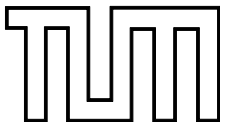

FAKULTÄT FÜR INFORMATIK
DER TECHNISCHEN UNIVERSITÄT MÜNCHEN

Chair for Information Systems

Analyzing and Leveraging Benefits of Online Social Networking for the Elderly –

Effects and Design of Social Networking Sites

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Vollständiger Abdruck der von der Fakultät für Informatik
der Technischen Universität München zur Erlangung des akademischen Grades eines

Doktors der Naturwissenschaften

genehmigten Dissertation.

Vorsitzender: Univ.-Prof. Dr. Johann Schlichter

Prüfer der Dissertation:

1. Univ.-Prof. Dr. Helmut Krcmar
2. Univ.-Prof. Dr. Jan Marco Leimeister, Universität Kassel

Die Dissertation wurde am 31.10.2013 bei der Technischen Universität München eingereicht und durch die Fakultät für Informatik am 22.04.2014 angenommen.

The dissertation thesis was written independently and without the aid of unfair or unauthorized resources. Indications of sources are given whenever content was taken directly or indirectly from other sources.

Garching b. München, October 2nd, 2013 _____

Place, Date Signature

Abstract

Motivation An aging population is a reality in most developed societies today. This shift in the demographic profile poses significant challenges not only for governments, healthcare providers, and societies at large, but also for elderly individuals in specific. In particular, this includes devising ways of involving elder individuals actively into the society since they face a higher risk of suffering social exclusion. Research in geriatric science has found that the lack of participation in social activities and reduced social contacts increase the risk of functional decline among elderly, while emotional support from social networks can keep them functionally capable. Therefore, social integration is crucial for the overall well-being of the elderly. Addressing issues related to an aging population in a more effective and efficient manner by making use of modern technological advances is an area of growing interest among researchers and policy makers. On the background of advances in information and communication technologies (ICT), a novel modality of social interaction emerged creating a participative human-centric virtual environment – namely online social networking – that has generated significant academic as well as industrial interest. However, there is little research investigating online social networking among the elderly and its potential socio-psychological benefits for this group of users.

Purpose The purpose of this work is (i) to identify expectations, needs, and concerns of the elderly towards online social networking; (ii) to analyze socio-psychological benefits potentially realized through adoption and use of social networking sites (SNS); and (iii) to investigate means of leveraging these benefits through adequately designed SNS functionalities.

Methodology This thesis followed the call for studies that intertwine behavioral science and design science research within the Information Systems (IS) and Human Computer Interaction (HCI) disciplines and consequently implied a broad range of qualitative and quantitative methods. A brief review of IS, HCI, and social sciences research literature delineates related work on *online social networking* and the scope of the underlying thesis. A series of exploratory focus group and semi-structured interviews, and an explorative quantitative study in form of an online survey (N = 102) were conducted in order to identify and better understand expectations, needs, and concerns towards online social networking among the elderly. An extensive literature review of relevant socio-psychological notions and an explorative quantitative study (N = 109) on the formation of social connectedness on the SNS Facebook supported me in theory building and the development of proposed measurement and structural research models. Established hypotheses on cause-and-effect relationships between constructs and corresponding measurement models were then tested by employing two surveys in the form of online questionnaires distributed within the SNS Twitter (N = 121) and Facebook (N = 147). Deduction of social design principles followed a theory-driven design approach. An experimental methodology was chosen to evaluate selected social design principles with elderly subjects that comprised of a laboratory experiment and quantitative evaluation based on expectation-confirmation theory, and a longitudinal field test and confirmatory focus group interviews (N = 51).

Results Elderly individuals primarily expected online social networking to constitute a supportive mean to their real-world social interactions and existing offline social networks. The

majority of elderly subjects indicated needs towards online social networking mostly relating to social searching behavior on SNS confirming earlier findings that the direction of SNS use is typically from offline to online. Main concerns expressed about data security and privacy on contemporary SNS may be explained by incomprehension and complexity of settings. Exploratory findings are summarized to a classification scheme of elderly SNS users. The thesis further identified social connectedness and social support as two relevant psychological notions in online social networking that are positively associated with each other and positively related to an individual's social capital, and potentially enhance subjective well-being of SNS users. Findings further suggest that frequency of use has a positive moderating effect on the relationships between social support, social connectedness, and social capital in online social networking. However, such an effect cannot be demonstrated for network size. Evidence and theoretical insights resulted in compilation of 14 social design principles that support developers of social systems in appropriate design decisions and thinking, and expand currently available descriptions such as the Facebook Social Design Guidelines.

Research contribution / Originality Thus far, the IS and HCI research on online social networking mostly ignores elderly individuals and focuses on target populations composed of predominantly younger users who are usually the early adopters and the more active users of such technologies. Therefore the thesis provides a systematic investigation on attitudes of elderly individuals, such as their expectations, needs, and concerns, towards online social networking. Conducted empirical studies extend social psychology, IS, and HCI research, which has investigated similar constructs and contributed to the theoretical development and understanding of the psychological notions social support, social connectedness, and social capital in online social interaction. Furthermore, this thesis constitutes one of the first studies to combine behavioral science and design science research in an overarching approach to not only translate theoretical understanding into concrete social design principles by applying theory-driven design, but also to evaluate principles through prototype configurations among elderly individuals.

Contributions to practice Not only designers and developers of social systems, but also geriatric care personnel, policy makers, and urban planners could benefit from findings in broadening their knowledge of how online social interactions affect individuals in the real-world. Yet, the primary practical contribution consists of the proposed social design principles that could be either consulted to justify design decisions or directly implemented by developers to build prospective and appropriate social systems for elderly users.

Research limitations / Further research General validity of both exploratory and empirical research conducted in the course of this thesis is primarily limited due to applied snowball sampling. Due to small sample sizes and the need to conserve degrees of freedom, various potential moderating effects of demographic characteristics were not evaluated or included in the conducted analyses. Evaluating design principles and prototype configurations in experimental settings gives rise to limitations that are inherent to this research methodology. Hence, IS and HCI researchers are invited to modify and extend established structural models and further enhance applied measurement items in order to broaden our theoretical understanding of socio-psychological implications in the SNS use. Future research should more intensely focus on negative effects of online social networking (SNS use) among the elderly such as

information overload, friend inflation, or negative socio-psychological notions such as jealousy. Designers and developers are prompted to test, enhance, and implement proposed social design principles in order to build appropriate social systems and social experiences for elderly users.

