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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. Introduciton

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.

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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] http://foldoc.org/user%20interface, last accessed: 29.04.2016

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 in 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 of 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

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), Goodman 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 guidelines[2] and standards[3].

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

[2]Note: 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).

[3]For a comprehensive overview of the principles and standards, please see Appendix 1.

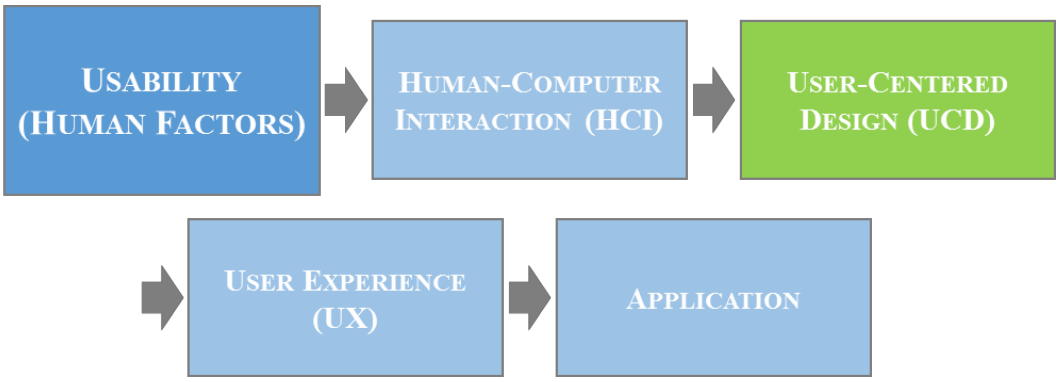

Figure 1: The Relationship between Usability, HCI, UCD and UX; Source: Own illustration based on Lowdermilk (2013)

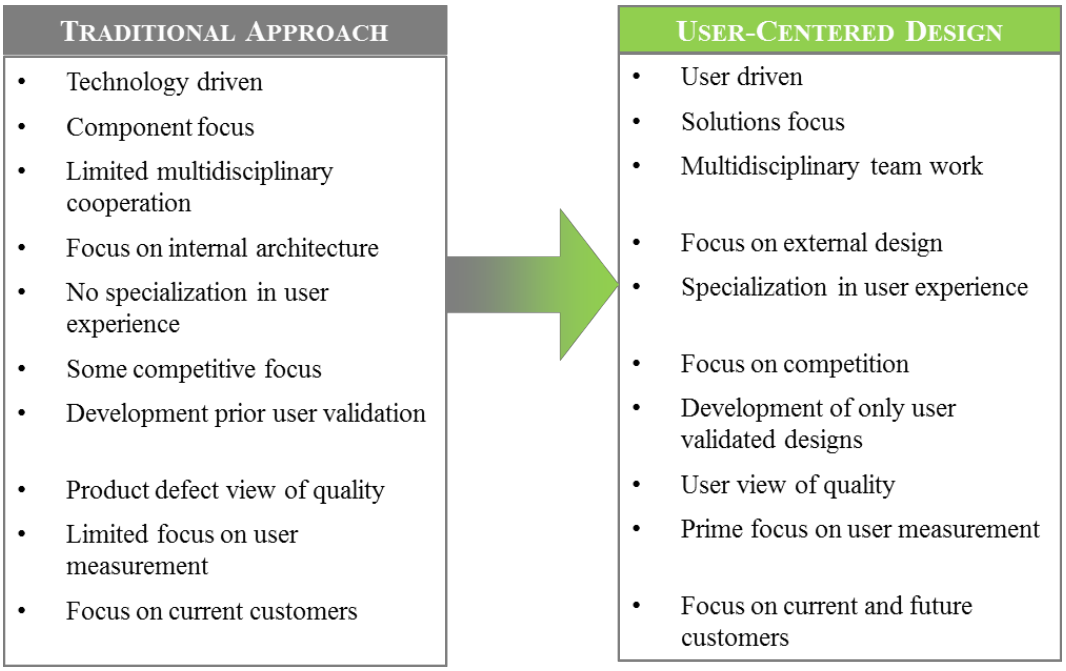

Figure 2: The Traditional Approach vs. User-Centered Design; Source: Own illustration based on Vredenburg et al. (Vredenburg et al. (2002a), p. 2)

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][4]). 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

[4]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[5]).

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 preselected 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),

[5]Note: The classification of the four stages of the system development process was done as a aggregation of reviewed literature in the scope of this thesis.

Table 1: User-Centered Design Methods in the Course of Systems Design; Source: Own illustration

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

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.[6] 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

[6] For 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 customer[7] 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

[7] Note: 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 innovation[8], 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)).

[8] "Innovation 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).

