and summarized into categories and sub-categories to reduce the volume of the material but maintaining the central content (Mayring (2008), S. 89). Also the open questions concerning obstacles and facilitators for the UCD process were analyzed in that manner. This method is characterized by the classification of the material into a communication model (here: finding out about features of the UCD process that are not captured by the closed questions in the survey), rule-guidance, categorization as well as the fulfillment of quality criteria. In the case of this study, the categorization will be done inductively; i.e. the categories will be derived straight from the material by generalization of the statements (Fantappiè Altobelli (2011), p. 346).

To gain further insights on the success of UCD, the sample was split into two halves according to their scores in the dependent variable “project success”. To find out about significant differences between these two subsamples, their respective mean (M) values had to be compared. These two subsamples can be considered independent and therefore independent two-sample t-tests will be conducted. Also for this type of analysis, several assumptions have to be met. One crucial assumption is that the dependent variable has to be measured on an interval or ratio scale. As explained above, Likert scales can be considered adequate here. In addition, the samples have to be independent. As stated earlier, this is the case because the overall sample was split according to their project success score. Moreover, since the t-test is a parametric test, the variances of the two samples have to be equal which can be tested by a Levene’s test. SPSS automatically computes the test statistic and offers an alternative value for the significance test even if this assumption is not met. Another assumption for conducting a t-test is that the dependent variable has to be normally distributed. This can be tested by a Kolmogorov–Smirnov test for interval scaled data. With the exception of three out of 13 items, this assumption is met at a significance level of $\alpha=5\%$.22

To evaluate if there is any significant relationship between the project success and the methods used, the types of users and the external stakeholders involved crosstabs were calculated. “Crosstabs (also referred to as contingency tables) are tables in a matrix format that show the frequency distribution of nominal or ordinal variables” and are “used to analyze the relationship between two variables” (Sarstedt and Mooi (2014), p. 106). The analysis technique to evaluate the significance of the differences between two independent samples as it applies here is the $\chi^2$ test of independence.

5. Results of Data Analysis

In this chapter, the results of the previously described empirical study will be presented. In the first part, the results concerning the features of UCD which have been theoretically summarized in chapter 2 will be shown23. Next, several insights concerning differences between two sub-samples in terms of project success will be given. Finally, the outcome of the hypotheses tests will be explained.

5.1. The State-of-the-Art of User-Centered Design in Germany

Concerning the state-of-the-art of UCD practices in Germany, three interesting aspects will be shown. First, the UCD setup in terms of the organization, the UCD team, objectives and key performance indicators (KPIs) will be presented. In a second step, the actual UCD process will be closer investigated. In this part, the several process stages will be examined with focus on user integration, methods used as well as external stakeholders being involved. The third part of this section refers to the open comments the participants gave concerning facilitators and obstacles in the UCD projects.

22For SPSS outputs please see Appendix 8.

23For SPSS outputs please see Appendix 4.
5.1.1. User-Centered Design Setup

First of all, it is interesting to see how the topic of UCD is handled across German B2C firms in terms of organizational setup. Figure 11 shows the distribution of different UCD setups in the samples (overall and calculation sample).

Most of the participants indicated that they are working in a UCD team operating across different departments (overall: 26.7%, n = 101, sample: 26.1%, n = 69), followed by working in a UCD team within one specific department (overall: 20.8%, sample: 23.2%). The category “I consider UCD an integral part of my job” was created by analyzing the open comments for the “other” item in this context. It summarizes comments like “Ich wende in meinem Job als PM UX an” (“I apply UX in my job as project manager”) or “Marktforschung” (“market research”) according to Mayring’s (Mayring (2008)) content analysis. The project acceptance (overall: 81.4%, n = 65.2%) and Marketing (overall: 61.6%, sample: 56.1%) are less relevant in this context according to the entries of the UCD experts (Vredenburg et al. (2002b)). Moreover, also other researchers like Hudson (2001), Ji and Yun (2006) and Vredenburg et al. (2002b) find this to be the most important motive for conducting UCD. Improved levels of system acceptance (M = 6.15, SD = 1.16, M = 6.19, SD = 1.16) as well as improved system quality due to more accurate user requirements (M = 6.09, SD = 1.10, M = 6.10, SD = 1.13) and the avoidance of costly features that the users do not want or cannot use (M = 6.04, SD = 1.25) also indicate high agreement. These insights match with Damodaran’s (Damodaran (1996)) findings on the benefits of effective user involvement in systems design. The objective of increasing user productivity (M = 5.76, SD = 1.35, M = 5.86, SD = 1.24) and increasing sales (M = 5.32, SD = 1.65, M = 5.45, SD = 1.49) which is often an indicator for firm performance (e.g. Auh and Menguc (2005), He and Wong (2004)) yield middle but yet high scores as well. The other motives which were mainly suggested by Kujala (2003) who reviewed benefits and challenges of user involvement were not as important for the questioned experts in this study.

Another topic of interest when describing the state-of-the-art of UCD practices in Germany is to find out about the KPIs that the project success is measured by in the different companies. An overview of the percentages of the entries to the respective KPI is shown in Figure 13. In line with the objectives and the findings of other scholars like Vredenburg et al. (2002b) and Ji and Yun (2006) user satisfaction is the most important goal (overall: 89.58%, sample: 88.41%) according to the entries of the UCD experts (n = 96, n = 69). Moreover, customer retention which is very closely connected to customer satisfaction (e.g. Ashley et al. (2015)) yields a very high percentage of agreement in the sample (overall: 73.96%, sample: 79.71%). Established business KPI like sales increase or the Return on Investment (ROI) are less relevant in this context according to the UCD experts. Garrett (2012) suggested the conversion rate, defined as the percentage of transactions in comparison to visits (p. 13), to be a valid measure of the return on investment.

Table 3: Minimum R² To Be Found Statistically Significant with a Power of 0.80; Own illustration based on (Hair et al. (2014), p. 170)

<table>
<thead>
<tr>
<th>Sample Size</th>
<th>2</th>
<th>5</th>
<th>10</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>39</td>
<td>48</td>
<td>64</td>
<td>-</td>
</tr>
<tr>
<td>50</td>
<td>19</td>
<td>23</td>
<td>29</td>
<td>42</td>
</tr>
<tr>
<td>100</td>
<td>10</td>
<td>12</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>250</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>8</td>
</tr>
</tbody>
</table>
After having examined the setup and frame conditions in which UCD projects are conducted, chapter 5.1.2 will grant insight into the features of the UCD process.

5.1.2. The User-Centered Design Process

In the context of the UCD process it is of special interest what kind of users are being integrated and when this takes place. Table 5 gives an overview of the percentages of entries for UIs.

As to be seen from this table, different types of users are integrated into the product development. There is very little incidence of no user integration during the analysis, design and deployment stage. Only during the implementation of a computerized system, 21.78% (overall), respectively 26.09% (sample) of the respondents indicated no integration at all. Mostly integrated into the analysis stage of the product devel-
In general, heavy users seem to be the user group which is most likely to be integrated into any stage of the process. Also expert users, i.e. users who work with the system on a daily basis, and light users are often stated to be involved throughout the product development. Non-Users, referring to persons who have not used the respective product before, are most likely to be integrated in the early stages of the development process. Lead users who are critical for product innovations (see chapter 2.2), however, are not as often stated as expected. That said, more than half the people surveyed (overall: 59.38%, sample: 61.19%) indicated that they include these customer innovators into the design stage.

Table 5: User Integration along the Development Process; Source: Own illustration

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Design</th>
<th>Implementation</th>
<th>Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>Sample</td>
<td>Overall</td>
<td>Sample</td>
</tr>
<tr>
<td>Non-Users</td>
<td>57.29%</td>
<td>58.21%</td>
<td>42.71%</td>
</tr>
<tr>
<td>Light Users</td>
<td>62.50%</td>
<td>61.19%</td>
<td>69.79%</td>
</tr>
<tr>
<td>Heavy Users</td>
<td>73.96%</td>
<td>77.61%</td>
<td>82.29%</td>
</tr>
<tr>
<td>Expert Users</td>
<td>66.67%</td>
<td>73.13%</td>
<td>69.79%</td>
</tr>
<tr>
<td>Lead Users</td>
<td>50.00%</td>
<td>53.73%</td>
<td>59.38%</td>
</tr>
<tr>
<td>Current Customers of Products/Services by my Company</td>
<td>60.42%</td>
<td>67.16%</td>
<td>55.21%</td>
</tr>
<tr>
<td>Potential Customers of Products/Services by my Company</td>
<td>69.79%</td>
<td>71.64%</td>
<td>60.42%</td>
</tr>
<tr>
<td>No User/Customer</td>
<td>4.95%</td>
<td>2.90%</td>
<td>4.95%</td>
</tr>
</tbody>
</table>

Development process are heavy users (overall: 73.96%, n = 101, sample: 77.61%, n = 69) and potential customers of the firm (overall: 69.79%, sample: 71.64%). In general, heavy users seem to be the user group which is most likely to be integrated into any stage of the process. Also expert users, i.e. users who work with the system on a daily basis, and light users are often stated to be involved throughout the product development. Non-Users, referring to persons who have not used the respective product before, are most likely to be integrated in the early stages of the development process. Lead users who are critical for product innovations (see chapter 2.2), however, are not as often stated as expected. That said, more than half the people surveyed (overall: 59.38%, sample: 61.19%) indicated that they include these customer innovators into the design stage.

Only 43.00% in the overall sample (n = 86), respectively 43.50% in the calculation sample (n = 69) stated that they use a project template when conducting a UCD project. Out of this subsample, the most frequent components of this plan are the user requirements (overall: 94.59%, n = 37, sample: 93.33%, n = 30) and the functional requirements (overall: 91.89%, sample: 93.33%). However, only half of the project template users indicated that they use a team mission statement (overall: 48.65%, sample: 50.00%), even though Loder (2013) and other UCD practitioners consider this a core component. Moreover, the UCD experts were questioned about the methods they are using during the design stage of the product development process. The percentages of entries are to be seen in Table 6.

In general, due to the high values in this table it can be stated that the methods which were deducted from UCD theory (chapter 2.1) are actually used in the daily business of UCD experts. The most consistently stated method used was the creation of prototypes (overall: 94.19%, n = 86, sample: 92.75%, n = 69). Almost every UCD expert surveyed in this study indicated that this method is used during the design stage. This is in line with the theoretical insights shown in chapter 2.1 as well as common procedures within the innovation process (e.g. Lilien et al. (2002)). Another widely accepted UCD method according to the sample is brainstorming (overall: 81.40%, sample: 81.16%) as well as the development of screen flow models (overall: 48.65%, sample: 50.00%). 80.23% (overall), respectively 79.71% (sample), of the UCD experts indicated that they are using usability testing during the design stage of the product development process. This high indication accords to the multitude of lit-
erature that especially focuses on this specific topic. Conducting market research and therefore using the “voice of the customer” (Griffin and Hauser (1993)) is only used by around 60% of the respondents. Given the emphasis these methods are given in the literature (see chapter 2), this might seem a little low.

In the overall sample, 80.2% \( (n_o=86) \) of the participants indicated that they test their design after having implemented it \( (\text{sample: } 79.7\%, \ n_s=69) \). The methods these persons are using in their respective companies and the way they are doing it are to be seen in Table 7. The percentages for the conducted methods were calculated as the share of entries in comparison to the valid cases \( (n_o=69, \ n_s=55) \) minus the number of entries in the “not conducted at all” -column. These values, respectively, refer to the share of entries in comparison to the valid cases.

It can be seen from the low indications at the “not conducted at all” -column that the most frequently used testing methods are open questions, in contrast to closed questions, allow for feedback on designs. These findings are also consistent with the insights by Ji and Yun (2006) and Vredenburg et al. (2002b). The market research instruments surveys and qualitative interviews that were already evaluated for the design stage are also relevant in the later stages of the process. Participatory design as method of user integration in the implementation stage (see chapter 2.1) does not seem to be much used by the respondents. Ethnographic observations seem to be the least common method for getting feedback on designs.

Examining the way of conducting the methods in terms of external stakeholder involvement, foreign usability consulting companies and universities or other academic institutions are hardly considered when testing developed design. Most of the testing methods stated were conducted by internal personnel or by a domestic usability consultancy.