Keywords: Online social networking, elderly, social networking sites, social support, social connectedness, social capital, design science research, theory-driven design, evidence-based design, social design principles

Acknowledgements

First and foremost, I am sincerely thankful and grateful to my research and thesis advisor, Prof. Dr. Helmut Krcmar, not only for the valuable support and guidance he showed me throughout my thesis writing, but also for the opportunity to conduct the underlying research at his Chair for Information Systems at the Technische Universität München. Secondly, I would like to express my gratitude to Prof. Dr. Jan Marco Leimeister, who made it possible for me to work in his research group and has supported me in every way through the last years. Through many discussions – at times excruciating, but always highly motivating, I found a reliable and excellent mentor in my research endeavor.

Many thanks to Prof. Dr. Marilyn Tremaine who supported me with her years of scientific experience and helped me take the first steps in the world of academia within her research group at Rutgers University. Moreover, I highly enjoyed our fun debates and conversations about research and sciences in general. Further I would like to thank Dr. Suparna Goswami for her countless discussions, detailed comments and helpful guidance.

I wish to extend my thanks to the Bundesministerium für Bildung und Forschung (BMBF) for funding the research project Mobil50+ and to the team, namely Andreas Prinz, Philipp Menschner and Agnieszka Horsonek.

I would like to thank my former colleagues Philip Koene, Sebastian Esch, Dr. Christoph Riedl, Dr. Ali Sunyaev, Dr. Ivo Blohm, Dr. Sebastian Dünnebeil, Michael Huber for their encouragement, ideas, opinions and Jens Fähling for his substantive, but never-ending discussions. I also highly value the newly formed friendships during our time at the Chair for Information Systems.

Besides I am thankful for the great collaboration with my students Dora Tili, Felix Fritzsche and Martin Hoeckrich as well as my scientific assistants Jörg Heilmann, Sascha Lunow and Julian Fischer.

Sincere thanks are given to my very good friends Lorenz Ring, Lisa Wan and Matthias Böck for proof-reading my thesis – I already found an appropriate reparation for their efforts. Dr. Céline Vetter for her helpful cross-disciplinary opinions and insights.

Last but not least, I am thankful for the continuous emotional support of my family, my parents Rita and Hans-Joachim, who always encouraged me in my decisions from the first day at school to writing the underlying thesis. I need to thank Clemens for not being just a brother, but one of my best friends and my girlfriend Yanamé for her endless motivation and support. I am sure it would have not been possible without their help.

Munich, October 2013 Felix Köbler

Table of contents

Table of figures

Table of tables

Abbreviations

σ	Standard Deviation
ANOVA	Analysis of Variance
API	Application Programming Interface
AVE	Average Variance Extracted
CFG	Confirmatory Focus Group
ECM	Expectation-Confirmation Model
ECT	Expectation-Confirmation Theory
EFG	Exploratory Focus Group
ERP	Enterprise Resource Planning
EU	European Union
FoF	Friends-of-Friends
HCI	Human Computer Interaction
HTML5	HyperText Markup Language 5
ICT	Information and Communication Technology
IS	Information Systems
IT	Information Technology
MM	Million
PLS	Partial Least Squares
SCP	Social Computing Platform
SNS	Social Networking Site
TAM	Technology Acceptance Model
UK	United Kingdom
USA	United States of America
VC	Virtual Community/Virtual Communities
WHO	World Health Organization

1 Introduction

Two currently observable phenomena – the drastically *progressive demographic shift* in most societies *and* the exponential growth and adoption of *online social networking* – served as core inspiration and motivation for the underlying thesis.

Social integration is decisive for the overall psychological *well-being* of the elderly who are more prone to social exclusion due to the natural aging process and current demographic shift in most modern societies. The thesis proposes to apply *online social networking* as means to convey and increase social interaction and integration as well as to generate social benefits through use of *social networking sites* (SNS) among elderly individuals.

While prior research investigating the benefits of *online social networking* has primarily focused on user groups such as teenagers and college students, there is less understanding on how online social networks can be used to support and strengthen social ties of the elderly and more importantly how these systems have to be designed to address expectations, needs, and concerns among elderly individuals towards this novel modality of computer-mediated communication and online social interaction as well as to leverage social benefits through their use.

Based on research on *online social networking*, the thesis proposes that SNS addressing these specific needs will be successful among elderly users and consequently have a positive effect on elderly people's overall psychological *well-being* as well as countervail social exclusion of elderly individuals. Furthermore, given that current SNS are particularly targeted towards younger people, the aim of the underlying research is to identify, suggest, and evaluate design principles for functionalities of online social networks that especially cater to the specific needs of elderly users and moreover leverage social benefits through use of and participation on SNS.

In the following sections, I intend to depict the primary motivation (see section 1.1) for the underlying thesis. I then outline the fundamental research problem (see section 1.2) and accordingly delineate the objectives and research questions (see section 1.3). The chapter ends with a brief outline of the thesis (see section 1.5).

1.1 Motivation

An aging population is a reality in most developed societies today[1]. In Germany for instance, it has been reported that by the year 2050 more than 30% of the population will be made up of people over the age of 65 (Eisenmenger/Pötzsch/Sommer 2006, 17). This shift in demograph-

[1] The following section contains textual material that has been previously published in the Proceedings of the 31st Annual International Conference on Information Systems entitled "Using Online Social Networking to Enhance Social Connectedness and Social Support for the Elderly" (Goswami et al. 2010, Paper 109). The list of contributive authors comprises Suparna Goswami, Jan Marco Leimeister and Helmut Krcmar.

ic profile poses significant challenges for the government, healthcare providers, and the society at large. Such challenges not only include monetary costs in terms of providing healthcare and other social benefits to the elderly, but also devising ways of keeping them functional (both cognitively and physically) and active in society, since intensified progression of the demographic shift negatively affects current predominant and traditional social structures and complicates social integration of elderly individuals.

In addition to age and health-related problems, elderly individuals also face a higher risk of suffering *social exclusion* (Craig 2004, 95ff). Consequently, one of the most important duties and responsibilities of today's societies is the assurance of quality of life for their elderly demographic segments. Additionally it is necessary to avert the risk of *social exclusion*, since mental fitness and social participation have a strong reciprocal influence given that social interaction is essential to satisfy various basic human needs such as that of being loved and the need to belong (Maslow 1970, 20f). Sense of belonging and community are important aspects of people's overall quality of life (Putnam 2000, 92) that influence both social and psychological *well-being* (see sections 5.1.1 and 5.1.2).