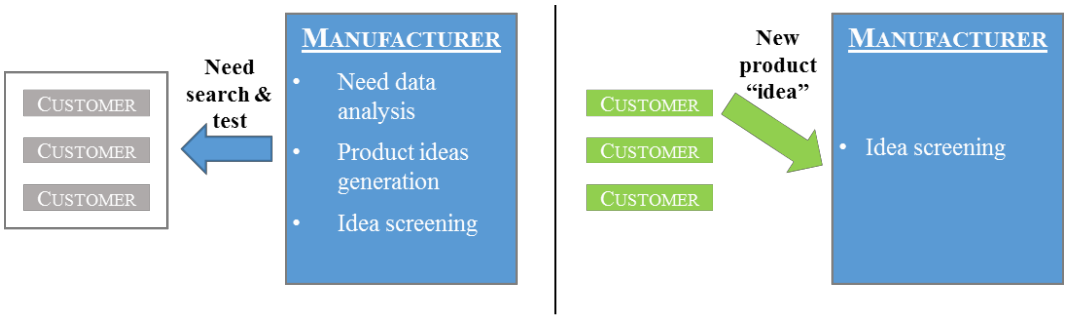

Figure 3: The Manufacturer-Active vs. the Customer-Active Paradigm; Source: Own illustration based on von Hippel (von Hippel (1978b), p. 242)

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

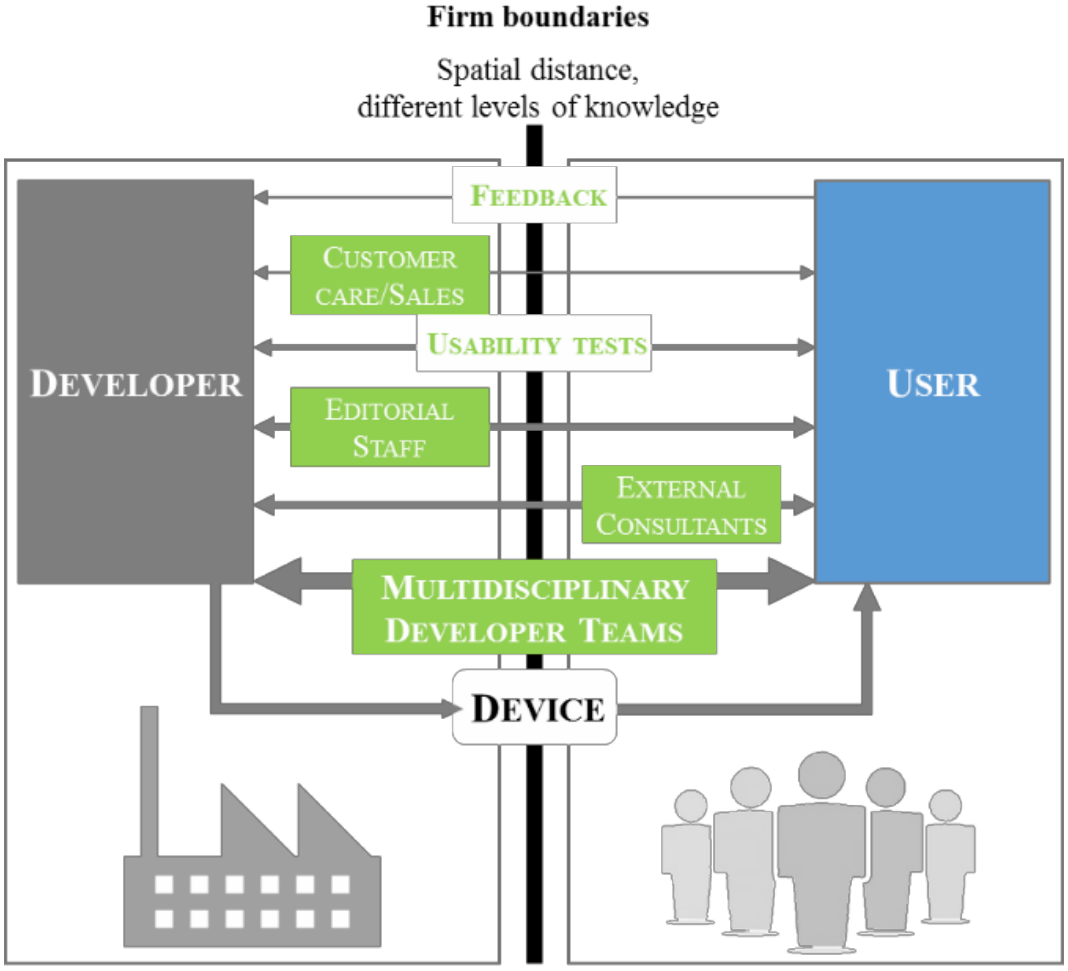

Figure 4: The Relationship between Companies and Users in Product Development; Source: Own illustration based on Zühlke (Zühlke (2011), p. 41)

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.[9] 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

[9] http://www.etymonline.com/index.php?term=ambidextrous, last accessed: 29.04.2016

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[10], 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 grey 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.

"There is only 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

[10] 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 UCD?