<table>
<thead>
<tr>
<th>Method</th>
<th>Overall</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating Prototypes</td>
<td>94.19%</td>
<td>92.75%</td>
</tr>
<tr>
<td>Brainstorming for Design Concepts and Metaphors</td>
<td>82.56%</td>
<td>84.06%</td>
</tr>
<tr>
<td>Developing a Screen Flow and/or a Navigation Model</td>
<td>81.40%</td>
<td>81.16%</td>
</tr>
<tr>
<td>Usability Testing</td>
<td>80.23%</td>
<td>79.71%</td>
</tr>
<tr>
<td>Doing Walkthroughs of Design Concepts</td>
<td>66.28%</td>
<td>69.57%</td>
</tr>
<tr>
<td>Beginning Design with Paper and Pencil</td>
<td>66.28%</td>
<td>69.57%</td>
</tr>
<tr>
<td>Conducting Market Research (Surveys, Interviews)</td>
<td>60.47%</td>
<td>59.42%</td>
</tr>
<tr>
<td>Documenting Standards and Guidelines</td>
<td>51.16%</td>
<td>53.62%</td>
</tr>
<tr>
<td>Other</td>
<td>9.30%</td>
<td>11.59%</td>
</tr>
</tbody>
</table>

### 5.2. Facilitators and Obstacles for User-Centered Design

Open questions, in contrast to closed questions, allow for the respondents to present their unbiased opinion and are therefore relevant for the examination of psychological issues (Fantappi Albetti (2011), p. 54). In this study, the investigation of two aspects of the UCD process is of interest: the facilitators and obstacles that the UCD experts face in their daily business life. In total, 28 open comments concerning the facilitators and 82 comments concerning the obstacles were given in this survey. They have been analyzed by Mayring’s (Mayring (2008)) content analysis. The results of the analysis concerning the facilitators is to be seen in Table 8.

The UCD experts gave several hints concerning three major categories that were already used earlier in this study. One great facilitator of UCD activities are related to the organizational context. In particular, there were statements indicating that customer orientation (e.g. “h[ö]rversetzen in den User” meaning “putting oneself in the user’s position”) as well as Top Management Support (e.g. “Grundsätzliche Rückendeckung der Projektansätze durch das Management” meaning “general rear cover by the management”) enable UCD. In terms of the setup of UCD activities, the multidisciplinary team (e.g. “das [E]inbinden vieler [E]xperten aus unterschiedlichen [B]ereichen“ meaning “the integration of many experts from different domains”) was the key to success. Often, the effective teamwork, good team spirit, the competence in the field of UCD as well as a holistic view towards UCD was mentioned. When it comes to the actual process, there were three main categories found: the iterative approach of UCD (e.g. “Testing in an early phase and testing frequently”), the users and the methods used. On the one side, the users were claimed to create great input and being highly engaged (e.g. “Engagement der Kunden” meaning “the customers’engagement”), and, on the other side, the solution was then implemented immediately and in a flexible way (e.g. “schnelles Livegehen und inkrementelle Verbesserung basierend auf Nutzerfeedback” meaning “going live very quickly and incremental improvement based on user feedback”). The categorization of the open comments concerning the obstacles within the UCD process is to be seen in Table 9.

Similarly as with the facilitators, there were three main categories to be found in the open comments concerning the obstacles in the UCD process. In terms of the organizational context, three negative influencers could be identified. The UCD experts stated the lack of support from the top management team (e.g. “Ungünstig ausgewirkt hat sich der
Table 7: Methods Used for Testing & Feedback; Source: Own illustration

<table>
<thead>
<tr>
<th>Method</th>
<th>Conducted by internal personnel</th>
<th>Conducted by a domestic usability consulting company</th>
<th>Conducted by a foreign usability consulting company</th>
<th>Conducted by an university/academic institution</th>
<th>Not conducted at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveys</td>
<td>Overall: 69.39%</td>
<td>Sample: 70.00%</td>
<td>Overall: 44.90%</td>
<td>Sample: 42.50%</td>
<td>Overall: 28.99%</td>
</tr>
<tr>
<td>Qualitative Interviews</td>
<td></td>
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<td></td>
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<tr>
<td>Focus groups</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Task analyses &amp; observations</td>
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<tr>
<td>Heuristic evaluations</td>
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<tr>
<td>A/B testing</td>
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<td></td>
</tr>
<tr>
<td>Ethnographic observation</td>
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<td></td>
<td></td>
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<tr>
<td>Participatory design</td>
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</table>

mangelnde Rückhalt in der Unternehmensleitung.” meaning “there was a negative influence due to the lack of rear cover by the management”), the missing valence of UCD activities throughout the organization (e.g. “Akzeptanz innerhalb des Entwicklungsteams und der Produktverantwortlichen – Design ist hinterher schön anmalen, Pixelschubser. Aber UCD ist weit mehr als das. Es bedarf viel Aufklärung im Vorfeld.” meaning “acceptance within the developers’ team and the management. Design is nice afterwards, pushing pixels. But UCD is much more than that. There is a massive lack of education beforehand”) as well as some regulatory issues (e.g. “teilweise gesetzl. Vorschriften oder aber auch betriebliche” meaning “statutory provisions or in-house regulations as well”). The (multidisciplinary) team in the context of the UCD setup was often stated in a positive manner as shown above. However, it seems that it can also be the main obstacle for UCD activities. The respondents mentioned lack of employee morale, vanities that impaired the processes, coordination problems between the team members as well as other stakeholders and the lack of UCD competence. When it comes to UCD processes, three main categories could be identified in the open comments. Many respondents stated the lack of project management and therefore no formal project plans (e.g. “getting the right users and having time to get stakeholders involved and understanding the goals of project as well as limitations so that they may give valuable input. To me this is why it is key to have a product manager and uxd role closely involve with product so this knowledge is centrally understood and thus most key criteria can be studied for test while involving stakeholders mainly for a buy in requirement”). This comment also shows two other obstacles which are related to the users and the methods. The respondents frequently indicated problems with the recruitment of an adequate user sample and the quality of the test outcome. Moreover, time and budget constraints as well as lacking flexibility for the implementation of design solutions were mentioned as further obstacles. These findings are in line with the ones Gulliksen et al. (2006) encountered among Swedish usability professionals.

It can be seen from the open comments concerning the facilitators and obstacles within the UCD process that the organizational context, the UCD setup and process feature components that are critical to the success of a project – in a positive or negative way. In that manner, the top management team can have a major positive or negative influence on the success of UCD projects. Similarly, the multidisciplinary UCD team as proposed by the guidelines established in chapter 2.1.3 is a key factor to success or failure.

5.3. Descriptive Results of Dependent and Independent Variables

In chapter 5.1 the descriptive results concerning the state-of-the-art of UCD in Germany were shown and the theoretically derived nature and characteristics of UCD were refined. Speaking in terms of the research model (see chapter 3), the middle (blue) part of the model has mainly been discussed. Further, it is of interest to test the hypotheses proposed in chapter 3.2. This will be done below. First, the goodness of the used constructs will be presented. As a next step, the descriptive values of these core constructs will be shown.

5.3.1. Goodness of Constructs

To grant reliability and evaluate the quality of the multi-item constructs used in this thesis, their goodness was tested. Table 10 summarizes the results of the conducted reliability and confirmatory factor analyses.
Table 8: Facilitators of the User-Centered Design Process; Source: Own illustration

<table>
<thead>
<tr>
<th>Facilitators</th>
<th>Organizational Context</th>
<th>UCD Setup</th>
<th>UCD Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Orientation</td>
<td>Top Management Team</td>
<td>(Multidisciplinary) Team</td>
<td>Iterative Approach</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Users</td>
</tr>
<tr>
<td>Effective Team Work</td>
<td></td>
<td></td>
<td>Methods</td>
</tr>
<tr>
<td>Team Spirit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UCD Competence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holistic View</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great Input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Engagement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Responsiveness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstacles</td>
<td>UCD Process</td>
<td>UCD Setup</td>
<td>Problem Management Team</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>-----------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Lack of</td>
<td>Time</td>
<td>Budget</td>
</tr>
<tr>
<td>Instruments</td>
<td>Standards</td>
<td>Users</td>
<td>Methods</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9: Obstacles of the User-Centered Design Process. Source: Own illustration.
As described earlier, seven constructs were used to test the hypotheses of this study. IT Competence, UCD Competence, Customer Orientation, Innovativeness, the Top Management Team and the Project Success were computed by calculating the mean scores of the validated (see chapter 5.2.1) items. In line with (Lubatkin et al. (2006), p. 656) who reviewed several methods of computing ambidexterity out of exploration and exploitation, the “additive” approach was followed. Therefore, the values for Exploration and Exploitation were added into the construct Ambidexterity.

The descriptive statistics, i.e. the number of valid observations, the mean, the standard deviation as well as the minimum and maximum, of the relevant constructs are shown in Table 11.

Also, the correlations of the constructs are of interest which are to be seen in Table 12.

The correlations between the constructs which are used as independent variables are highly significant and can be considered strongly related according to Cohen (1988).

5.4. Comparison between ‘Winners’ and ‘Losers’

To further investigate on the success of UCD, the sample was split in two halves according to the respective score in project success \( n = 52, M = 5.35, MD = 5.36 \). The resulting subsample with the observations that showed a score lower than \( M = 5.35 \) for the overall success \( (= \text{‘Losers’}) \) as well as the other subsample with success scores higher or equal to \( M = 5.35 \) \( (= \text{‘Winners’}) \) contained 26 observations each.

Concerning the motives of conducting UCD a t-test was conducted. The results of the test is to be seen in Table 13.\(^{24}\)

Significant differences between the winners and the losers were found for improved quality, enhanced customer satisfaction and relationship, increased user productivity and participation in decision-making as well as generation of innovative ideas and reduced training costs. For all those motives higher mean values were calculated. Therefore, it can be stated that the focus of the winners lays on other key issues that seem to be beneficial for the project outcome.

In addition, crosstabs and the corresponding \( \chi^2 \) were calculated to find out about significant differences between the winners and the losers in terms of user types involved in the product development process and the methods used. Table

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\(^{24}\) For SPSS outputs please see Appendix 7.
Table 11: Descriptive Statistics of the Constructs; Source: Own illustration

<table>
<thead>
<tr>
<th>Construct</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT Competence</td>
<td>40</td>
<td>2</td>
<td>7</td>
<td>5.1</td>
<td>1.26</td>
</tr>
<tr>
<td>UCD Competence</td>
<td>57</td>
<td>1.29</td>
<td>7</td>
<td>4.17</td>
<td>1.49</td>
</tr>
<tr>
<td>Customer Orientation</td>
<td>51</td>
<td>1.75</td>
<td>6.63</td>
<td>5.11</td>
<td>1.07</td>
</tr>
<tr>
<td>Innovativeness</td>
<td>62</td>
<td>1.5</td>
<td>7</td>
<td>4.31</td>
<td>1.36</td>
</tr>
<tr>
<td>Ambidexterity</td>
<td>59</td>
<td>5</td>
<td>13.83</td>
<td>9.97</td>
<td>2.19</td>
</tr>
<tr>
<td>Top Management Team</td>
<td>65</td>
<td>1.67</td>
<td>7</td>
<td>4.73</td>
<td>1.38</td>
</tr>
<tr>
<td>Project Success</td>
<td>52</td>
<td>3.29</td>
<td>6.57</td>
<td>5.35</td>
<td>0.72</td>
</tr>
</tbody>
</table>

Table 12: Correlations of the Constructs; Source: Own illustration; * Correlation is significant at the 0.05 level. ** Correlation is significant at the 0.01 level

Table 13: Results of T-Test Concerning UCD Motives (Winners vs. Losers); Source: Own illustration. * p<0.1. ** p<0.05. *** p<0.01