Research in geriatric science has found that lack of participation in social activities and reduced social contacts increases the risk of functional decline among elderly, while *emotional support* from social networks can keep them functionally capable (Stuck et al. 1999, 459). Communities or social networks result from interaction with other human beings and are therefore essential for giving access to several forms of social benefits such as *social capital* (Huysman/Wulf 2004, 2). Benefits accrue to individuals and groups through social interactions (Bandiera/Barankay/Rasul 2008, 743ff; Granovetter 1973, 1360). Such benefits evolving from interactions between human beings are termed as *social capital* and can serve as a strong motivation for establishing and maintaining social connections (Adler/Kwon 2002, 17; Bourdieu 1986, 249) and also strengthen individuals' social networks.

Social networks can be described by *structural* characteristics such as the network size, density, strength of ties and homogeneity (Scott 2000, 69ff; Seeman/Berkman 1988, 738) and *functional* characteristics such as *social connectedness*, *social support*, *social capital*, social influence and social comparison (Berkman/Glass 2000, 141ff). While the *structural* characteristics describe the properties of the social network at large, the *functional* characteristics can influence the general social and psychological *well-being* of network members.

In general, these *structural* and *functional* attributes of social networks are negatively influenced by rapidly changing prevailing social structures in societies on the background of a current demographic shift towards elderly segments in the population. In addition, social networks of elderly individuals are exposed to major life course events typical of their age such as the loss of a life partner and social circles due to entering retirement, which additionally weaken established social networks.

Hence, evidence of previous research suggests that elderly individuals who maintain strong social relationships are more likely to lead independent lives and to be integrated in community settings longer than elderly individuals who preserve smaller social networks or are socially isolated (Ashida/Heaney 2008, 873).

Following Carroll (2010, 641), in addition to various efforts that realize and foster social integration and interaction as well as prevent social exclusion of elderly individuals by applying traditional and existing means such as legal provisions or politically motivated support programs, "an important complementary strategy is to develop, appropriate and apply technological mediation so as to enhance interaction to levels not possible in a face-to-face world". Addressing issues related to an aging population and the social needs of elderly demographic segments in a more effective and efficient manner by making use of modern technological advances is therefore a growing concern among researchers and policy makers. Specifically, research projects and efforts that study how elderly people can perpetuate their lives without being socially excluded from society through strengthened individual social networks and allow them to thrive in social interactions through novel and innovative ways gain importance in multiple scientific disciplines.

In parallel to the continuous drastic shift of demographic structures in most modern societies and its mostly negative effects on individuals and society at large – fueled by rapid advances in information and communication technologies (ICT) – the phenomenon of *online social networking* has evolved that has created a participative human-centric virtual environment and consequently received increased significant academic as well as industry interest in recent years. In addition to real-life or offline social interactions for maintaining social connections, SNS have evolved into significant means for developing, maintaining, and strengthening social connections as well as fostering a novel modality of online social interaction among humans (Brandtzæg/Lüders/Skjetne 2010, 1006ff; Ellison/Steinfield/Lampe 2007, 1143; Humphreys 2007, 341; Vasalou/Joinson/Courvoisier 2010, 719ff). This novel form of computer-mediated communication and online social interaction is increasingly consuming a significant and growing portion of people's time and attention (Bapna et al. 2011, 2).

SNS have grown exponentially in their registered and active number of users since the turn of the century (Huberman/Romero/Wu 2008, 2). They basically allow its users to individually present themselves in the notion of profiles, display their social networks, and establish or maintain connections with others (Ellison/Steinfield/Lampe 2007, 1144) in order to follow the lives of friends, acquaintances, and families. These systems enable its users to establish and manage online social networks and hence support users to maintain and strengthen existing real-life social networks.

Contemporary SNS are composed of functionalities that could address and potentially counteract problems related to *social exclusion* among elderly individuals in light of the demographic shift and various other negative implications for individuals and most modern societies at large. This could be realized by providing adequately designed SNS functionalities with the aim (i) to lower the risk of social exclusion of continuously growing elderly demographic segments in today's societies; (ii) to facilitate alternative means to support the social life of elderly individuals as well as to provide a novel socio-technological intervention to reap potential social benefits for elderly individuals such as increased *social capital* or heightened feelings of *social connectedness*; as well as (iii) to prevent elderly individuals from being left behind in novel and rapidly changing means of computer-mediated communication and online social interaction.

The phenomenal growth and adoption of *online social networking* over the last decade has accordingly resulted in heightened research and practical interest in them and serves as a fertile ground in research disciplines such as Information Systems (IS), Human Computer Interaction (HCI) and social sciences (Ji 2010, 1003ff; Oinas-Kukkonen/Lyytinen/Yoo 2010, 62ff).

Examples of contemporary SNS are the SNS Twitter, Facebook, and most recently Google+, and they represent the most dominant SNS in terms of registered and active user numbers by 2012.

Initial research approaches have attempted to understand the phenomenon by focusing on issues such as what motivates people to join and regularly participate on SNS, characterizing and classifying different groups of user types, benefits and gratifications that users experience from participating in such sites as well as on risks and costs (e.g., such as security and privacy implications for users) incurred from participation (Acquisti/Gross 2006, 42ff; Ellison et al. 2007, 1145; Lampe/Ellison/Steinfield 2006, 167ff). Findings of recent research suggest that SNS potentially serve as important sources of *social capital* and consequently various benefits that can be realized through enhanced *social capital* (Ellison et al. 2007, 1153-1161; Steinfield/Ellison/Lampe 2008, 435; Zhao/Rosson 2009, 244ff). Furthermore, adoption and use of SNS "could support social endeavor *in ways never before possible*" and potentially constitute an option to address predominate social needs among (elderly) individuals by supporting and conveying "the extant strengths of human social interaction" (Carroll 2010, 641).

Therefore SNS tap into that potential and display one such option by providing systems and specific functionalities to address previously described social needs among (elderly) individuals, e.g., especially that of advanced senior citizens suffering from limited mobility (Mollenkopf/Doh 2002, 389ff), and to potentially lower the risk of *social exclusion*. Based on research on *online social networking*, the thesis proposes that SNS addressing these specific needs and requirements are likely to be actively used and successfully adopted by elderly users, and therefore potentially generate social benefits for elderly individuals that further might result in positive effects on an individual's subjective *well-being* and overall *satisfaction with life*.