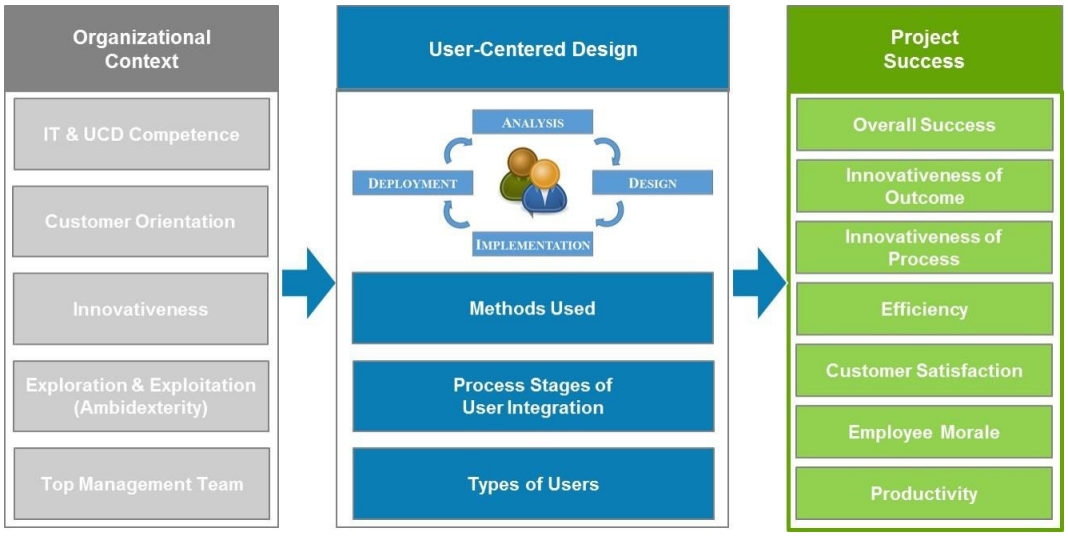

Figure 5: Research Model of the Thesis; Source: Own illustration

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 adaption, integration and reconfiguration of new and existing assets (see chapter 2.3). Providing the employees with a clear vision is an important a 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[11] 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

[11] For 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[12].

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[13] 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 an 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.

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

[13] The detailed sampling strategy will be presented in chapter 4.4.

Figure 6: Macro-Structure of the Questionnaire; Source: Own illustration

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

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

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'[14] and 'LinkedIn'[15] 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"[16], 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

[14] https://www.xing.com/, last accessed: 29.04.2016
[15] https://www.linkedin.com/, last accessed: 29.04.2016
[16] https://www.linkedin.com/help/linkedin/topics/6073/6089/397, last accessed: 29.04.2016

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[17].

The overall sample (n_o[18]=70) consisted of 74.3% men (sample: 74.6%, n_s[19]=67) 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 German (overall: 92.1%, n_o=101, sample: 91.3%, n_s=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_o=71, sample: 50.0%, n_s=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_o=70, sample: 64.2%, n_s=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_o=53, sample: 45.1%, n_s=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_o=71) as well as the calculation sample (n_s=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. (2002b).

The majority of the participants indicated to be working in the Marketing department (overall: 29.6%, n_o=71, sample: 26.5%, n_s=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_o=71, sample: 25.0%, n_s=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_o=69, sample: 43.3%, n_s=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[20] 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.

[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".

[20] H1a: IT Competence has a positive influence on the project success.
H1b: UCD Competence has a positive influence on project success.
H2: Customer orientation has a positive influence on project success.
H3: Innovativeness has a positive influence on project success.
H4: Ambidexterity, i.e. exploration and exploitation, has a positive influence on project success.
H5: The top management team's support and guidance has a positive influence on project success.