14 shows the summary of the crosstabs concerning the different user types. The percentages are related to the share of entries compared to the number of observations minus the entries for no user integration at the respective stage. Hardly any significant differences between the two subsamples could be found. However, it is interesting to see that the more successful group states that they do not integrate any users at the deployment stage significantly more often than the less successful group. Also for the implementation stage, the winners indicated that they do not involve users at all (winners: 44.44%, n_w=26, loser: 18.18%, n_l=26). Other than that it is to be seen from the table that the winners almost always have higher indications in terms of different user integration along the development process. Especially inter-
Table 14: User Integration along the Development Process (Winners vs. Losers); Source: Own illustration, *p<0.1, **p<0.05

<table>
<thead>
<tr>
<th></th>
<th>Analysis</th>
<th>Design</th>
<th>Implementation</th>
<th>Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Winner</td>
<td>Loser</td>
<td>Sig?</td>
<td>Winner</td>
</tr>
<tr>
<td>Non-Users</td>
<td>64.00%</td>
<td>60.00%</td>
<td>No</td>
<td>38.46%</td>
</tr>
<tr>
<td>Light Users</td>
<td>68.00%</td>
<td>60.00%</td>
<td>No</td>
<td>61.54%</td>
</tr>
<tr>
<td>Heavy Users</td>
<td>80.00%</td>
<td>76.00%</td>
<td>No</td>
<td>84.62%</td>
</tr>
<tr>
<td>Expert Users</td>
<td>68.00%</td>
<td>76.00%</td>
<td>No</td>
<td>61.54%</td>
</tr>
<tr>
<td>Lead Users</td>
<td>56.00%</td>
<td>48.00%</td>
<td>No</td>
<td>69.23%</td>
</tr>
<tr>
<td>Current Customers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light Users</td>
<td>72.00%</td>
<td>64.00%</td>
<td>No</td>
<td>73.08%</td>
</tr>
<tr>
<td>Potential Customers</td>
<td>80.00%</td>
<td>68.00%</td>
<td>No</td>
<td>69.23%</td>
</tr>
<tr>
<td>No User/ Customer Integration</td>
<td>3.85%</td>
<td>3.85%</td>
<td>No</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

Testing to see is that the integration of current customers is significantly higher in the design stage for the winners (73.08%) in comparison to the losers (52.00%). Moreover, the winners seem to have higher user involvement during the analysis stage, whereas the losers show more user involvement in the design stage. This might be due to the winners’ focus on analyzing the needs and requirements of the users beforehand and then building up on this knowledge. Concerning the conducted methods with respect to their stakeholders involved only two significant differences between the winners and losers could be found: the winners internally conduct card sorting more often (winners: 64.29%, n_w=23, losers: 42.86%, n_l=20) and losers tend to not conduct card sorting at all (winners: 39.13%, losers: 66.00%). This could be an indicator for the effectiveness of card sorting. The results of the crosstabs and the evaluation of significance according to the $\chi^2$ statistic are summarized in Table 15.

Most of the methods seem to be conducted by internal personnel. Among very common methods for the winners are qualitative interviews, task analyses and surveys. Moreover, the winners tend to involve domestic usability consulting companies more often than the losers. Foreign consultancies as well as academic institutions seem not to have such a big relevance for the winners. The losers, however, tend to work with foreign companies. This might affect the project success insofar as communication gaps and other obstacles have to be overcome before the cooperation can be facilitated.

Even if the analyses do not all show significant results, the tendencies between the approaches of winners and losers are obvious.

5.5. Hypotheses Testing

To test hypotheses H1a through H5, a multiple regression analysis was conducted. The model to be tested is as follows:

$$\text{Project success} = \beta_1 \times \text{IT Competence} + \beta_2 \times \text{UCD Competence} + \beta_3 \times \text{Customer Orientation} + \beta_4 \times \text{Innovativeness} + \beta_5 \times \text{Ambidexterity} + \beta_6 \times \text{Top Management Team}$$

Only 29 observations could have been used for the analysis. The model fit can be considered satisfactory since the $R^2$ is 0.352 which lays above the value of 0.30 which is common for cross-sectional research (Sarstedt and Mooi (2014), p. 226). This value is also in line with Table 3 which showed the minimum $R^2$ values to be expected given a statistical power of 0.80 and a sample size between 20 and 50. However, the F-test for the regression model was not significant on a $\alpha=5\%$ level.

In terms of the tested hypotheses, the regression coefficients and their respective significance were examined. The summary of these findings as well as the number of valid observation (n), the mean (M) and the standard deviation (SD) are presented in Table 16.

As to be seen from this table none of the proposed hypotheses could have been confirmed. The only significant outcome indicates a negative relationship between IT competence and project outcome. Also innovativeness seems to have a negative impact on the success of a UCD project. A slight positive impact can be suggested from the values for IT competence.
Table 15: Methods Used for Feedback & Testing (Winners vs. Losers); Source: Own illustration, * p < 0.1

<table>
<thead>
<tr>
<th>Method</th>
<th>Winners</th>
<th>Losers</th>
<th>Sig?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveys</td>
<td>61.11%</td>
<td>80.00%</td>
<td>No</td>
</tr>
<tr>
<td>Qualitative Interviews</td>
<td>65.00%</td>
<td>75.00%</td>
<td>No</td>
</tr>
<tr>
<td>Focus groups</td>
<td>56.25%</td>
<td>63.64%</td>
<td>No</td>
</tr>
<tr>
<td>Task analyses &amp; observations</td>
<td>83.33%</td>
<td>78.57%</td>
<td>No</td>
</tr>
<tr>
<td>Heuristic evaluations</td>
<td>53.85%</td>
<td>81.82%</td>
<td>No</td>
</tr>
<tr>
<td>Card sorting/A/B testing</td>
<td>64.29%</td>
<td>42.86%</td>
<td>Yes*</td>
</tr>
<tr>
<td>Ethnographic observation</td>
<td>80.00%</td>
<td>50.00%</td>
<td>No</td>
</tr>
<tr>
<td>Participatory design</td>
<td>83.33%</td>
<td>50.00%</td>
<td>No</td>
</tr>
</tbody>
</table>

N. Chochoiek / Junior Management Science 2(1), 2017, 81-116
The subsequent evaluation of the state-of-the-art of UCD in scope of this thesis indicated the relevance of the concept. Also adding the exploration-exploitation framework (March theory added weight to UCD from a theoretical point of view. Of benefits for customers and companies in organizational user integration approach which is heavily discussed in terms parallels in both, argumentation line and characteristics. The concept of UCD gave important insights into the characteristics linked to the mainly practice-oriented concept by showing the relevance of the concept. The subsequent evaluation of the state-of-the-art of UCD in the UCD competence, customer orientation, ambidexterity and the top management team. However, the absolute values of the respective regression coefficient are very small so that there cannot be made any valid statement about the effects of the tested constructs. This might be due to the very small sample size. In addition, the linear relationship between the dependent and independent variables could not have been confirmed from the scatter plots. Other approaches to conduct the regression analysis, e.g. considering the independent variables stepwise and building blocks of highly correlated constructs such as IT and UCD competence, all yielded lower values for the $R^2$ as well as the adjusted $R^2$ and are therefore considered inferior to the model described above.

### 6. Discussion

#### 6.1. Summary of the Findings

There were two main aspects that were aimed by this study. One: the nature of UCD was to be specified and validated by an empirical investigation among UCD experts in Germany. And two: several hypotheses concerning the relationship between the organizational background and the project success that UCD is being conducted in were derived from theory and tested empirically.

The literature overview (chapter 2) to redefine the concept of UCD gave important insights into the characteristics of this concept, the recommended methods to be used and critical principles to be followed. This synopsis painted a vivid picture of the approach often described as “fuzzy” (e.g. Gulliksen et al. (2006)). Moreover, relationships to two research streams in the field of management could have been linked to the mainly practice-oriented concept by showing parallels in both, argumentation line and characteristics. The user integration approach which is heavily discussed in terms of benefits for customers and companies in organizational theory added weight to UCD from a theoretical point of view. Also adding the exploration-exploitation framework (March (1991)) and its organizational adaptation to the discussion scope of this thesis indicated the relevance of the concept. The subsequent evaluation of the state-of-the-art of UCD in Germany yielded many interesting results. Concerning the motives of why to actually follow the UCD approach, the majority of people indicated that system quality should be enhanced and costly features that are not necessary should be avoided. Moreover, the customer satisfaction and acceptance of the system should be increased. Therefore, the benefits for the users but also for the companies are focused which is in line with the theoretically founded argumentation. Also, when it comes to KPIs used to measure the effect of UCD in the respective companies it can be stated that this approach is followed. On the one hand, the user satisfaction and the retention are being measured. On the other hand, the conversion rate, a rather factual mean, is taken into consideration.

A very important principle of UCD is the employment of a multidisciplinary team. The data from the survey indicates that this guideline is being followed in praxis. Most of the respondents stated that they are working in such a UCD team across different departments. Areas covered within the team are mainly Design, IT and Marketing. Another category for the UCD setup was found by the analysis of the open comments concerning the “other” category. Many respondents indicated that they consider UCD an integral part of their work. This was applicable for persons working in Marketing and Market Research as much as for persons working in a more IT related department. As to be seen in the analysis of the open comments concerning the obstacles and facilitators of UCD activities, the multidisciplinary team is a crucial determinant to project success. Either the respondents emphasize the perfect teamwork and the high UCD competence from different points of view which is very beneficial to the project outcome or the UCD experts indicate that communication problems between the different stakeholders and the vanities of the team members spoil the success.

Also the top management team seems to be a very important factor toward UCD projects’ outcome. Receiving support and therefore credibility and weight in the overall organization is stated to be a major facilitator. However, mirrored conclusions can be drawn on the obstacles view: the lack of UCD competence on the side of the top management team as well as the lack of their support can evoke motivational as well as qualitative drawbacks to the UCD success.

Concerning the UCD process, time and budget restraints have also been mentioned as major problems. This is in line with the findings of McCoy (2002) stating that usabil-

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Table 16: Summary of Hypotheses Testing; Source: Own illustration, * p<0.1

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>Regression Coefficient</th>
<th>Significance</th>
<th>Support of Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>IT Competence</td>
<td>29</td>
<td>5.06</td>
<td>1.24</td>
<td>-0.35</td>
<td>Yes*</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>1b</td>
<td>UCD Competence</td>
<td>29</td>
<td>4.36</td>
<td>1.44</td>
<td>0.2</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Project</td>
<td>Customer Orientation</td>
<td>29</td>
<td>5.09</td>
<td>1.01</td>
<td>0.19</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Success</td>
<td>Innovativeness</td>
<td>29</td>
<td>4.28</td>
<td>1.07</td>
<td>-0.04</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Success</td>
<td>Ambidexterity</td>
<td>29</td>
<td>9.91</td>
<td>2.04</td>
<td>0.14</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>Top Management Team</td>
<td>29</td>
<td>4.59</td>
<td>1.43</td>
<td>0.1</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

27 For scatter plots please see Appendix 9.

28 For SPSS outputs concerning alternatively conducted regression analyses please see Appendix 10.
ity and user involvement are typically among the first items in a project which are to be abandoned if time gets tight.

The user integration basically happens at every stage of the product development process. Only during the implementation stage are there a high amount of entries showing no user integration at all. Mostly light, heavy and expert users are being involved during the analysis, design and deployment stage. However, the statements in the open comments concerning facilitators and obstacles of UCD activities indicate that UCD experts often have a hard time finding the right target group so that the quality of the outcomes lacks representativeness.

Most of the theoretically suggested methods are actually widely spread among the UCD professionals. During the analysis stage of the development process prototypes, usability testing as well as brainstorming and the use of screen-flow models are most prevalent. However, only about half of the UCD experts stated that they are documenting standards and principles as theory heavily suggested. This is interesting because in the open comments concerning the obstacles it was stated that the lack of project management hinders effective UCD work. Project templates as well as documenting standards and guidelines could be a good step in the right direction to solve this problem.

When it comes to the methods used during the implementation and deployment stage of the process, a high usage of the theoretically derived methods can be observed. The majority of them are yet rather exploitative and consult the user concerning their needs instead of also actively involving them according to the proposal of user innovation by von von Hippel (1978a). The “voice of the customer” is taken into consideration by means of qualitative and quantitative surveys as well as task analyses. Moreover, the integration by participatory design is rather low which is in line with the finding that the customer integration at the implementation stage is not as common as in the other stages.