However, in most documented research concerning *online social networking,* the target population has been college students or teenagers, i.e., predominantly young people who are usually the primary target user group and consequently early adopters as well as the more active users of novel ICT applications and systems. Barring a few examples (Kanayama 2003, 267ff; Wright 2000, 100ff), there has been little research investigating computer-mediated communication and online social interaction through *online social networking* among the elderly, the motivations that elderly might have in participating in such networks and factors that can facilitate or inhibit them (see section 4). Hence, there is little understanding regarding the factors that can facilitate SNS use among the elderly and whether active participation in SNS potentially leads to different socio-psychological results as well as beneficial outcomes for elderly users. The possible ways of using these novel technologies to support social interaction and other needs among the elderly is therefore much less understood.

Ashida/Heaney (2008, 889) called for research to increase the understanding of functionalities implemented in contemporary SNS and their effectiveness in order to improve intervention efforts and to leverage beneficial aspects to promote health, longevity, and social and psychological *well-being* of elderly individuals. Accordingly Burke/Marlow/Lento (2010, 1909) demanded research that could benefit social psychologists, developers, and designers to attain an "understanding of what SNS users are actually doing, and the relationship between their feature use and feelings of connection to others" by focusing on users' activities within SNS and potential beneficial outcomes resulting in increased (social and psychological) *well-being*.

Although there are some indications that older adults are increasingly joining some of the popular online social networks (see section 2.3), penetration of SNS is still quite low among elderly individuals, and existing online social networks primarily target younger individuals, who currently form the largest user group. However, there has not been any systematic investigation on (i) attitudes of elderly individuals such as their expectations, needs and concerns towards *online social networking*; (ii) differing SNS user types in elderly age segments, (iii) how existing functionalities can effectively support specific needs for the elderly; and (iv) continuatively on how functionalities need to be adequately designed for elderly users to foster adoption and to realize potentials of *online social networking* given that current SNS are particularly targeted towards younger people – and therefore might not always be suitable for elderly users having different levels of ICT use skills and familiarity (Saunders 2004, 573ff).

To conclude, the underlying thesis (i) primarily proposes the use of *online social networking* to facilitate social interactions among elder individuals and hence help reduce the risk of *social exclusion* by the use of adequately designed SNS functionalities; and consequently (ii) elaborates and suggests a set of evaluated and appropriate design principles for online social networks targeted to elderly users to ensure elderly demographic segments are not excluded from this novel form of computer-mediated communication and online social interaction, and prospective developments in *online social networking*.

In the following section, I attempt to outline the research problem tackled in context of the underlying thesis in greater detail and consecutively derive the research questions in the successive section.

1.2 Research problem

As computers and the Internet ubiquitously permeate and enhance different aspects of human life and increasingly influence social and human interactions, there is an increasing realization that one group of users – the elderly – especially are at risk of being left behind in *online social networking*. In parallel to these socio-technological developments, elderly individuals are highly affected by negative consequences of an occurring demographic shift in most modern societies and primarily threatened by *social exclusion*.

Previous research further indicates that elderly users differ from younger users both in terms of their attitudes regarding ICT and system use as well as their capabilities (Saunders 2004, 573ff). Research investigating the effects of age on the use of ICT and systems documented

clear age-related differences in the importance of various factors in technology adoption and use (Morris/Venkatesh 2000, 357).

There is a growing necessity to take into account the specific (socio-technical) needs of this specific audience and investigate ways of addressing these requirements and needs in describing and finding novel and innovative means. Therefore the underlying thesis addresses these needs by examining the viability of computer-mediated communication and online social interaction through SNS as means of facilitating social interaction, integration, and potential social benefits such as *social connectedness* and *social support* by providing adequate design principles of SNS functionalities that especially cater to social needs and requirements of elderly individuals.

Much of the early research in the IS and HCI research disciplines on computer-mediated communication and online social interaction focused on *virtual communities* (VCs) (see sections 2.2.4.2 and 3.3) – the predecessor systems of current SNS – and has been based on the assumption that individuals participating in VCs would be using these platforms to connect with other individuals outside their pre-existing social group or location primarily based on shared interests or shared life scenarios (Wellman et al. 1996, 220, 222). The role of VCs in providing *informational*, *emotional* and *appraisal support* to elderly and patients groups has been investigated (Kanayama 2003, 276-288; Leimeister et al. 2008, 360-367). Studies of geographically co-located community supported by online networks have further shown that computer-meditated communication and online social interactions have positive effects on community interaction and involvement (Hampton/Wellman 2003, 279ff, 301ff; Kavanaugh et al. 2005, 498ff; Kavanaugh/Patterson 2001, Article 3). While some recent projects were able to demonstrate that the use of online social networks to support geographically co-located communities resulted in higher levels of network identity (Hampton/Wellman 2003, 301f), none of these projects specifically focused on an elderly user population or the specific needs and requirements of this particular target user group towards the design of functionalities in systems such as SNS to foster adoption and active use of these novel socio-technological systems.

Furthermore, contemporary SNS can be distinguished from VCs by the fact that SNS are primarily used for the maintenance of existing ties, although they also allow for the creation of totally new online ties. For instance, in the SNS Facebook, the direction of use is typically from offline to online, i.e., people are more likely to use it for maintaining their offline social network, rather than creating purely online ties. The use of such *online social networking* helps in strengthening and intensifying offline relationships that people establish and maintain in the real-life (Ellison/Steinfield/Lampe 2007, 1144; Lampe/Ellison/Steinfield 2006, 167ff).

Existing SNS functionalities potentially address some previously mentioned social needs of elderly individuals and societal issues triggered by the demographic shift. However, there has not been any systematic investigation on expectations, needs, and concerns that elderly users are likely to have regarding *online social networking* and SNS use, how implemented SNS functionalities can support these specific (socio-technical) needs effectively, and how functionalities need to be adequately designed to potentially generate and leverage social benefits for the elderly.

The thesis consequently aims to explore expectations, needs, and concerns of elderly individuals towards *online social networking* by applying explorative research methods, to analyze (socio-technical) needs of elderly individuals, and to explore how these socio-technical needs can be better supported through the use of *online social networking*. Drawing from research in psychology and gerontology, I identify the need to feel *socially connected* and perceived *social support* as two important aspects of social needs that humans and especially elderly individuals have. Based on previous research on *online social networking*, I propose that SNS which address these socio-technical needs will be successful among elderly users and potentially have a positive effect on elderly people's overall psychological *well-being* and *satisfaction with life*. Gained explorative evidence and theoretical understanding can facilitate the design of SNS functionalities that cater to this specific user audience and therefore make it possible for elderly individuals to take advantage of SNS use and to realize various social benefits through active participation.