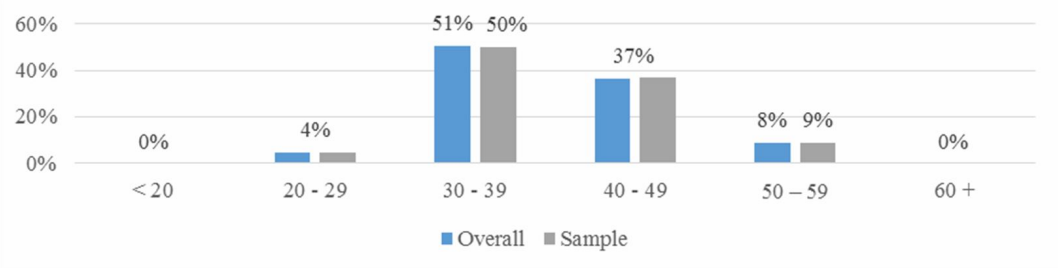

Figure 7: Distribution of Age; Soruce: Own illustartion

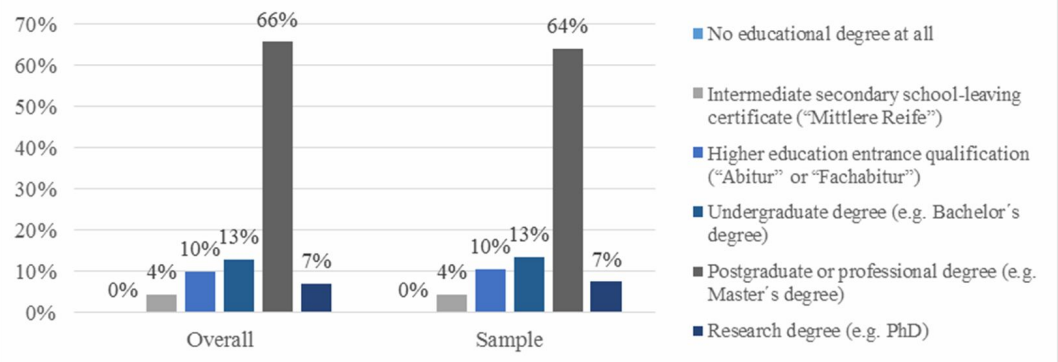

Figure 8: Distribution of Educational Levels; Soruce: Own illustartion

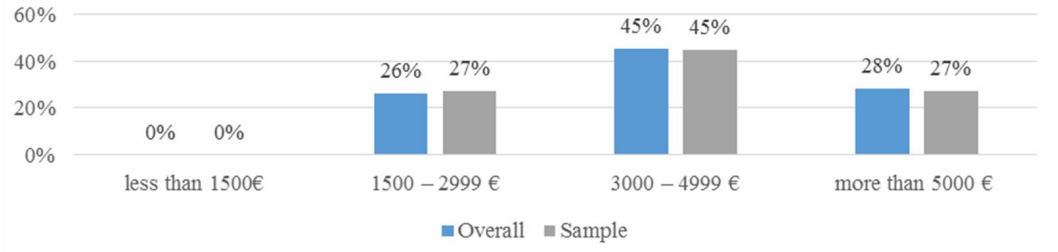

Figure 9: Distribution of Monthly Net Income; Soruce: Own illustartion

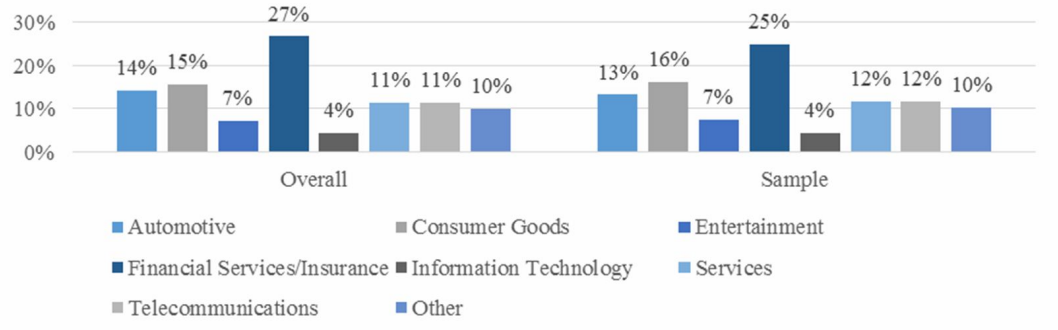

Figure 10: Distribution of Industries; Soruce: Own illustartion

196-199). 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 te 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 α chosen and the number of independent variables" (p. 170) which is to be seen in Table 3 for a significance level of α =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.[21] 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 α=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 χ^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 shown[23]. 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.

[21] For SPSS outputs please see Appendix 8.

[22] For SPSS outputs please see Appendix 8.

[23] For SPSS outputs please see Appendix 4.

Table 3: Minimum R^2 To Be Found Statistically Significant with a Power of 0.80; Own illustration based on (Hair et al. (2014), p. 170)

Significance Level a = 0.05 Number of Independent Variables				
Sample Size	2	5	10	20
20	39	48	64	-
50	19	23	29	42
100	10	12	15	21
250	4	5	6	8

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_o=101, sample: 26.1%, n_s=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 team size ranges from one to 60 team members (n_o=85, M_o=8, MD_o=5; sample: n_s=56, MIN_s=1, MAX_s=50, M_s=8.23, MD_s=5). When comparing these results to the survey on UCD practice among conference attendees in the United States conducted by Vredenburg et al. (2002b), it can be seen that the number of team members is approximately twice as high as the number stated by the UCD experts in this study. These teams also cover various departments as to be seen in Figure 12.

Most of the teams cover the fields of Design (overall: 81.4%, n_o=86, sample: 82.6%, n_s=69), IT (overall: 67.4%, sample: 65.2%) and Marketing (overall: 61.6%, sample: 59.4%). These findings are in line with the UCD principle of multidisciplinary teams (see chapter 2).

On average, these teams were in charge of M_o=18.64 (n_o=72, SD=23.18, Median(MD)=10) UCD projects in the last twelve months (sample: M_s=18.12, n_s=51, SD_s=22.46, MD_s=10); the persons interviewed were personally involved in M_o=6.22 (n_o=101, SD_o=11.44, MD_o=3, sample: M_s=6.08, n_s=69, SD_s=12.12, M_s=3) UCD projects. Vredenburg et al. (2002b) find slightly higher but still comparable values (M=7.98, MD=10) in their survey.