In the study, the locus of the method usage was assessed, too. Overall, the majority of feedback and testing methods is conducted by internal personnel of the respective firm. However, also the support of domestic usability consulting companies is relatively common for the UCD experts. Foreign consultancies and academic institutions do not seem to be very relevant in this context.

When comparing the winners and the losers in terms of project success it can be seen that there are differences for the UCD motives, the user integration and the methods used. Even if not all of these findings are statistically significant, a tendency can be observed. In particular, the winners emphasize improved quality, the enhanced customer satisfaction and relationship, the increased user productivity and the participation in decision-making as well as the generation of innovative ideas and reduced training costs. Also in terms of the types of users involved, interesting insights were gained. The winners seem to integrate the users less often in the implementation and deployment stage than the losers. This could implicate that for successfully conducting UCD the involvement in the earlier stages of the process like analysis and design are more important than in the later ones. As several reviewed guidelines and standards indicate, it is essential to know the user (see chapter 2.1). This is in line with the high amount of entries in the analysis stage. However, other principles state that the user should be involved iteratively throughout the design and development process. These seemingly contradictory outcome could be explained by their quality. Supposing that the winners conduct much user research and foster involvement with great success in the early stages so that they can build upon to something, it makes sense that the level of involvement is less in the later stages. The losers on the other hand might try to fix problems that have not been identified in the early stages and have to deal with them along the process. The higher levels of user integration could be due to the attempt to fix these problems later on. In terms of stakeholder involvement, the winners more often involve domestic consultancies whereas losers show higher entries for foreign consulting companies. This might indicate that the focus on local, external knowledge is beneficial for the project outcome.

The hypotheses concerning the positive influence of several aspects of the organizational context of UCD activities towards a holistic construct of project success were derived from theory and tested by a regression model. Even if the theory taken into consideration indicated positive influences of IT and UCD competence, customer orientation, innovativeness, ambidexterity and the top management team toward the project success, no statistically significant support for the hypotheses could have been found. However, as the relationship of the organizational context towards project success is in line with the argumentation in prior research also concerning the influence towards firm performance this thesis has made valid assumptions that should stimulate further investigations.

6.2. Theoretical Implications

This study has given an extensive and holistic overview of the characteristics and methods concerning UCD by reviewing relevant theoretical and practical literature concerning this concept. So far, this was not done in such a compact, yet comprehensive way before. It can be used as a basic framework for praxis and theory in the future.

To the knowledge of the author of this thesis, there is no other study available that links the widely applied concept of UCD to organizational theory. Since the world we are living in is becoming more and more digital and also the work places are taking course towards IT dominated structures, it is important to bridge the gap between these very important disciplines. Building on the intensively discussed, tested and validated concepts of user integration and exploration-exploitation, UCD research should be considered another facet to these fields. Therefore, this study could give inspiration to other researchers who have so far only considered their respective field of research. This way, scholars who are concerned with the possibilities to implement ambidexterity should e.g. extend their research scope.
in terms of multidisciplinary UCD teams and also the involvement of external consultancies. In line with this, the impact of distributed innovation on incumbents as proposed by (O’Reilly and Tushman (2013), p. 333) can be further explored. Moreover, the dependent and independent variables have not been used and evaluated in the way this thesis suggests so far. Several scholars have examined the influence of the single aspects of the organizational context but no one has related them to the concept of UCD and proposed empirically testable relationships.

6.3. Managerial Implications

The analysis of the open comments concerning the facilitators and obstacles in the UCD process (chapter 5.1.3) and the theoretical deliberations concerning ambidexterity (chapter 2.3) have especially granted important insight for management. First of all, as the top management team has a major influence on the setup and the acceptance of UCD within the company, it is necessary for senior managers to acquire at least a minimal understanding of the concept, nature and importance of UCD. If managers underestimate the impact of UCD activities so that the outcomes will not reach the quality level they deserve and the implementation of these insights are only followed half-heartedly they will miss out on major performance increases and the company might not survive in the long run. Since innovation does not only occur on a large scale but also through seemingly minor improvements in which existing technologies or components are integrated to dramatically enhance performance of existing products or services (Henderson and Clark (1990)), managers must enable their respective company to yield incremental, as well as non-incremental, innovation by user integration. The management must provide sufficient resources in terms of budget, time and usability professionals (Gulliksen et al. (2006)). Nielsen (2008) suggests that an investment of 10% of the project budget into UCD is required which will in turn yield over 83%. It might also be necessary to further develop the KPIs that UCD activities are measured in. Due to the insights from the empirical study it seems that the existing KPIs are either not applicable in an UCD context or that the managers do not attach the required value to the measures of customer satisfaction and retention.

Another crucial factor which can be influenced from a managerial perspective is the multidisciplinary team. In line with Tushman and O’Reilly (1996), respectively (O’Reilly and Tushman (2008), O’Reilly and Tushman (2013)), the senior management is responsible for facilitating the pursuit of both exploration and exploitation across the firm. Therefore, the top management team needs to find a way to enable effective teamwork between team members with different origins and expertise. Moreover, they have to either function as project managers or employ someone who will take that role. Standards and guidelines have to be documented so that the UCD teams do not have to struggle with process-related issues and rather be able to focus on the actual conduct of UCD methods and analyzing and implementing the resulting insights.

6.4. Limitations and Implications for Future Research

This study related important concepts of organizational theory with the praxis-oriented concept of UCD and gave important insight into the state-of-the-art of this approach in Germany. However, there are some limitations to be mentioned. Due to limited time and resources, only 29 observations could have been used for the evaluation of the proposed hypotheses. As a proposal for further research, bigger incentives, for example, could be offered so that more UCD experts can be recruited and the hypotheses could be tested in a more reliable and valid setup. Furthermore, a bigger sample across different regions and different industries could be examined to find out about significant differences between the respective groups (e.g. Lubatkin et al. (2006)).

Future research could also be concerned with finding another way of testing the proposed hypothesis. Since they do make sense from a theoretical and logical point of view but do not yield any significant effects, another method might be more applicable in this context. In terms of the research model, other approaches considering possible interaction effects between the independent variables should be further examined.

The insights from this study were collected by a quantitative approach which makes sense for the validation of the theoretically derived characteristics of the UCD concept and to test the hypotheses. However, the insights from the two open questions in the survey yielded observations which are very rich in content. This leads to the assumption that further qualitative research, e.g. concerning the processes and the team work during the product development, could be better understood that way. This would also be a beneficial approach to better carve out the iterative aspects of the UCD concept.

Moreover, this thesis made pioneer efforts in finding a holistic measure of UCD project success. However, due to the scope of the theoretical background, other important factors could have been missed. Therefore, future research could further develop and evaluate this measure with respect to other important disciplines of research.
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Homburg, C. and Giering, A. Konzeptualisierung und Operationalisierung
Kognitive Verzerrungen im strategischen Entscheidungsprozess

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Abstract


Keywords: Strategisches Entscheidungsverhalten, Kognitive Verzerrung, Kognitiver Bias, Behavioral Strategy, Strategisches Management

1. Einleitung

Strategische Entscheidungen determinieren die grundlegende Ausrichtung eines Unternehmens und sind damit von elementarer Bedeutung für dessen langfristigen Erfolg. Dementsprechend umfangreich fällt die Forschung zu den Prozessen aus, durch die strategische Entscheidungen getroffen werden. Im Laufe der Jahrzehnte ist eine nahezu unüberschaubare Anzahl von Modellen zur Erklärung strategischer Entscheidungsprozesse entstanden. Dabei hat insbesondere das Paradigma des rationalen Entscheidungsträgers zentrale Bedeutung erlangt. Allerdings lassen sich wesentliche Aspekte von Entscheidungsprozessen durch diesen Ansatz nicht erklären. Tatsächlich beobachtete Entscheidungen weichen mitunter fundamental von dem ab, was die normative Entscheidungstheorie erwarten ließe. Einen wesentlichen Faktor, der zur Erklärung dieser Abweichungen beitragen kann, stellen kognitive Verzerrungen dar.

1.1. Problemdarstellung

In der ökonomischen Theorie sind Entscheidungsträger vollkommen informierte Individuen, die sich stets nutzenmaximierend verhalten. Diese Annahme vollkommener Rationalität wurde bereits in frühen Arbeiten zu Entscheidungsprozessen infrage gestellt. Tatsächlich ist die kognitive Kapazität von Entscheidungsträgern begrenzt: Sie sind nicht

6Vgl. Eisenhardt und Zbaracki (1992), S. 17.

DOI: http://dx.doi.org/10.5282/jums/v2i1pp117-135
dazu in der Lage, simultan alle relevanten Informationen zu berücksichtigen und auszuwerten.\textsuperscript{1} Angesichts der hohen Komplexität und Unsicherheit strategischer Entscheidungen sind sie auf Heuristiken angewiesen, welche die Komplexität der Entscheidungssituation reduzieren.\textsuperscript{2} Während Heuristiken im Allgemeinen hilfreich sind, können sie in manchen Fällen zu schweren und systematischen Fehlern führen.\textsuperscript{3} Aus der Anwendung von Heuristiken resultieren dann kognitive Verzerrungen (Cognitive Biases), die das Entscheidungsverhalten signifikant beeinflussen und zu falschen strategischen Entscheidungen führen können.\textsuperscript{4} Um zu verstehen, wie Entscheidungsträger strategische Probleme verstehen und lösen, ist es daher essentiell, die Auswirkungen von kognitiven Verzerrungen auf den strategischen Entscheidungsprozess (SEP) zu berücksichtigen.\textsuperscript{5} Ein besseres Verständnis dieser Auswirkungen kann dazu beitragen, die Qualität strategischer Entscheidungen zu verbessern und dadurch den langfristigen Erfolg des Unternehmens zu sichern.\textsuperscript{6}

1.2. Ziel der Arbeit und Gang der Untersuchung

Die vorliegende Arbeit soll einen Überblick über die Erkenntnisse der Managementforschung zum Einfluss kognitiver Verzerrungen auf den SEP geben. Die zentrale Fragestellung dieser Arbeit lautet demnach:

„Welche kognitiven Verzerrungen treten im Kontext strategischer Entscheidungen auf und welche Auswirkungen haben diese auf den SEP?“


Im Anschluss wird in Teil 3 die dieser Arbeit zugrundeliegende Methodik vorgestellt. Um die umfangreiche Literaturbasis bestmöglich zu bearbeiten und die Ergebnisse gleichzeitig nachvollziehbar werden zu lassen, wird dabei besonderes Augenmerk auf ein systematisches und objektives Vorgehen gelegt. Nach einer detaillierten Erläuterung der Vorgehensweise erfolgt eine kurze Zusammenfassung der Ergebnisse der Literatursuche.


2. Der strategische Entscheidungsprozess

Der nachfolgende Abschnitt soll einen Überblick über die umfangreiche Literatur zum SEP geben. Dazu erfolgt zunächst eine Charakterisierung wesentlicher Merkmale strategischer Entscheidungen. Darauf aufbauend wird eine Typologie eingeführt, anhand derer sich die zahlreichen Modelle des SEP differenzieren lassen (Kapitel 2.1). Im Anschluss wird ein einflussreiches Modell des SEP vorgestellt, das in abstrahierter Form die Grundstruktur des Hauptteils dieser Arbeit bildet (Kapitel 2.2).