I therefore attempt to identify and evaluate design principles for SNS functionalities that potentially enhance the feeling of *social connectedness* and foster *social support* among elderly individuals. Current SNS are particularly targeted towards younger people and therefore only cater to requirements of a younger segment of the population. Current functional implementations might not always be suitable for elderly users having different levels of skills and familiarity of ICT and systems use as well as computer literacy (Saunders 2004, 573ff).

The subsequent section summarizes the three *research questions* of the underlying thesis and briefly delineates their particular *objectives*.

1.3 Research questions and objectives

The thesis is structured based on three *research questions* and their corresponding research activities.

RQ 1: What are the expectations, needs, and concerns that elderly (non-) users are likely to have regarding online social networking?

The purpose of the conducted explorative study was (i) to examine expectations, needs and concerns elderly individuals have regarding *online social networking* as well as (ii) to gain an initial understanding on specific and prospective (socio-technical) requirements of elderly individuals towards *online social networking* and SNS in specific. The chosen explorative approach was two-fold and comprised an (i) *explorative qualitative study* and (ii) *explorative quantitative study* that focused on the analysis of use behaviors and preferences elderly SNS user populations exhibit towards specific SNS functionalities – based on the example of the most dominant contemporary SNS Facebook – and *online social networking* in general. Hence the conducted explorative studies primarily address the call for more research investigating ICT and system accessibility issues faced by elderly individuals and serves as a starting point for drafting social design principles towards better and age-specific design of social systems and applications – such as SNS (Arch 2008).

Documented evidence and findings of conducted explorative studies were primarily applied to derive social design principles for SNS functionalities that especially cater to requirements of elderly individuals towards *online social networking*. I summarize findings to *a classification for SNS users Age 50+* which primarily serves to define the target audience for the proposed social design principles for SNS functionalities in the underlying thesis and supported me to gain a better understanding of elderly SNS users and their characteristics in order to leverage (social) benefits as well as to counteract previously described negative effects of the demographic shift on elderly individuals through the utilization of *online social networking*.

The classification could additionally support designers and developers in building *personas* – a design technique increasingly applied in activities included in *user-centered, scenario-based* and *interaction design* to conceptualize human computer interactions (Pruitt/Grudin 2003, 1) – in order to build adequate and better social systems and functionalities that especially cater to elderly individuals.

RQ 2: What are determinants of social capital and its effects in online social networking for users?

An extensive review on literature in the fields of psychology, gerontology, and sociology resulted in the identification and theoretical understanding of *social capital* as overarching theoretical framework for the proposed research model to define determinants and effects of *online social networking* use for the elderly. The theoretical notions *social connectedness* and *social support* as means of overcoming social isolation, and enhancing social integration in the lives of elderly people were identified as potential determinants of *social capital*. While the theoretical notion of *social support* has been well documented in previous research primarily originating from psychological and sociological research disciplines, e.g., literature provides established operationalization and validated measurement items, the former construct lacks theoretical grounding and understanding in the context of computer-mediated communication and online social interaction. Therefore, in the course of the underlying thesis two studies have been conducted (i) to develop a deepened theoretical understanding of *social connectedness* in the context of *online social networking*; (ii) to test and refine appropriate established measurement items, and (iii) to identify and propose novel measurement items.

On the background of theoretical reviews on the notions *social connectedness*, *social support,* subjective *well-being*, and a deepened understanding of the notion *social connectedness* in the light of *online social networking,* the thesis proposes that active participation in SNS will have positive implications for prospective achieved *social capital* of an individual through this novel form of computer-mediated communication and online social interaction.

Furthermore, I advocate to utilize the theoretical construct *social capital* as a mediator variable for an individual's *well-being* and as the overarching theoretical framework in the proposed research model, since direct effects of *social support* and *social connectedness* on an individual's *well-being* or *health* are more difficult to measure (Bowling/Farquhar/Browne 1991, 563f). Therefore, the established research model proposes that participation in SNS will have positive implications for the overall *well-being* of active SNS users.

An online survey was designed to measure perceived *social connectedness, social support, social capital,* and *well-being* among participating SNS users using data collected from younger and respectively elderly SNS users in order to derive comparative results and findings to be utilized in the theory-driven deduction of social design principles.

RQ 3: What are design principles for adequate conceptualization of SNS functionalities for the elderly?

Based on gained explorative insights and theoretical understanding documented in RQ1 and RQ2, a specific set of social design principles of SNS functionalities is identified that (i) cater to specific (socio-technical) requirements based on expectations, needs, and concerns of elderly individuals towards *online social networking* and (ii) facilitate *social connectedness*, *social support,* and *social capital* to induce *well-being* of elderly individuals.

The ultimate goal of designers is to understand how features and functionalities of the designed system or application get embodied into users' behaviors and practices to satisfy their motivations and expectations from the system (Vasalou/Joinson/Courvoisier 2010, 725). Therefore a *laboratory experiment* (quantitative evaluation) and *longitudinal field test* (qualitative evaluation) were chosen to evaluate a selection of proposed design principles with the objective of assessing the extent to which proposed design principles (i) fulfill (socio-technical) requirements based on expectations, needs, and concerns towards *online social networking* expressed by elderly individuals, and (ii) bear the potential to leverage social beneficial outcomes such as *social connectedness*, *social capital,* and psychological *well-being* through the use of SNS functionalities among elderly individuals. The extent of user satisfaction can act as an evaluation of the design and implementation characteristics of a system or application (Wixom/Todd 2005, 98ff). The chapter concludes with a set of selected evaluated design principles for online social networks targeted to elderly users to avoid elderly demographic segments to be excluded from this novel form of social interaction as well as to foster and leverage social benefits for elderly individuals in appropriate means.

To summarize, the research aims to follow a multi-pronged approach that comprises the

(i) understanding of the expectations, needs, and concerns that elderly individuals are likely to have regarding *online social networking*;

(ii) development and testing of a theoretically grounded model that identifies potential beneficial (social) aspects of SNS for elderly and various factors that can result in the recognition of these benefits;

(iii) identification of social design principles from conducted qualitative and quantitative research based on currently implemented SNS functionalities; and evaluation and discussion of selected design principles for SNS functionalities that specifically cater to requirements of elderly individuals towards *online social networking* and potentially leverage (social) beneficial outcomes.