Most of the these projects concerned mobile or online applications (overall: 75.51%, n_o=98, sample: 78.26%, n_s=69) as well as intra- or internet websites (overall: 74.49%, sample: 68.12%). Open comments concerning the "other" option included games, toys and enterprise resource planning.

The objectives for applying UCD to which the participants had to rate their agreement on a seven-point Likert-scale from 1 ("strongly disagree") to seven ("strongly agree") are to be seen in Table 4.

The main reason for the participants to use UCD seems to be the improved customer satisfaction with the developed product (M_o=6.40, SD_o=0.97, M_s=6.35, SD_s=1.16) which is in line with the earlier described characteristics and principles of UCD (chapter 2). 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_o=6.15, SD_o=1.16, M_s=6.19, SD_s=1.16) as well as improved system quality due to more accurate user requirements (M_o=6.09, SD_o=1.10, M_s=6.10, SD_s=1.13) and the avoidance of costly features that the users do not want or cannot use (M_o=6.09, SD_o=1.18, M_s=6.04, SD_s=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_o=5.76, SD_o=1.35, M_s=5.86, SD_s=1.24) and increasing sales (M_o=5.32, SD_o=1.65, M_s=5.45, SD_s=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_o=96, n_s=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

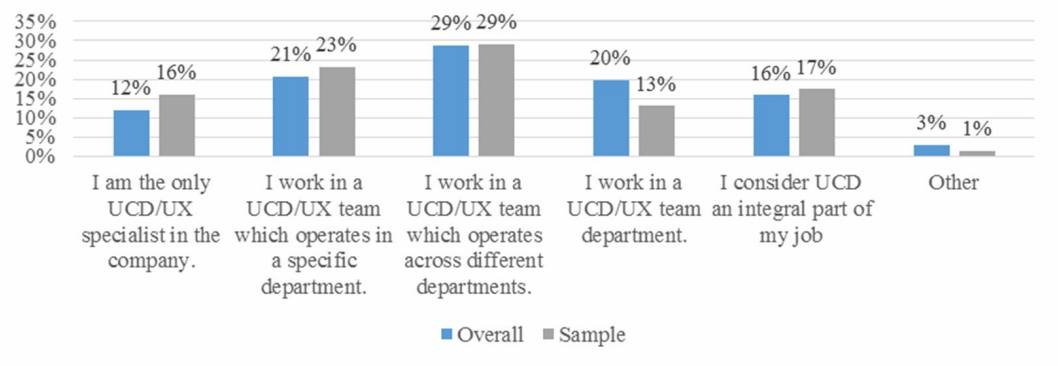

Figure 11: Distribution of Different UCD Setups; Soruce: Own illustartion

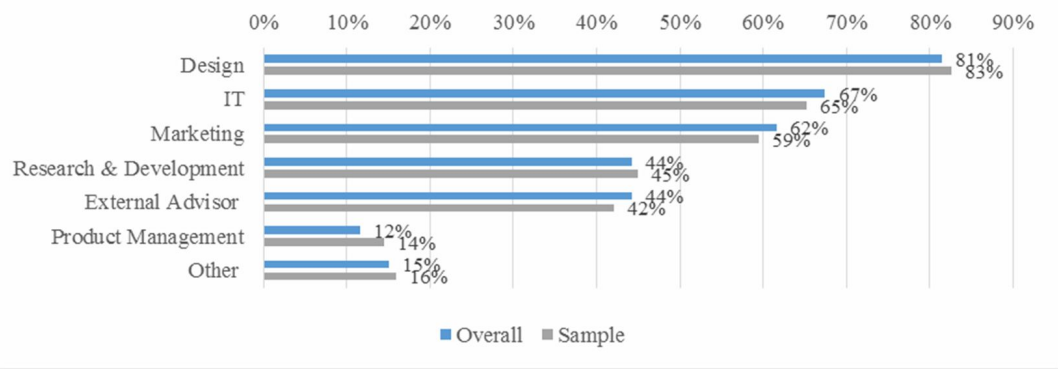

Figure 12: Team Composition; Soruce: Own illustartion

Table 4: : Objectives of Use of User-Centered Design; Source: Own illustration

Objectives	Overall			Sample		
	n	M	SD	n	M	SD
Improved quality of the system arising from more accurate user requirements	99	6 09	1 10	67	6 10	1 13
Avoidance of costly system features that the user does not want or cannot use	101	6 09	1 18	69	6 04	1 25
Improved levels of acceptance of the system	100	6 15	1 16	68	6 19	1 16
Enhanced customer satisfaction due to greater understanding of the system	100	6 40	0 97	68	6 35	1 03
Enhanced customer relationship from involving the user in the process	100	5 37	1 70	68	5 47	1 61
Getting contact with potential users	99	4 76	1 87	68	4 84	1 86
Increasing user productivity	98	5 76	1 35	66	5 86	1 24
Generation of innovative ideas	101	5 25	1 66	69	5 36	1 54
Increased participation in decision-making within the organization	96	5 07	1 47	66	5 17	1 35
Increasing sales	101	5 32	1 65	69	5 45	1 49
Reducing development cost	100	4 43	1 74	68	4 49	1 75
Reducing training costs	89	3 65	1 85	64	3 81	1 87
Reducing user support	98	5 04	1 62	67	5 04	1 64

for UIs.