2.1. Theoretischer Hintergrund und Überblick

Strategische Entscheidungen bestimmen die grundsätzliche Ausrichtung eines Unternehmens.\textsuperscript{7} Sie sollen den langfristigen Erfolg des Unternehmens sichern und beinhalten damit unweigerlich die Antizipation unsicherer Ereignisse.\textsuperscript{8} Typische strategische Entscheidungen sind beispielsweise die Einführung eines neuen Produktes, die Akquisition eines Unternehmens oder die Schließung einer Niederlassung.\textsuperscript{9} Typische strategische Entscheidungen sind beispielsweise die Einführung eines neuen Produktes, die Akquisition eines Unternehmens oder die Schließung einer Niederlassung.\textsuperscript{10}

Der Begriff des SEP beschreibt darauf aufbauend den Prozess, durch den die oberste Führungsebene eines Unternehmens derartige Entscheidungen trifft.\textsuperscript{11} Dieser Prozess ist in hohem Maße unstrukturiert; es existieren keine vorgefertigten Abläufe zur Bewältigung der Entscheidung. Der SEP ist somit gekennzeichnet durch Neuartigkeit, Komplexität und

\textsuperscript{Vgl. Eisenhardt und Zbaracki (1992), S. 17.}
\textsuperscript{12}Vgl. Hungenberg (2014), S. 4.
\textsuperscript{13}Vgl. Butler et al. (1989), S. 374.
\textsuperscript{14}Vgl. Das und Teng (1999), S. 757.
\textsuperscript{17}Vgl. Butler et al. (1989), S. 374.
\textsuperscript{21}Vgl. Barnes (1984), S. 129.
\textsuperscript{22}Vgl. Schwenk (1984), S. 42.
Unbestimmtheit. Die Entscheidungsträger verfügen zu Be- ginn meist über ein allenfalls rudimentäres Verständnis der Situation und den Weg zu einer möglichen Lösung. Erst durch einen langwierigen und komplizierten Prozess kommt letztendlich eine Entscheidung zustande.\textsuperscript{16}

Die Qualität strategischer Entscheidungen kann aus- schlaggebend sein für die Profitabilität und sogar für das Überleben eines Unternehmens.\textsuperscript{19} Die Forschung zum SEP bekommt dadurch eine hohe praktische Relevanz: Sie kann die Effektivität strategischer Entscheidungen verbessern und somit einen wichtigen Beitrag zum langfristigen Erfolg ei- nes Unternehmens leisten. Zudem kann sie Aufschluss darüber geben, warum Unternehmen unterschiedlich erfolgreich sind.\textsuperscript{20}

2.1.1. Modelle des strategischen Entscheidungsprozesses

In der Literatur existiert eine Vielzahl an Modellen, die den SEP beschreiben und die jeweils unterschiedliche Schwerpunkte setzen. Ein Großteil dieser Modelle lässt sich entlang eines Kontinuums zwischen sequentiellen, strukturierten Prozessen an einem Extrem und anarchischen Prozessen am anderen Extrem darstellen.\textsuperscript{21}

(a) Sequentielle Modelle


(b) Anarchische Modelle

Kritiker dieser rationalen Modelle führen an, dass diese der Komplexität, Ambiguität und Instabilität realer Entscheidungssituationen nicht gerecht werden.\textsuperscript{27} Sie beschreiben organisationale Entscheidungen als soziale Prozesse, die mitunter auch stark von politischen Aspekten geprägt sind. Diese Modelle entfernen sich unterschiedlich stark vom Ansatz der rationalen Modelle. Am weitesten entfernt und damit am anderen Extrem des Kontinuums ist das Garbage Can-Modell von Cohen et al.\textsuperscript{28} Es beschreibt Organisationen als organisierte Anarchien, in denen sich vier weitestgehend unabhängige Strömte wiederfinden: Probleme, die um Aufmerksamkeit konkurrieren; Lösungen, die nach Problemen suchen; Teilnehmer, die in den Entscheidungsprozess einund austreten; und Entscheidungsgelegenheiten, in denen Organisationen ein Entscheidungsverhalten zeigen müssen. Entscheidungen sind demnach vielmehr das Produkt eines zufälligen Zusammentreffens dieser Ströme als das Ergebnis eines rationalen und strukturierten Prozesses.\textsuperscript{29}

(c) Weitere Modelle

Ein Großteil der Literatur zu organisationalen Entscheidungsprozessen lässt sich im Bereich zwischen den beiden Extremen ansiedeln. So vereinen einige Autoren in ihren Modellen sowohl sequentielle als auch anarchische Elemente des Entscheidungsprozesses. Andere entwickeln Typologien, die verschiedene Modi von Entscheidungsprozessen identifizieren.\textsuperscript{30} So finden sich nach einer Kategorisierung von Das und Teng zwischen den dargestellten Extremen Rational Mode und Gargage Can Mode die Modi Avoidance Mode, Logical Incrementaliste Mode und Political Mode.\textsuperscript{31}

2.2. Darstellung des verwendeten Modells

Die Darstellung der Erkenntnisse zu kognitiven Verzerrungen im Kontext strategischer Entscheidungen in Teil 4 erfolgt entlang eines idealtypischen Modells des SEP. Dabei handelt es sich um eine abstrahierte Variante des von Mintzberg et al. entwickelten Entscheidungsmodells.\textsuperscript{32} Dieses kann als Mittelweg zwischen den beiden Extremen des rationalen und des anarchischen Modus gesehen werden. Es verwendet einen sequentiellen Prozess als Grundlage, integriert aber gleichzeitig verschiedene dynamische Faktoren wie externe Unterbrechungen und unternehmenspolitische Einfüsse und trägt damit auch den chaotischen Elementen des Garbage Can-Modells Rechnung.\textsuperscript{33}

Ausschlaggebend für die Verwendung dieses Modells waren drei zentrale Faktoren: Erstens ermöglicht es durch die Beibehaltung der sequentiellen Grundstruktur eine über- sichtliche Darstellung der für die jeweiligen Phasen relevanten kognitiven Verzerrungen. Ein eher unstrukturiertes oder gar anarchisches Modell des SEP würde die Übersichtlichkeit stark beeinträchtigen. Zweitens finden rationale Modelle...
eine stärkere empirische Bestätigung als anarchische Modelle.\textsuperscript{34}

Drittens haben die Erkenntnisse von Mintzberg et al. einen starken Einfluss auf die Managementforschung gehabt.\textsuperscript{35} Auch Modelle aktueller Lehrbücher zeigen große Ähnlichkeiten zu diesen Erkenntnissen oder bauen sogar explizit darauf auf.\textsuperscript{56}

2.2.1. Phasen des strategischen Entscheidungsprozesses

Nach Mintzberg et al. besteht der SEP aus den drei Phasen \textit{Identification, Development} und \textit{Selection}. Dabei ist heranzuziehen, dass die einzelnen Phasen zwar voneinander abgegrenzt werden können, sie aber keineswegs stetig und ungestört durchlaufen werden. Es handelt sich vielmehr um einen dynamischen Prozess, der von Unterbrechungen, Verzögerungen und anderen Faktoren beeinflusst wird. Anstatt linear von einer Phase zur anderen fortzuschreiten, wechseln Entscheidungsträger daher häufig zwischen den einzelnen Phasen vor und zurück.\textsuperscript{37}

\textbf{(a) Problemidentifikation (Identification)}

Die Identifikationsphase beginnt mit der Wahrnehmung einer Entscheidungssituation (\textit{Decision Recognition Routine}). Diese manifestiert sich in einer Abweichung der gegenwärtigen Situation von einem erwarteten Standard. In den meisten Fällen muss diese Abweichung vom Entscheidungsträger aktiv aus einer Menge an mehrdeutigen Informationen identifiziert werden.\textsuperscript{38}

Nachdem der Handlungsbedarf erkannt und der Entscheidungsprozess initiiert wurde, erfolgt die Analyse der Entscheidungssituation (\textit{Diagnosis Routine}). Der Entscheidungsträger muss ein Verständnis für die neuartige Situation entwickeln und die genaue Problemstellung definieren.\textsuperscript{39} Die Definition der Problemstellung hat dabei Auswirkungen auf den weiteren Verlauf des Entscheidungsprozesses, indem sie beispielsweise die Anzahl betrachteter Alternativen von Anfang an einschränkt.\textsuperscript{40}

\textbf{(b) Generierung von Entscheidungsalternativen (Development)}

In der Entwicklungsphase werden Entscheidungsalternativen für die zuvor definierte Problemstellung generiert. Dies kann sowohl durch die Suche nach vorgefertigten Lösungen (\textit{Search Routine}) als auch durch die Entwicklung individueller Lösungen (\textit{Design Routine}) geschehen. Dabei wird zunächst häufig in der unmittelbaren Umgebung des Entscheidungsträgers gesucht – beispielsweise in seiner Erinnerung und innerhalb des Unternehmens. Scheitert diese Suche, werden zusätzliche, weiter entfernte und weniger vertraute Quellen einbezogen. Schlägt auch diese Suche fehl, wendet sich der Entscheidungsträger der Entwicklung individueller Lösungen zu.\textsuperscript{41}

Die Entwicklung einer individuellen Lösung ist ein komplexer, iterativer Prozess, in dem sich die Beteiligten schrittweise einer Lösung nähern, ohne im Vorfeld zu wissen, wie diese aussehen wird. Aufgrund der daraus resultierenden hohen Kosten und des erhöhten Zeitbedarfs wird häufig nur eine individuelle Lösungsalternative voll ausgearbeitet.\textsuperscript{52}

\textbf{(c) Evaluation und Auswahl (Selection)}

Die Selektionsphase bildet die dritte und letzte Phase des SEP. Sie dient der Auswahl einer der zuvor generierten Entscheidungsalternativen. In der Regel umfasst die Selektionsphase drei zentrale Aktivitäten: \textit{Screen Routine, Evaluation-Choice Routine} und \textit{Authorization Routine}.\textsuperscript{43} Die \textit{Screen Routine} dient der schnellen Elimination von Entscheidungsalternativen. Durch eine oberflächliche Beurteilung auf Grundlage der Umsetzbarkeit wird die Anzahl der generierten Alternativen reduziert, sodass lediglich die anschließend verbleibenden Alternativen intensiver evaluiert werden müssen.\textsuperscript{44}

Die \textit{Evaluation-Choice Routine} entspricht der Aktivität, die am ehesten als die eigentliche Entscheidungsfindung betrachtet werden kann. Hierbei nehmen entweder ein oder mehrere Entscheidungsträger eine Beurteilung vor (\textit{Judgment bzw. Bargaining}), oder es findet eine umfassende Analyse statt, auf Grundlage derer letztendlich eine Entscheidung getroffen wird (\textit{Analysis}).\textsuperscript{45} Hervorzuheben ist, dass lediglich die letzte Variante der Entscheidungsfindung der gängigen Darstellung eines rationalen Entscheidungsprozesses entspricht, nach der zunächst Entscheidungskriterien definiert und die einzelnen Alternativen objektiv evaluiert werden, bevor schließlich eine Entscheidung getroffen wird.\textsuperscript{46}

Verfügt der Entscheidungsträger nicht gleichzeitig auch über die Entscheidungsgewalt, setzt im Anschluss an die Entscheidungsfindung die Authorization Routine ein. Dabei durchläuft die getroffene Entscheidung verschiedene Hierarchiestufen, bis sie letztendlich genehmigt oder aber auch abgelehnt wird. Im Falle einer Ablehnung wird die Entscheidungsalternative entweder verworfen oder aber angepasst; in diesem Fall spricht der Entscheidungsprozess zurück in die Entwicklungsphase.\textsuperscript{47}

\textbf{(d) Weitere Elemente}

Mintzberg et al. führen zusätzlich zu diesen zentralen Aktivitäten noch weitere unterstützende Aktivitäten an und klassifizieren verschiedene dynamische Faktoren wie Verzö-
gerungen und Beschleunigungen.\textsuperscript{48} Da diese Elemente weder zur Erläuterung der kognitiven Verzerrungen notwendig sind noch zur Struktur des Prozesses beitragen, werden diese hier jedoch nicht weiter behandelt.

3. Methodik

Im folgenden Abschnitt wird die Vorgehensweise bei der Erstellung der vorliegenden Arbeit erläutert. Hierzu wird zunächst die grundsätzliche Methodik dargestellt (Kapitel 3.1). Die Darstellung beginnt mit der Entwicklung der Zielsetzung, beschreibt die einzelnen Schritte der Literatursuchung und schließt mit der Konzeption des Haupteils. Im Anschluss erfolgt eine kurze Zusammenfassung der Ergebnisse der Literatursuche (Kapitel 3.2).

3.1. Darstellung der verwendeten Methodik

Das gewählte Vorgehen orientiert sich an der von Denyer et al. vorgeschlagenen Methodik eines Systematic Literature Reviews. Dieses zeichnet sich insbesondere durch eine umfassende und unvoreingenommene Literatursuche aus und wird ebenfalls in zahlreichen aktuellen Literature Reviews in der Managementforschung verwendet.\textsuperscript{49} Die verwendete Methodik lässt sich in die drei Phasen Planung, Durchführung und Ergebnisdarstellung einteilen.