Therefore the thesis proposes and documents evaluated social design principles towards appropriate design of SNS to leverage socio-psychological benefits such as *social connectedness* and *social support*, to realize positive effects on elderly people's overall *satisfaction with life*, and to countervail social exclusion of elderly individuals through *online social networking*.

In the subsequent section, I attempt to briefly outline the research approach and methodology applied in the course of the underlying thesis research.

1.4 Research approach

In the course of the thesis, I adopted the position that research is a process and activity that creates or contributes to the understanding of a *phenomenon* (Kuhn 1970, 24, 35, 46; Lakatos 1978, 1f). A phenomenon is "typically a set of behaviors of some entity that is found interesting by the researcher or (…) a research community. Understanding is knowledge that allows prediction of the behavior of some aspects of the phenomenon" (Hevner/Chatterjee 2010, 2).

In the underlying thesis the *phenomenon of interest* constitutes to the adoption of *online social networking* as well as potential social benefits resulting from SNS use (in the context of elderly individuals). Therefore I aim to contribute to a deeper comprehension by (i) *understanding* expectations, needs, and concerns that elderly individuals are likely to have regarding *online social networking*; (ii) *developing* and *testing* theoretically grounded models that explain the formation of beneficial aspects of *online social networking* for (elderly) individuals and various factors that can result in the recognition of these benefits; (iii) *identifying* and *deriving* social design principles from qualitative and quantitative research findings based on currently implemented SNS functionalities; and (iv) *evaluating* selected social design principles that specifically cater to requirements of elderly individuals towards *online social networking* and potentially foster social beneficial outcomes.

The fact that the general knowledge on a specific phenomenon is incomplete – scientific and engineering problems are yet unsolved – researchers "address the void in our knowledge and those unresolved problems by asking relevant questions and seeking answers to them" (Hevner/Chatterjee 2010, 2). In the course of any research activity scientific methods are applied, which are provided by the specific research stream, to systematically obtain answers by "inquiringly studying the evidence within the parameters of the scientific method" and rigorously generating "the answer to a question, the resolution of a problem, or a greater understanding of a phenomenon" (Hevner/Chatterjee 2010, 3).

The conducted research presented in the thesis is placed within the scientific disciplines of Information Systems (IS) and Human Computer Interaction (HCI) research, whereas both disciplines can be characterized as multi-paradigmatic research communities (Vaishnavi/Kuechler 2007, 4).

Following Lee (2001, iii), research within the IS and HCI disciplines "examines more than just the technological system, or just the social system, or even the two side by side; in addition, it investigates the phenomenon that emerges when the two interact" (Lee 2001, iii). The

IS and HCI research disciplines are concerned with socio-technical phenomena and contribute to the knowledge by involving "two complementary but distinct paradigms, behavioral sciences and design sciences" (Hevner et al. 2004, 1). The distinction essentially bases on considerations formulated by Simon (1996, 1-5), who distinguishes between "natural sciences" and "sciences of the artificial".

Behavioral science – the terminology I will use for consistency in the following section and entire document instead of *natural science* – focuses on what natural or social phenomena are and how these phenomena behave and stresses on "what is reality" (Järvinen 2004, 2). Following Hevner/Chatterjee (2010, 5), *behavioral science* "seeks to find the truth. It starts with a hypothesis, then researchers collect data, and either prove or disprove the hypothesis". In contrast to the notion of *behavioral science*, "sciences of the artificial focus on how to design and construct artifacts and artifical (*sic*) systems having desired properties" (Carlsson 2005, 93) and are regarded as a "problem-solving paradigm whose end goal is to produce an artifact which must be built and then evaluated" (Hevner/Chatterjee 2010, 5), which stresses on the "utility of artifacts" (Järvinen 2004, 2). Consequently, *behavioral science* is "description- and explanatory-driven whereas design science is prescription-driven" (Carlsson 2005, 94).

While various authors (Hevner et al. 2004, 75f; March/Smith 1995, 252f) argue that the two paradigms are discrete from each other and should be considered as two disjoined entities, a shift towards *behavioral science* (Simon 1996, 1-5) in general and a tendency to publish articles that in particular follow a *behavioral science* paradigm in the IS and HCI disciplines is observable (Chen/Hirschheim 2004, 208f; Glass/Ramesh/Vessey 2004, 93). Conversely, I apprehend that *behavioral science* and *design science* need to be regarded as two intertwining scientific paradigms in the IS and HCI disciplines, in that *design science* could be expanded beyond its engineering focusing and accordingly would benefit by applying and combining prevailing types of scientific deduction modes, namely (i) exploratory, (ii) theoretical, (iii) applied science, and (iv) experimental research (see Figure 1).