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 in the overall (n_o=101) and calculation sample (n_s=69) and highlights the top three types of users per stage.

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-

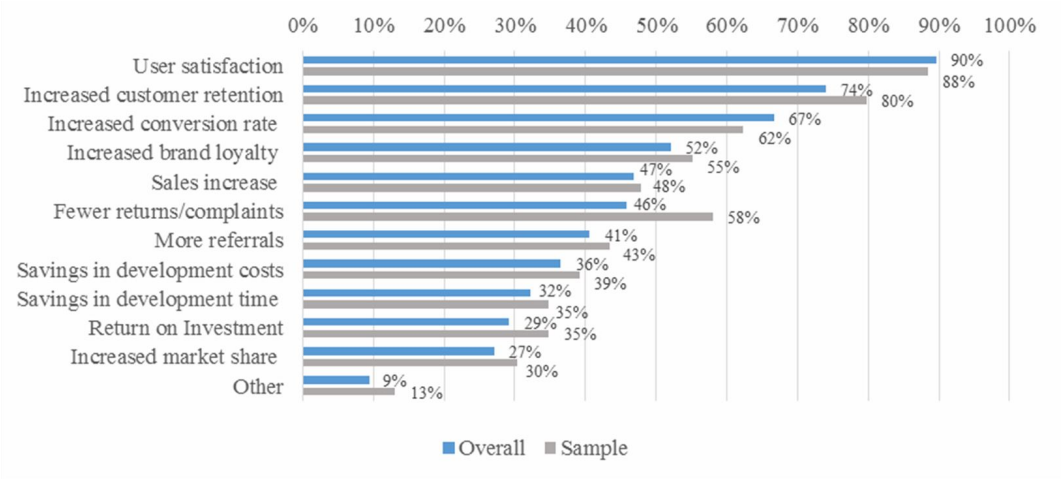

Figure 13: Key Performance Indicators for User-Centered Design Projects; Soruce: Own illustration

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

	Analysis		Design		Implementation		Deployment	
	Overall	Sample	Overall	Sample	Overall	Sample	Overall	Sample
Non-Users	57.29%	58.21%	42.71%	41.79%	31.65%	25.49%	33.33%	32.31%
Light Users	62.50%	61.19%	69.79%	68.66%	50.63%	50.98%	52.69%	53.85%
Heavy Users	73.96%	77.61%	82.29%	85.07%	67.09%	70.59%	62.37%	67.69%
Expert Users	66.67%	73.13%	69.79%	76.12%	56.96%	62.75%	51.61%	55.38%
Lead Users	50.00%	53.73%	59.38%	61.19%	49.37%	56.86%	48.39%	50.77%
Current Customers of Products/Services by my Company	60.42%	67.16%	55.21%	61.19%	39.24%	47.06%	40.86%	43.08%
Potential Customers of Products/Services by my Company	69.79%	71.64%	60.42%	64.18%	43.04%	47.06%	48.39%	50.77%
No User/Customer	4.95%	2.90%	4.95%	2.90%	21.78%	26.09%	7.92%	5.80%

opment process are heavy users (overall: 73.96%, n_o=101, sample: 77.61%, n_s=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_o=86), respectively 43.50% in the calculation sample (n_s=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_o=37, sample: 93.33%, n_s=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 Lowdermilk (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_o=86, sample: 92.75%, n_s=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-

Table 6: Methods Used during the Design Stage of the Development Process; Source: Own illustration

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

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 (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 to get feedback in the implementation and deployment stage of the product development process are qualitative interviews, task analyses, and surveys. 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.

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 (Fantappiè Altobelli (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[i]neinversetzen 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

	Conducted by internal personnel		Conducted by a domestice usability consulting company		Conducted by a foreign usability consulting company		Conducted by an university/ academic institution		Not conducted at all	
	Overall	Sample	Overall	Sample	Overall	Sample	Overall	Sample	Overall	Sample
Surveys	69.39%	70.00%	44.90%	42.50%	4.08%	5.00%	4.08%	2.50%	28.99%	27.27%
Qualitative Interviews	66.07%	68.89%	53.57%	48.89%	8.93%	11.11%	5.36%	4.44%	18.84%	18.18%
Focus groups	56.76%	56.67%	54.05%	53.33%	5.41%	6.67%	8.11%	6.67%	46.38%	45.45%
Task analyses & observations	77.36%	80.49%	32.08%	24.39%	1.89%	2.44%	5.66%	7.32%	23.19%	25.45%
Heuristic evaluations	72.73%	71.43%	27.27%	21.43%	9.09%	10.71%	6.06%	7.14%	52.17%	49.09%
Card sorting/ A/B testing	60.98%	61.29%	43.90%	38.71%	4.88%	3.23%	2.44%	3.23%	40.58%	43.64%
Ethnographic observation	61.54%	61.54%	38.46%	38.46%	7.69%	7.69%	0.00%	0.00%	81.16%	76.36%
Participatory design	68.42%	62.50%	42.11%	43.75%	5.26%	6.25%	0.00%	0.00%	72.46%	70.91%