In der Planungsphase fand zunächst eine Exploration des Themenfeldes statt. Hierdurch sollte ein erster Überblick über den Einfluss kognitiver Faktoren auf den SEP gewonnen werden. Darauf aufbauend wurde die konkrete Zielsetzung der Arbeit festgelegt: Die Darstellung des aktuellen Forschungsstandes zum Einfluss kognitiver Verzerrungen auf den SEP. Im Anschluss daran wurden auf Grundlage der bereits zusammengetragenen Literatur mögliche Suchparameter identifiziert, die für die Durchführungsphase infrage kommen.

Ferner wurden in der ersten Phase die zu verwendenden Quellen festgelegt. Durchsucht wurden die Datenbanken Business Source Complete und EconLit. Um eine möglichst hohe Qualität der Literaturbasis sicherzustellen, wurden ausschließlich englischsprachige Zeitschriften die einen Peer-Review-Prozess durchlaufen berücksichtigt. Eine Einschränkung des Publikationszeitraums wurde nicht vorgenommen, um nicht Gefahr zu laufen, grundlegende und wegbereitende Publikationen aus der Betrachtung auszuschließen.


3.2. Ergebnisse der Literatursuche


Die einbezogenen Aufsätze lassen sich anhand ihrer inhaltlichen Schwerpunkte in vier Kategorien einteilen. Die erste Gruppe behandelt den grundsätzlichen Einfluss kognitiver

\textsuperscript{48} Vgl. Mintzberg et al. (1976), S. 260ff.
\textsuperscript{49} Vgl. Mintzberg et al. (1976), S. 260ff.
\textsuperscript{50} Vgl. Bachrach et al. (2005), S. 487.
\textsuperscript{52} Vgl. Chambers et al. (1998), S. 115.


4. Kognitive Verzerrungen im strategischen Entscheidungsprozess

Entscheidungsträger sind in strategischen Entscheidungssituationen angesichts hoher Komplexität und Unsicherheit nicht dazu in der Lage, simultan sämtliche relevanten Informationen zu berücksichtigen und zu verarbeiten. Aufgrund dieser kognitiven Limitierungen greifen Entscheidungsträger Informationen zu berücksichtigen und zu verarbeiten. Aufgrund dieser kognitiven Limitierungen greifen Entscheidungsträger auf eine Vielzahl von Heuristiken zurück, die ihre Entscheidungssituation vereinfachen. Aus der Anwendung dieser Heuristiken können kognitive Verzerrungen resultieren, die wiederum zu fehlerhaften strategischen Entscheidungen führen können. Die Kognitionspsychologie kennt inzwischen eine Vielzahl solcher kognitiver Verzerrungen; gleichwohl ist nur eine Teilmenge davon relevant für den SEP.


4.1. Problemidentifikation

In der ersten Phase des SEP muss die Problemstellung zunächst wahrgenommen und anschließend definiert werden. Dabei hängt es stark von der subjektiven Wahrnehmung des Entscheidungsträgers ab, wie vorliegende Informationen zu
Tabelle 2: Kategorisierung der berücksichtigten Aufsätze Quelle: eigene Darstellung

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<th>Kategorie</th>
<th>Zugeordnete Aufsätze</th>
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Einen Problem interpretiert respektive ob diese überhaupt akzeptiert und genutzt werden. \(^{61}\) Es können vier wesentliche kognitive Verzerrungen identifiziert werden, die das Verhalten während der Problemidentifikation beeinflussen: Prior Hypothesis Bias, Status-Quo Bias, Reasoning by Analogy und Escalating Commitment.

4.1.1. Prior Hypothesis Bias

Entsprechend der idealtypischen Vorstellung rationaler Entscheidungen sollten Entscheidungs träger alle relevanten Informationen sammeln, objektiv auswerten und ausgehend von dieser Analyse die bestmögliche Entscheidung treffen. \(^{62}\) Konträr dazu bewirkt der Prior Hypothesis Bias, dass Entscheidungsträger vorgefertigte Ansichten und Hypothesen in den Entscheidungsprozess einbringen und dadurch Informationen ignorieren oder falsch interpretieren. \(^{63}\) Besitzen Individuen beispielsweise bestimmte Erwartungen bezüglich der Zusammenhänge von Variablen, treffen sie Entscheidungen auf Grundlage dieser Erwartungen, auch wenn es zahlreiche Beweise gibt, dass diese falsch sind. \(^{64}\)

Der Ursprung dieser Verzerrung liegt im Verhalten von Individuen bei der Informationssuche und -verarbeitung: Kon- sistente, also die eigene Sichtweise bestätigende Informationen werden gezielt gesucht, während inkonsistente Informationen vermieden oder ignoriert werden. \(^{65}\) Gleichzeitig werden vorhandene konsistente Informationen stärker gewichtet als inkonsistente Informationen. \(^{66}\) Glaubt der Entscheidungsträger also an den Erfolg der gegenwärtigen Strategie, ignorieren er Informationen zu einem sich abzeichnenden Scheitern oder wertet diese ab, sodass keine Problemlösungsstrategie stattfindet. Im entgegengesetzten Fall gewichtet er negative Informationen übermäßig stark, um eine Anpassung oder einen Wechsel der Strategie herbeizuführen. Der Prior Hypothesis Bias kann somit dazu führen, dass Entscheidungs träger eine Problemstellung entweder gar nicht oder aber falsch wahrnehmen. \(^{67}\)

Als eine Ausgestaltung des Prior Hypothesis Bias kann das Phänomen des Motivated Reasoning gesehen werden: Hierbei tendieren Individuen dazu, ihre Informationsverarbeitung dem gewünschten Ausgang der Entscheidung anzupassen. Verfügt der Entscheidungsträger zu Beginn des Entscheidungsprozesses bereits über Annahmen bezüglich der vermeintlich besten Lösungsalternative, kann dieses Verhalten dazu führen, dass Informationssuche und -verarbeitung

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\(^{65}\) Vgl. Festinger (1962), S. 21f.
Tabelle 3: Kognitive Verzerrungen in den einzelnen Phasen des strategischen Entscheidungsprozesses

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<th>Kognitive Verzerrung</th>
<th>Beschreibung</th>
<th>Effekt auf den SEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Problemdarstellung</td>
<td>Prior Hypothesis Bias</td>
<td>Einbringung vorgefertigter Ansichten und Hypothesen in den Entscheidungsprozess</td>
</tr>
<tr>
<td></td>
<td>Status-Quo Bias</td>
<td>Entwicklung einer ungerechtfertigten Präferenz für den Status quo des Unternehmens</td>
</tr>
<tr>
<td></td>
<td>Escalating Commitment</td>
<td>Festhalten an früheren Entscheidungen trotz negativer Ergebnisse</td>
</tr>
<tr>
<td></td>
<td>Reasoning by Analogy</td>
<td>Rückgriff auf Analogien zur Ergründung der Entscheidungssituation</td>
</tr>
<tr>
<td>2. Generierung von Entscheidungsalternativen</td>
<td>Single Outcome Calculation</td>
<td>Fokussierung auf einzelne Ziele und Entscheidungsalternativen</td>
</tr>
<tr>
<td></td>
<td>Problem Set</td>
<td>Rückgriff auf standardisierte Problemlösungsroutinen</td>
</tr>
<tr>
<td></td>
<td>Availability Bias</td>
<td>Beurteilung von Wahrscheinlichkeiten auf Basis des Erinnerungsvermögens oder der Vorstellungskraft</td>
</tr>
<tr>
<td></td>
<td>Illusion of Control</td>
<td>Überschätzung der Kontrollierbarkeit von Ausgängen strategischer Entscheidungen</td>
</tr>
<tr>
<td></td>
<td>Overconfidence</td>
<td>Überschätzung der eigenen Fähigkeiten</td>
</tr>
</tbody>
</table>

auf die Bestätigung dieser Annahme ausgerichtet werden. Dabei findet allerdings keine völlig willkürliche Beibehaltung von Annahmen statt; vielmehr versucht der Entscheidungsträger, eine Rechtfertigung zu konstruieren, die auch einen unvoreingenommenen Beobachter überzeugen würde. Es wird also versucht, eine Illusion von Objektivität aufrechtzuerhalten.  

4.1.2. Status-Quo-Bias


Adjustment and Anchoring tritt in Situationen auf, in denen Individuen Einschätzungen auf Basis eines initialen Werts vornehmen und diese nach und nach anpassen. Typischerweise

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weise sind diese Anpassungen unzureichend, sodass die finale Bewertung in Richtung des Initialwertes verzerrt ist.74 Beispielsweise nehmen Entscheidungsträger im SEP negative Informationen über den Erfolg einer gewählten Strategie zwar auf, passen ihre Einschätzungen über den erwarteten Erfolg der Strategie aber nur unzureichend an. Die ursprünglichen Erwartungen an die gewählte Strategie bilden somit einen Ankerpunkt in der Beurteilung neuer Informationen. Im Ergebnis fallen etwaige Revisionen der verfolgten Strategie zu gering aus.75

Ein eindrucksvolles Beispiel für die Auswirkungen von Adjustment and Anchoring liefert Convair, eine ehemalige Tochtergesellschaft von General Dynamics Ende der 1950er-Jahre.76 Das Vorhaben, mit der Entwicklung der CV-880 in den Markt für Mittelstreckenflugzeuge einzutreten, basierte auf einer dramatischen Unterschätzung der Kosten sowie einer deutlichen Überschätzung des Marktpotenzials.77 Trotz immer deutlicherer Hinweise, dass ihre Prognosen falsch waren (so wies beispielsweise ein Ingenieur darauf hin, dass allein die Kosten fremdbeschaffter Teile bereits den angelobten Verkaufspreis überstiegen), korrigierten die Entscheidungsträger diese offensichtlich nicht ausreichend. Sie hielten an der Entwicklung des Flugzeuges fest und verursachten dem Konzern dadurch dramatische Verluste.78

Der zweite Faktor, der zu einer Bevorzugung des Status Quo führen kann, ist Verlustaversion (Loss Aversion). Unter normalen Umständen verhalten sich Individuen in Entscheidungs situationen risikoavers und damit verlustaversion, d.h. sie gewichten mögliche Verluste stärker als mögliche Gewinne.80 Wenn ein Entscheidungsträger nun mit der Wahl zwischen einem Projektt, bei dessen Scheitern er persönliche Verantwortung des Entscheidungsträgers für die negativen Konsequenzen trägt,81 tritt er konsistentes Verhalten auf, das bestehende Engagement stattdessen weiter verstärkt.82 Obwohl das zugrundeliegende Entscheidungsproblem unverändert ist, resultiert die Veränderung der Problemdarstellung dann in diametralen Entscheidungen.83 Dieser Umstand unterstreicht anschaulich, wie stark der Einfluss der Problemformulierung auf den weiteren Verlauf des SEP sein kann.