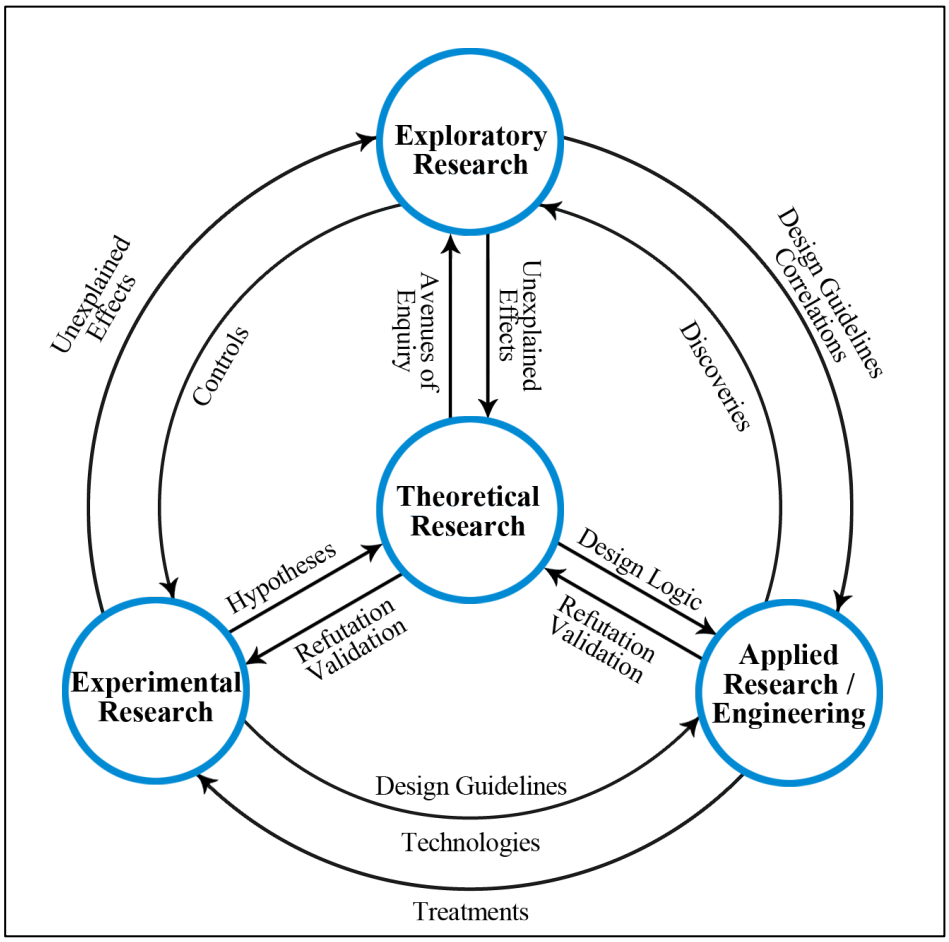

Figure 1: Modes of scientific inquiry and their influences in IS research
Source: Own illustration in adoption to Briggs/Schwabe (2011, 94)

Congruent, Briggs/Schwabe argue that specific standards of rigor for the four research modes are already established and accepted in various disciplines such as IS and HCI research whereas activities in *design science research* "can be realized as instances of the four modes of scientific inquiry" (2011, 93). Continuative, in agreement with Briggs/Schwabe (2011, 93ff), I argue that *design science research* studies bear the potential for not only contributing to the applied scientific knowledge base, but additionally to the *behavioral science* knowledge base by connecting the different deduction modes, in that each of the four can inform and feed the other three (Nunamaker/Chen/Purdin 1991, 94).

Figure 2 summarizes essential elements of theorizing in *design science research* and highlights methods and techniques applied in scope of the underlying thesis research.

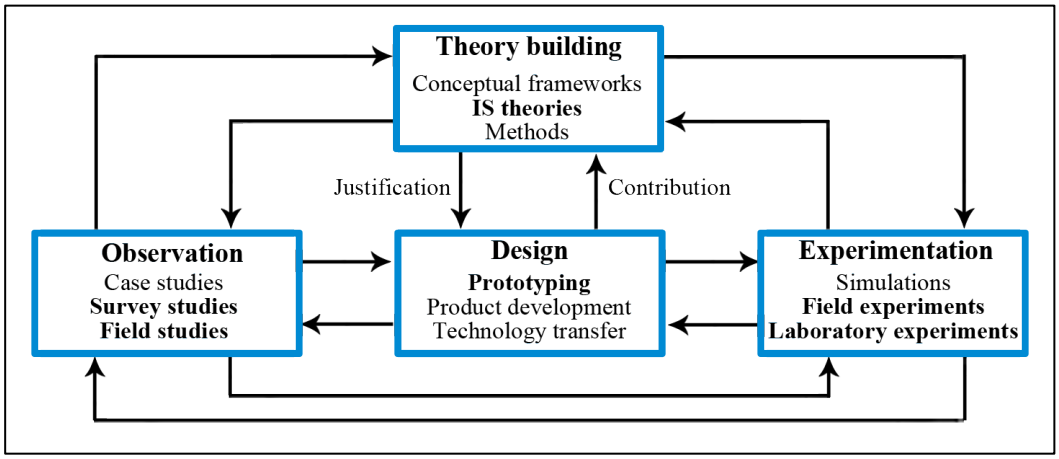

Figure 2: Elements of design science research
Source: Own illustration in adoption to Nunamaker/Chen/Purdin (1991, 94ff)

The argumentation is in line with Hevner/Chatterjee (2010, 11) who proposed a "complementary research cycle between design science and behavioral science" which addresses "fundamental problems faced in the productive application of information technology" – typically for the IS and HCI research disciplines (see Figure 2).

In the course of the underlying thesis, I attempted to implement all of the aforementioned four scientific deduction modes, namely (i) exploratory, (ii) theoretical, (iii) applied science, and (iv) experimental research, as proposed by Briggs/Schwabe (2011, 93).

I therefore used *exploratory research* methods (i.e., literature review, context interviews, exploratory focus group interviews, and an explorative quantitative study) to discover, describe, and concatenate (earlier) findings of the underlying *phenomenon of interest* – which constitutes the enormous adoption of *online social networking* among the total Internet population in recent years, its strong permeation in daily social interaction, and the communication routines that potentially could generate (social) beneficial aspects such as *social capital*, *social connectedness,* and psychological *well-being* among (elderly) individuals (see section 5). Briggs/Schwabe (2011, 94) therefore suppose that the validity and generalizability of *exploratory research* findings are generated through concatenation, which basically constitutes the accumulation of studies from which inductions are potentially generated and by which intersubjective concurrence on inductions may be established. Hence, in conducting *exploratory research* I not only attempted to discover the phenomenon of *online social networking* in the context of elderly individuals, but if possible, also concatenate previous findings up to the point of conceptual saturation (Stebbins 2001, 12ff). In particular, by conducting *exploratory research* within the scope of the thesis, I intended to gain an initial understanding on preconditions for potential adoption of SNS among elderly individuals namely their expectations, needs, and concerns towards *online social networking* as well as SNS use behavior of (elderly) individuals to further identify determinants for the generation of social benefits through the adoption of *online social networking*. Further Briggs/Schwabe (2011, 94) assume that each mode of inquiry bears the potential to support and inform each of the other modes (see Figure 1). Therefore anticipated findings not only lead to a better understanding of contexts and conditions under which social beneficial aspects potentially arise through *online social networking*, but also helped me to develop the proposed theoretical model; and therefore addi-

tionally delivered grounded empirical support for abstractions of theoretical constructs as well as to scrutinize on assumed causal relationships and identified measurements (see sections 5.2.2.1 and 5.4). Insights and gained understanding from both qualitative and quantitative explorative studies delivered input and contributed to generate an initial set of design principles and choices during the *applied research* phase in scope of the thesis (see section 6.1 and 6.2). Furthermore, initially gained understanding from both explorative studies conducted in the course of the thesis helped me in designing the experimental setup and field test during the *experimental research* phase of the underlying thesis.