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 vales 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

Facilitators											
Organizational Context		UCD Setup				UCD Process					
Customer Orientation	Top Management Team	(Multidisciplinary) Team				Iterative Approach	Users		Methods		
		Effective Team Work	Team Spirit	UCD Competence	Holistic View		Great Input	High Engagement	Timing	Implementation	
										Flexibility	High Responsiveness

Table 9: Obstacles of the User-Centered Design Process; Source: Own illustration

Obstacles											
Organizational Context			UCD Setup				UCD Process				
Top Management Team	No Valence within the Organization	Legal/ Inhouse Regulations	(Multidisciplinary) Team				No Project Management	Users		Methods		
			Lack of Employee Morale	Vanities	Coordination Problems	Missing UCD Competence		Recruiting Problems	Quality of Outcome	Time Constrains	Budget Constrains	Lack of Flexibility

Table 10: Results of Reliability and Factor Analyses; Source: Own illustration

Construct	Number of Items	Number of Factors	KMO	Variance Explained (%)	Item-Total Correlation	Cronbac's α
IT Competence	15	1	0.835	55.114	0.391 - 0.830	0.938
UCD Competence	7	1	0.884	60.884	0.644 - 0.734	0.884
Customer Orientation	8*	1	0.88	54.23	0.357 - 0.747	0.861
Innovativeness	2*	1	0.5	81.813	0.636	0.766
Exploration	6	1	0.794	61.164	0.533 - 0.770	0.869
Exploitation	6	1	0.845	59.896	0.509 - 0.761	0.861
Top Management Team	3*	1	0.659	64.772	0.491 - 0.616	0.766
Project Success	7	1	0.621	41.287	0.374 - 0.595	0.755

Sarstedt and Mooi (2014) claim that items can be removed from a multi-item scale to improve the reliability of the construct (p. 269). This was done for the constructs of Customer Orientation (one item removed), Innovativeness (two items removed) and Top Management Team (one item removed). The Kaiser-Meyer-Olkin (KMO) statistic which "indicates whether the correlation between variables can be explained by the other variables of the dataset" (Sarstedt and Mooi (2014), p. 242) shows that the factor analysis is meaningful for all constructs since the value is equal or above the threshold of 0.5 (Janssens et al. (2008), p. 256). Five of the constructs (IT Competence, UCD Competence, Customer Orientation, Exploration and Exploitation) show "middling" (0.70 – 0.79) to "meritorious" (0.80 – 0.89) scores, two (Top Management Team and Project Success) are "mediocre" (0.60 – 0.69) and only one construct has a 'miserable' (0.50 – 0.59) score (Sarstedt and Mooi (2014), p. 242). In addition, all but one construct indicate percentages for the total variance explained above the threshold of 50% (Fornell and Larcker (1981), p. 46). The correlation between the single items and the total construct are all above 0.30 which can be considered satisfactory (Homburg and Giering (1996), p. 8). Moreover, 'Cronbach's Alpha', i.e. a common measure to evaluate internal consistency of a construct, should reach a value of at least a value of 0,70. All of the constructs used in this study have values higher than this threshold and can therefore be considered reliable (Janssens et al. (2008), p. 274).

In terms of validity there are three aspects to be considered: content validity, construct validity and criterion validity (Fantappiè Altobelli (2011), pp. 165-166). Content and construct validity can be considered as given due to face validity since (most of) the constructs were adapted from existing literature (Sarstedt and Mooi (2014), p. 36). Criterion validity refers to the congruence of the measurement of a latent construct and of the corresponding criterion. It can be calculated by the correlation between the respective vales. This will be presented below.

5.3.2. Descriptive Statistics and Correlations of the Constructs

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 (='Losers') as well as the other subsample with success scores higher or equal to M=5.35 ('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 χ^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

[24]For SPSS outputs please see Appendix 7.