4.1.3. Escalating Commitment

Escalating Commitment bezeichnet das Festhalten an einer Entscheidung, obwohl diese negative Konsequenzen aufweist und eigentlich revidiert werden müsste.84 Anstatt ein scheitern des Projekts zu stoppen, halten Entscheidungsträger daran fest und weisen diesem sogar mehr Ressourcen zu, als einem entsprechenden erfolgreichen Projekt.85 Somit nehmen sie zwar die negativen Informationen aus ihrer Umwelt wahr, interpretieren diese aber so, dass nicht eine Änderung der Strategie, sondern vielmehr eine weitere Verstärkung des bestehenden Engagements angezeigt ist, um das Projekt noch zu retten.86

Als Ursache dieses Verhaltens lassen sich zwei zentrale Faktoren ausmachen: Zum einen ist dies die gefühlte persönliche Verantwortung des Entscheidungsträgers für die negativen Ergebnisse: Sie führt zu dem Bedürfnis, die eigene vergangene Entscheidung vor sich selbst und vor anderen zu rechtfertigen. Zum anderen kann auch der Einfluss kultureller und organisationaler Normen eine Rolle spielen: Empfindet der Entscheidungsträger konsistentes Verhalten als erwünscht, wird er eher davon absehen, eine getroffene Entscheidung zu revidieren.87 So zeigen Ross und Staw, dass Manager positiver beurteilt werden, wenn sie sich konsistent verhalten und eingeschlagene Handlungen trotz negativer Ergebnisse weiterverfolgen, um sie letztendlich zum Erfolg zu führen.88

Schwenk liefert darüber hinaus eine weitere mögliche Erklärung für die Entstehung von Escalating Commitment. So tendieren Entscheidungsträger dazu, den negativen Verlauf eines Projekts dem Zufall zuzuschreiben anstatt einem Fehler in der zugrundeliegenden Entscheidung. In diesem Fall erscheint eine Revision der Entscheidung nicht angebracht und das bestehende Engagement wird stattdessen weiter verstärkt.89 Tatsächlich ist ein derartiger Attributional Bias, bei dem Manager gute Ergebnisse sich selbst, schlechte Ergebnisse jedoch exogenen Faktoren zuschreiben, ein häufig anzutreffendes Phänomen.90 Die Ergebnisse einer Studie von Ross und Staw unterstützen zudem Schwenks Hypothese: Teilnehmer investierten mehr Ressourcen in ein scheitern des Projekts, wenn das Scheitern exogenen anstatt endogenen Faktoren zugeschrieben werden konnte.91

77Vgl. Smith (1963), S. 64ff.
78Vgl. Smith (1963), S. 68ff.
84Vgl. Staw (1976), S. 27.

4.1.4. Reasoning by Analogy

Eine Möglichkeit für Entscheidungsträger, der enormen Unsicherheit und Ambiguität strategischer Entscheidungsprobleme zu begegnen, ist der Rückgriff auf Analogien, also auf als ähnlich empfundene Situationen. Diese können aus der Erfahrung der Entscheidungsträger, aus Entscheidungen anderer Unternehmen oder aber aus besonders plastischen Bildwerten stammen.\(^93\) Beispielsweise nutzen Unternehmen häufig die Analogie einer gut oder schlecht geöltten Maschine, um ihre Situation zu greifbar zu machen.\(^94\) Die Wahl der Analogie kann also das Verständnis von Entscheidungssituationen äußerst subjektiv, sodass es regelmäßig zu einer Über- oder Unterschätzung von Gemeinsamkeiten kommt. So müssen beispielsweise Unternehmen nach einer Diversifikation häufig erkennen, dass zwei Geschäftsbereiche deutlich weniger Gemeinsamkeiten aufweisen, als ursprünglich angenommen.\(^100\)


4.2. Generierung von Entscheidungsalternativen

Im Anschluss an die Problemdarstellung werden in der zweiten Phase des SEP Entscheidungsalternativen generiert. Bereits im vorangehenden Abschnitt wurde deutlich, dass kognitive Verzerrungen der Identifikationsphase sich auf die Entwicklungsphase auswirken können. So können Prior Hypothesis Bias, Status-Quo Bias und Escalating Commitment dazu führen, dass Informationen zu auftretenden Entscheidungsproblemen fehlerinterpretiert oder gar gänzlich ignoriert werden, sodass erst gar keine Generierung von Entscheidungsalternativen stattfindet. Weiter kann durch Reasoning by Analogy von Beginn an eine Fokussierung auf bestimmte zentrale Entscheidungsaspekte verursacht werden, sodass in der Folge lediglich eine begrenzte Menge an möglichen Alternativen betrachtet wird.\(^104\) Neben diesen Auswirkungen gibt es zwei zentrale kognitive Verzerrungen, die in der Entwicklungphase auftreten können und die tendenziell ebenfalls zu einer Limitierung der Anzahl generierter Alternativen führen: Single Outcome Calculation und Problem Set.

4.2.1. Single Outcome Calculation

Nach der normativen Theorie versuchen Entscheidungsträger in der Entwicklungsphase des SEP ausgehend von ei-
ner Spezifizierung aller relevanten Werte und Ziele mehrere Entscheidungsalternativen zu generieren. In der Realität ist die Suche nach Alternativen allerdings mitunter weit weniger umfangreich und objektiv. Entscheidungsträger konzentrieren sich stattdessen häufig auf ein zentrales Ziel sowie auf eine einzelne Alternative, um dieses Ziel zu erreichen. So wird beispielsweise bei der Betrachtung einer schlecht laufenden Geschäftseinheit die Desinvestition schnell zur einzigen überhaupt berücksichtigten Entscheidungsalternative.


107 Vgl. Van Wallendael und Hastie (1990), S. 249.
117 Vgl. Jervis (1976), S. 130 sowie S. 139.
ziehen.\textsuperscript{123}

4.2.2. Problem Set

Problem Set stellt eine weitere kognitive Verzerrung dar, die sich ebenfalls limitierend auf die Generierung von Entscheidungsalternativen auswirken kann. Aufgrund wiederholter Nutzung einer bestimmten Strategie zur Problemlösung fällt es einem Individuum oft schwer, alternative Strategien zu entwickeln.\textsuperscript{124} Übertragen auf den SEP liefert diese Verzerrung eine mögliche Erklärung dafür, dass Entscheidungsträger bestimmte Annahmen über ihre Unternehmen und ihre Industrie entwickeln und damit verbunden über die Strategien, die zur Problemlösung geeignet sind.\textsuperscript{125} In der Konsequenz greifen Entscheidungsträger dann überwiegend auf standardisierte Lösungsstrategien zurück, während andere, möglicherweise bessere Entscheidungsalternativen vorschnell abgelehnt werden, sodass im Endeffekt eine suboptimale Strategie gewählt wird.\textsuperscript{126}

Die Tendenz, auf standardisierte Routinen zurückzugreifen, wird zusätzlich durch die Default Heuristic verstärkt. So existiert in vielen Entscheidungssituationen eine Standardalternative, die etwa aus vergangenen Entscheidungen oder auch aus den Strategien von Wettbewerbern resultiert. Entscheidungsträger neigen dazu, derartige Standardalternativen anderen Alternativen vorzuziehen. Auch wenn es in bestimmten Entscheidungssituationen vorteilhaft sein kann, auf Standardroutinen zurückzugreifen – etwa wenn die verfügbare Zeit knapp ist oder die Kosten der Informationsbeschaffung hoch sind – bleibt die Gefahr bestehen, bessere Entscheidungsalternativen zu verfehlen.\textsuperscript{127}

4.3. Evaluation und Auswahl

In der dritten und letzten Phase des SEP müssen die zuvor generierten Entscheidungsalternativen evaluierter und im Anschluss daran eine der Alternativen zur Implementierung ausgewählt werden. Die Ergebnisse und damit der Einfluss der kognitiven Verzerrungen aus vorgelagerten Phasen des SEP wirken sich offenkundig auch auf diese Phase aus: Ist beispielsweise die Menge generierter Alternativen aufgrund von Single Outcome Calculation begrenzt, wurde möglicherweise die optimale Lösung bereits eliminiert oder gar nicht erst gefunden, sodass lediglich unter (wenigen) suboptimalen Lösungen ausgewählt werden kann. Im Extremfall steht die Entscheidung bereits vor Erreichen der Selektionsphase fest.\textsuperscript{128} Findet allerdings eine Auswahl unter verschiedenen Entscheidungsalternativen statt, lassen sich vier zentrale kognitive Verzerrungen ausmachen, die diese Auswahl erheblich beeinflussen können: Representativeness, Availability Bias, Illusion of Control und Overconfidence.

\textsuperscript{128}Vgl. Schwenk (1984), S. 120.
\textsuperscript{129}Vgl. Anderson und Johnson (1966), S. 851.
\textsuperscript{130}Vgl. Schwenk (1984), S. 120.
\textsuperscript{131}Vgl. Haley und Stumpf (1989), S. 484f.
\textsuperscript{132}Vgl. Azar (2014), S. 1744f.
\textsuperscript{133}Vgl. Schwenk (1984), S. 120.

4.3.1. Representativeness

Die Theorie rationaler Entscheidungen unter Unsicherheit sieht vor, dass ein Entscheidungsträger den möglichen Ausgängen seiner Entscheidung Wahrscheinlichkeiten zuweist und so die Entscheidungsalternative auswählt, die den höchsten Erwartungsnutzen aufweist.\textsuperscript{135} Tatsächlich nehmen Entscheidungsträger im SEP Beurteilungen von Wahrscheinlichkeiten vor, etwa über den Eintritt bestimmter Veränderungen in der Umwelt des Unternehmens.\textsuperscript{136} Allerdings leiden diese Urteile unter kognitiven Verzerrungen: So kann Representativeness zu falschen Einschätzungen von Wahrscheinlichkeiten führen und dadurch fehlerhafte Entscheidungen nach sich ziehen.\textsuperscript{137}

Typischerweise beurteilen Individuen Wahrscheinlichkeiten danach, wie repräsentativ ein Ereignis für die wesentlichen Charakteristiken einer Grundgesamtheit oder eines Prozesses ist.\textsuperscript{138} Konfrontiert man beispielsweise eine Testperson mit der anekdotischen Beschreibung einer Person, und fragt anschließend nach dem wahrscheinlichsten Beruf dieser Person, basiert die Testperson ihre Schätzung darauf, wie stark die Beschreibung einem bestimmten Stereotypen ähnelt. Statt auf den Grundsätzen der Wahrscheinlichkeitstheorie basieren subjektive Einschätzungen also auf wahrgenommener Ähnlichkeit.\textsuperscript{139} Es lassen sich mehrere Faktoren identifizieren, die zwar die statistische Wahrscheinlichkeit beeinflussen, sich aber kaum auf die Repräsentativität und damit auch kaum auf die subjektive Wahrscheinlichkeit auswirken, sodass es in der Folge zu fehlerhaften Beurteilungen kommt.

Zum einen ignorieren Individuen häufig Informationen zu Basisraten, sodass ein sogenannter Prävalenzfehler entsteht (Insensitivity to Prior Probability of Outcomes). Wird im zuvor skizzierten Beispiel etwa gefragt, ob die Person eher Bibliothekar oder Landwirt ist, tendieren Individuen je nach Beschreibung dazu, auf Bibliothekar zu tippen – obwohl es in der Grundgesamtheit deutlich mehr Landwirte als Bibliothekare gibt.\textsuperscript{132} Tatsächlich werden derartige Basisraten häufig nahezu vollkommen vernachlässigt.\textsuperscript{133} Dieser Wahrnehmungsfehler wird zudem dadurch begünstigt, dass Individuen dazu neigen, statistische Informationen zu ignorieren, wenn sie mit lebhaften und anekdotischen Beschreibungen konfrontiert werden.\textsuperscript{136}

Zum anderen missachten Individuen den Einfluss von Stichprobengrößen (Insensitivity to Sample Size).\textsuperscript{137} Fragt man beispielsweise Versuchspersonen danach, wie wahrscheinlich es ist, dass 600 von 1000 Neugeborenen respektive 60 von 100 Neugeborenen männlich sind, werden diese Ereignisse als gleich wahrscheinlich eingeschätzt, obwohl

\textsuperscript{129}Vgl. Samuelson und Zeckhauser (1988), S. 7.
\textsuperscript{130}Vgl. Schwenk (1988), S. 43.
\textsuperscript{131}Vgl. Schwenk (1994), S. 120f.
\textsuperscript{132}Vgl. Kahneman und Tversky (1972), S. 451.
\textsuperscript{133}Vgl. Kahneman und Tversky (1974), S. 1124.
\textsuperscript{134}Vgl. Kahneman und Tversky (1974), S. 1124f.
\textsuperscript{135}Vgl. Kahneman und Tversky (1973b), S. 239.
\textsuperscript{136}Vgl. Schwenk (1986), S. 300ff.
Letzteres deutlich wahrscheinlicher ist. Im SEP führt diese Insensibilität mitunter zu einem Überschätzen der Aussagefähigkeit kleiner Stichproben: Um generalisierbare Aussagen vor der Voraussetzung einer erfolgreichen Strategie treffen zu können, wäre grundsätzlich eine große Anzahl umgesetzter Strategien aus der Vergangenheit notwendig. Entscheidungsträger sind oft aber nicht dazu in der Lage, diese umfangreichen Daten zu sammeln und basieren ihre Erkenntnisse daher auf relativ kleinen Datensätzen. In der Folge entwickeln Entscheidungsträger oft ein ungerechtfertigtes Vertrauen in die Zuverlässigkeit der so gewonnenen Erkenntnisse. Zusätzlich kann dieses fehlerhafte Verständnis über die Fehler und Ungenauigkeiten, die sich aus kleinen Stichproben ergeben, dazu führen, dass auf einen kausalen Zusammenhang zwischen Variablen geschlossen wird, obwohl dieser gar nicht existiert.