Table 11: Descriptive Statistics of the Constructs; Source: Own illustration

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

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

	Construct	Correlations						
		1	2	3	4	5	6	7
1	IT Competence	1						
2	UCD Competence	0.791**	1					
3	Customer Orientation	0.633**	0.657**	1				
4	Innovativeness	0.584**	0.364**	0.602**	1			
5	Ambidexterity	0.737**	0.589**	0.721**	0.665**	1		
6	Top Management Team	0.470**	0.498**	0.582**	0.451**	0.606**	1	
7	Project Success	0.113	0.186	0.417**	0.134	0.411**	0.327*	1

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

Motive	n		Mean		Significance
	Winners	Losers	Winners	Losers	
Improved quality of the system arising from more accurate user requirements	25	26	6.44	5.88	0.067*
Avoidance of costly system features that the user does not want or cannot use	26	26	6.12	5.73	0.3
Improved levels of acceptance of the system	26	25	6.42	5.88	0.108
Enhanced customer satisfaction due to greater understanding of the system	26	25	6.69	6	0.018**
Enhanced customer relationship from involving the user in the process	26	25	5.85	4.88	0.043**
Getting contact with potential users	26	25	4.88	4.73	0.772
Increasing user productivity	26	26	6.23	5.46	0.032**
Generation of innovative ideas	26	26	5.5	5.46	0.062*
Increased participation in decision-making within the organization	26	26	5.96	4.72	0.001***
Increasing sales	26	26	5.77	5.08	0.111
Reducing development cost	26	24	4.73	4.48	0.593
Reducing training costs	26	26	4.46	3.38	0.033**
Reducing user support	26	24	5.31	4.92	0.378

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

	Analysis			Design			Implementation			Deployment		
	Winner	Loser	Sig?	Winner	Loser	Sig?	Winner	Loser	Sig?	Winner	Loser	Sig?
Non-Users	64.00%	60.00%	No	38.46%	44.00%	No	27.78%	31.82%	No	36.36%	26.92%	No
Light Users	68.00%	60.00%	No	61.54%	68.00%	No	50.00%	40.91%	No	54.55%	46.15%	No
Heavy Users	80.00%	76.00%	No	84.62%	84.00%	No	61.11%	72.73%	No	68.18%	61.54%	No
Expert Users	68.00%	76.00%	No	61.54%	80.00%	No	44.44%	68.18%	Yes*	40.91%	53.85%	No
Lead Users	56.00%	48.00%	No	69.23%	52.00%	No	44.44%	59.09%	No	45.45%	50.00%	No
Current Customers	72.00%	64.00%	No	73.08%	52.00%	Yes*	55.56%	36.36%	No	45.45%	38.46%	No
Potential Customers	80.00%	68.00%	No	69.23%	64.00%	No	50.00%	40.91%	No	50.00%	46.15%	No
No User/ Customer Integration	3.85%	3.85%	No	0.00%	3.85%	No	44.44%	18.18%	No	18.18%	0.00%	Yes**

esting 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 χ^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[25] a multiple regression analysis was conducted[26]. The model to be tested is as follows:

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

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 α=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

[25] H1a: IT Competence has a positive influence on the project success.
H1b: UCD Competence has a positive influence on project success.
H2: Customer orientation has a positive influence on project success.
H3: Innovativeness has a positive influence on project success.
H4: Ambidexterity, i.e. exploration and exploitation, has a positive influence on project success.
H5: The top management team's support and guidance has a positive influence on project success.

[26] For SPSS outputs please see Appendix 8.

Table 15: Methods Used for Feedback & Testing (Winners vs. Losers); Source: Own illustration, * p<0,1

	Conducted by internal personnel			Conducted by a domestic consulting company			Conducted by a foreign consulting company			Conducted by an academic institution			Not conducted at all		
	Winners	Losers	Sig?	Winners	Losers	Sig?	Winners	Losers	Sig?	Winners	Losers	Sig?	Winners	Losers	Sig?
Surveys	61.11%	80.00%	No	55.56%	33.33%	No	5.56%	6.67%	No	0.00%	6.67%	No	21.74%	25.00%	No
Qualitative Interviews	65.00%	75.00%	No	45.00%	50.00%	No	5.00%	25.00%	No	5.00%	6.25%	No	13.04%	20.00%	No
Focus groups	56.25%	63.64%	No	56.25%	45.45%	No	6.25%	9.09%	No	12.50%	0.00%	No	30.43%	45.00%	No
Task analyses & observations	83.33%	78.57%	No	22.22%	14.29%	No	0.00%	7.14%	No	11.11%	7.14%	No	21.74%	30.00%	No
Heuristic evaluations	53.85%	81.82%	No	30.77%	18.18%	No	7.69%	18.18%	No	15.38%	0.00%	No	43.48%	45.00%	No
Card sorting/ A/B testing	64.29%	42.86%	Yes*	35.71%	57.14%	No	0.00%	14.29%	No	7.14%	0.00%	No	39.13%	65.00%	Yes*
Ethnographic observation	80.00%	50.00%	No	40.00%	33.33%	No	0.00%	16.67%	No	0.00%	0.00%	No	78.26%	70.00%	No
Participatory design	83.33%	50.00%	No	33.33%	50.00%	No	0.00%	16.67%	No	0.00%	0.00%	No	73.91%	70.00%	No

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

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

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[27]. 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[28].

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-

[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 screenflow 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 the 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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