Darüber hinaus ignorieren Entscheidungsträger häufig, inwieweit ein Ereignis auf Grundlage der verfügbaren Informationen überhaupt vorhersehbar ist (Insensitivity to Predictability). Fragt man beispielsweise eine Person nach dem zukünftig erwarteten Gewinn eines Unternehmens, sagt diese einen höheren Gewinn voraus, wenn die Beschreibung des Unternehmens sehr vorteilhaft ist. Hingegen wird ein niedrigerer Gewinn vorausgesagt, wenn die Beschreibung weniger vorteilhaft ist. Dies lässt sich dadurch erklären, dass ein Unternehmen mit hohen Gewinnen am ehesten der sehr vorteilhaften Beschreibung entspricht, also am repräsentativen. Die Gewinnvorhersage basiert folglich lediglich auf Repräsentativität und ignoriert, wie zuverlässig die verfügbaren Informationen tatsächlich sind und inwieweit diese überhaupt eine akkurate Vorhersage ermöglichen. Das ungefähr fertigte Vertrauen in die Zuverlässigkeit einer derartigen Vorhersage, die lediglich auf Repräsentativität beruht, wird auch als Illusion of Validity bezeichnet. Das Vertrauen wächst dabei mit steigender Repräsentativität – während die statistische Genauigkeit gleichzeitig zurückgeht.


4.3.2. Availability Bias


Vgl. Combs et al. (1978), S. 555.
**Illusory Correlation** kann bei strategischen Entscheidungssituationen insbesondere dann problematisch sein, wenn ein Expertenteam für die Erstellung von Prognosen eingesetzt wird. Die Experten bestätigen sich dann gegenseitig in ihrer Fehleinschätzung bezüglich der wahrgenommenen Korrelation. Fatalerweise interpretieren Entscheidungsträger im SEP diese Übereinstimmung häufig als Zeichen für die Zuverlässigkeit der Beobachtungen der Experten.\(^{154}\) Eng verbunden mit dem Availability Bias ist auch der Hindsight Bias.\(^{155}\) Um zurückliegende Entscheidungen objektiv zu evaluieren, müssen Entscheidungsträger Informationen über den tatsächlichen Ausgang der Entscheidungs situation ignorieren. Zahlreiche Studien zeigen, dass Individuen hierzu grundsätzlich nicht in der Lage sind.\(^{156}\) Das Wissen über den Ausgang eines Ereignisses erhöht dessen wahr genommene Wahrscheinlichkeit – ohne dass dies dem Entscheidungsträger bewusst ist. Er ist dann überzeugt, dass der eingetretene Ausgang bereits im Vorfeld erkennbar gewesen sei.\(^{157}\) Diese Wahrnehmung beeinflusst zukünftige strategische Entscheidungen auf zwei Arten: Zum einen führt sie zu einer Fokussierung auf vermeintlich zentrale Entscheidungs variablen, die in vergangenen Situationen besonders auffällig waren.\(^{158}\) Zum anderen kann sie fehlgeleitete personelle Konsequenzen oder Änderungen am Entscheidungsprozess nach sich ziehen.\(^{159}\)

### 4.3.3. Illusion of Control

Unter dem Einfluss von Illusion of Control überschätzen Entscheidungsträger, inwieweit sie den Ausgang einer Strategie kontrollieren können. Sie überschätzen den Einfluss ihrer eigenen Fähigkeiten und nehmen zudem an, dass sie durch zusätzliche Anstrengungen ihre Strategie dennoch zum Erfolg führen können, falls Probleme auftreten sollten.\(^{160}\) So zeigen mehrere Studien, dass Individuen eine höhere persönliche Erfolgsrate erwarten, als objektive Wahrscheinlichkeiten mit Nutzung der Umwelt versuchen, sie kontrollierbar wahrzunehmen.\(^{161}\) Selbst eine offenkundige Fehlentscheidung kann sie durch zusätzliche Anstrengungen ihrer Strategie auf die Dauer erfolgreich führen.\(^{162}\) Illusion of Control kann damit zu übermäßig positiven Einschätzungen der Erfolgsaussichten einer strategischen Entscheidungsalternative führen.\(^{163}\)

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\(^{154}\) Vgl. Barnes (1984), S. 130.
\(^{157}\) Vgl. Fischhoff (1975), S. 297.
\(^{159}\) Vgl. Buxzar und Connolly (1988), S. 630.
\(^{162}\) Vgl. Langer Ellen und Roth (1975), S. 953f.

Illusion of Control bildet zudem ein wichtiges Element im Risikoverhalten von Entscheidungsträgern: Anders als die normative Theorie vorsieht, findet im Entscheidungsprozess keine Abwägung von Risiken gegenüber potenziellen Trägern statt.\(^{164}\) Stattdessen sehe Entscheidungsträger Risiken als kontrollierbar an; sie sind überzeugt, dass sie Risiken durch den Einsatz ihrer eigenen Fähigkeiten reduzieren können.\(^{166}\) Risiken sind also keine inhärenten Bestandteile einer Entscheidungssituation, sondern Faktoren, die es zu überwinden gilt.\(^{166}\)

Es lassen sich zwei zentrale Erklärungsansätze für die Entstehung von Illusion of Control ausmachen. Erstens können Entscheidungsträger dazu tendieren, sich auf diejenigen Aspekte einer Situation zu konzentrieren, die sie kontrollieren können. Bei der Abschätzung ihrer Erfolgschancen ignorieren sie dann Faktoren, die außerhalb ihres Kontrollbereiches liegen und zu einem Scheitern führen könnten. In der Konsequenz überschätzen Entscheidungsträger die Erfolgswahrscheinlichkeit der betrachteten Entscheidungsalternative.\(^{167}\)

Die zweite Erklärung ergibt sich aus dem menschlichen Bedürfnis, die eigene Umwelt zu kontrollieren.\(^{168}\) Durch selektive Informationsverarbeitung könnten Entscheidungsträger sich selbst davon überzeugen, ihre Umwelt kontrollieren zu können. Diese Überschätzung der eigenen Kontrollfähigkeit kann dazu beitragen, das Unbehagen zu reduzieren, das aus der Unsicherheit strategischer Entscheidungssituationen resultiert.\(^{169}\) Auch die Überzeugung, den Verlauf einer Entscheidung durch zusätzliche Anstrengungen beeinflussen zu können, trägt zu dieser Reduktion der Unsicherheit bei.\(^{170}\)


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\(^{170}\) Vgl. Das und Teng (1999), S. 763.
wieder verkaufen.\textsuperscript{172} In der Literatur lassen sich weitere Fälle finden, in denen eine derartige Überschätzung der eigenen Fähigkeiten zu fehlgeleiteten Akquisitionen geführt haben könnte.\textsuperscript{173}

4.3.4. Overconfidence

Die vorangegangenen Ausführungen machen deutlich, dass das Urteilsvermögen von Entscheidungsträgern durch zahlreiche und mitunter schwerwiegende kognitive Verzerrungen beeinträchtigt wird. Dennoch zeigen sie häufig ein übermäßiges Vertrauen in die Korrektheit der eigenen Urteile.\textsuperscript{174} Unter dem Einfluss dieser als Overconfidence bezeichneten Verrückung überschätzen Entscheidungsträger die Aussagefähigkeit vorhandener Informationen sowie die eigenen Fähigkeiten und entwickeln oft eine unangemessene, träumende Zuversicht hinsichtlich ihrer Entscheidungen.\textsuperscript{175}

Overconfidence ist damit eng verbunden mit Illusion of Control: Auch hier findet eine Überschätzung der eigenen Fähigkeiten statt, aus der sich eine übermäßig positive Einschätzung von Erfolgs- und Scheiternscheinlichkeiten ergibt. Während sich diese Überschätzung bei Illusion of Control jedoch im Wesentlichen auf nicht oder nur begrenzt kontrollierbare Ereignisse bezieht, beschreibt Overconfidence den allgemeineren Fall. Aus dieser Perspektive lässt sich Illusion of Control somit auch als Spezialfall von Overconfidence ansehen.\textsuperscript{176}

Tatsächlich ist eine Überschätzung der eigenen Fähigkeiten weit verbreitet und in einer Vielzahl von Situationen anzutreffen.\textsuperscript{177} So bewerten beispielsweise 93% der Amerikaner in einer Studie ihre Fahrrkräfte als überdurchschnittlich gut.\textsuperscript{178} Camerer und Lovallo zeigen in einer darauf aufbauenden Studie, wie Overconfidence zu einem übermäßigen Markteintritt führen kann, indem die Teilnehmer ihre relativen Erfolgs- und Scheiternscheinlichkeit deutlich überschätzen.\textsuperscript{179}

Overconfidence kann zahlreiche Ursachen haben, darunter viele der bereits dargestellten kognitiven Verzerrungen: So können etwa Prior Hypothesis Bias, Adjustment and Anchoring und Availability Bias die Informationsverarbeitung so beeinflussen, dass lediglich bestätigende Informationen gesucht und aufgenommen werden.\textsuperscript{180} Dabei steigt das Vertrauen mit der Menge verfügbarer Informationen, auch wenn das Urteilsvermögen selbst dadurch nicht zwangsläufig verbessert wird.\textsuperscript{181} Je mehr Informationen vorhanden sind, desto leichter lassen sich bestehende Überzeugungen bestätigen.\textsuperscript{182} In der Folge entwickeln Entscheidungsträger dann eine übersteigerte Zuversicht in die ausgewählte Möglichkeit, allmahlich angetaner Entscheidungsalternative. Auch Representativeness kann durch die fahrgelartete Annahme ausreichender Prognostizierbarkeit zu einer trügerisch Sicherheit führen.\textsuperscript{183} Grundsätzlich bilden derartige unbewusste oder nicht ausreichend hinterfragte Annahmen der Entscheidungsträger einen entscheidenden Faktor in der Entstehung von Overconfidence.\textsuperscript{184}


5. Zusammenfassung und kritische Würdigung

Das Verhalten von Entscheidungsträgern im SEP weicht mitunter deutlich von dem ab, was die normative Entscheidungstheorie impliziert. In der vorliegenden Arbeit wurde mit der Betrachtung kognitiver Verrückungen ein wesentlicher Faktor zur Erklärung dieser Abweichungen vorgestellt. Anhand eines idealtypischen Modells des SEP wurde dargestellt, welche zentralen kognitiven Verrückungen im Kontext strategischer Entscheidungen auftreten und welche Auswirkungen diese auf den Entscheidungsprozess haben.


So führen kognitive Verrückungen in der Phase der Problemidentifikation zu einer fehlerhaften Wahrnehmung der

\textsuperscript{172} Vgl. Hoffer (1975), S. 804.
\textsuperscript{174} Vgl. Brenner et al. (1996), S. 218 sowie Fischhoff et al. (1977a), S. 6; Fischhoff et al. (1977b), S. 552; und Oskamp (1965), S. 264 ff.
\textsuperscript{176} Vgl. Schwenk (1986), S. 303 sowie Fischhoff et al. (1977a), S. 6.
\textsuperscript{178} Vgl. Svenson (1981), S. 146.
\textsuperscript{179} Vgl. Camerer und Lovallo (1999), S. 314.
\textsuperscript{181} Vgl. Oskamp (1965), S. 264 ff.
\textsuperscript{182} Vgl. Hogarth und Makridakis (1981), S. 127.
\textsuperscript{183} Vgl. Schwenk (1984), S. 121.
\textsuperscript{184} Vgl. Duhaine (1996), S. 113 sowie Fischhoff et al. (1977b), S. 564.
\textsuperscript{185} Vgl. Miller (1992), S. 25.


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