According to Briggs/Schwabe (2011, 95) "the goal of theoretical research is to create models of cause and effect that predict and explain variations in phenomena". In the thesis it is the potential generation of (social) beneficial aspects such as increased *social capital* and psychological *well-being* among individuals through *online social networking*. Therefore in the course of the thesis, I primarily applied *theoretical research* to derive and establish a cause-and-effect model, to hypothesize on correlations among identified constructs, and to explain variations in the observed phenomena (see section 5.4). The established hypotheses and corresponding measurement models were then tested by employing a survey in the form of an online questionnaire distributed within the SNS Facebook. Within this process, I investigated previously established constructs and formulated their (theoretical) interplay within the proposed structural cause-and-effect model by phrasing hypotheses on potential causal relationships based on (i) a thorough literature review; (ii) both qualitative and quantitative explorative studies on expectation, needs, and concerns of elderly individuals towards *online social networking*; and (iii) two pre-studies focusing on the formation of social benefits through *online social networking* – namely (a) a *quantitative explorative* study investigating *social connectedness* formation through the use of the SNS Facebook status message functionality as well as (b) an empirical quantitative study focusing on the generation of *social capital* among users of the SNS Twitter (see section 5.2.2). In line with Briggs/Schwabe (2011, 94), *theoretical research* in scope of the underlying thesis mainly intertwines with *applied* and *experimental research* as such that I used theoretical understanding for deriving the proposed set of design principles and potentially predicting the consequences of applied novel design choices and the configuration of the conducted *laboratory experiment* and *longitudinal field test*.

The goal of *applied research* is to use scientific knowledge to solve important practical problems and to advance the state-of-the art (Briggs/Schwabe 2011, 100; Card 1989, 502). *Applied research* is distinguished from engineering in that the latter seeks to create a specific instance of a useful artifact to solve a specific problem and to make things economically that satisfies some goal as aspired by (product) development (Card 1989, 502). Consequently, *applied research* "seeks to create novel, generalizable solutions for an important class of problems, and to synthesize bodies of knowledge, construction principles, and generalizable work practices that can increase the likelihood that designed artifacts will meet design objectives" (Briggs/Schwabe 2011, 100). The process in which scientific knowledge – namely in the instantiation of theories – is transferred and converted to solve practical problems and to advance the state-of-the art in the field of IS and HCI research, is termed as "theory-driven design" (Card 1989, 501ff), and therefore contradicts the notion that breakthroughs in any given design discipline are merely a product of designers' intuition, loose empirical observa-

tions, and rapid prototyping. Based on considerations stated by Nunamaker/Chen/Purdin (1991, 91ff). Gehlert et al. (2009, 441f) declare that the relation between theory and design is twofold: (i) theories can be used to derive design artifacts such as systems and user interfaces. This relation is based on the assumption that any design artifact cannot work if it does not comply with the laws embodied in a theory; whereas (ii) theories can be extracted from design artifacts to initiate theory building in order to generalize design knowledge as well as to enhance the comparison of design artifacts. In recent times*, theory-driven design research* applied in the design process of systems has increased in its popularity especially in the IS and HCI research disciplines (Kraut/Resnick 2012, 9ff; Riedl 2011). Kraut/Resnick (2012, 1, 9ff) speak of *evidence-based social design*, which aims at translating the findings resulting from the test of theoretical models into concrete design implications. In addition to the applied *theory-driven design research* paradigm, I used state-of-the art implementations of SNS functionalities corresponding to current best practices and attempted to incorporate findings and gained understanding of both explorative studies in the deduction of social design principles for SNS functionalities that cater to specific requirements of elderly individuals.

In course of the thesis, I therefore approached the compilation of the proposed design principles by taking a *user-centered design* perspective (Norman/Draper 1986, 2ff) and Facebook's core concepts for *social design* as a baseline and starting point. *Social design* is a relatively novel terminology and can be thought of as "a way of thinking about product design that puts social experiences at the core" (Facebook Developers 2012). In section 6.1, I provide a more detailed overview on and description of *Facebook social design guidelines*, which according to the proposed framework foster (i) utilizing community, (ii) building conversations, and (iii) curating identity. However, their current verbalization exhibits a high level of abstraction and fails to deliver precise instructions for implementation.

In addition, the deduction of and compilation process for the identified and proposed social design principles was theoretically guided by the *behavior chain model* introduced by Fogg/Eckles (2007, 202), which was originally established to capture the range of behaviors users display in *online social networking* and during SNS use (Fogg/Iizawa 2008, 36; Vasalou/Joinson/Courvoisier 2010, 720ff). In section 6.1, I additionally provide a more detailed description of the *behavior chain model.*

According to Briggs/Schwabe (2011, 97) the goal of *experimental research* is to test the propositions of a deductive "nomological theory" that in the case of the underlying thesis constitute (i) the proposed social design principles and (ii) established structural theoretical model. At this point, it should be mentioned that not only the design principles, but also the theoretical model proposed in the underlying thesis can be regarded as an artifact according to the *design science paradigm* and therefore the testing of the measurement model through the conducted survey could additionally be considered as a form of evaluation.

Selecting appropriate theories and methods for evaluating designed artifacts is a significant component of *design science research* (Hevner/Chatterjee 2010, 110ff). The design principles derived and generated in the course of the underlying thesis were developed (i) to address the specific requirements of elderly individuals towards *online social networking* by taking into account their expectations, needs, and concerns towards this novel modality of social commu-

nication and interaction as well as (ii) to foster the generation of (social) beneficial aspects such as *social capital*, *social connectedness,* and psychological *well-being* among elderly individuals through use of SNS functionalities and adoption of *online social networking*. Therefore, the evaluation of selected proposed design principles aims to assess the extent to which instantiation of proposed design principles addressed (elderly) users' needs and expectations regarding *online social networking* and the implications of addressing such user needs. The ultimate goal of designers is to understand how features and functionalities of the designed system or application get embodied into users' behaviors and practices to satisfy their motivations and expectations from the system (Vasalou/Joinson/Courvoisier 2010, 725). The extent of user satisfaction can act as an evaluation of the design and implementation characteristics of a system or application (Wixom/Todd 2005, 98ff). A *laboratory experimental* setup and *longitudinal field test* were selected to evaluate a selection of proposed design principles with the objective of assessing the extent to which proposed social design principles (i) fulfill requirements based on expectations, needs, and concerns towards *online social networking* expressed by elderly individuals as well as (ii) bear the potential to foster social beneficial outcomes such as *social connectedness*, *social capital,* and psychological *well-being* through the use of SNS functionalities among elderly individuals. I expect that by satisfying the inherent user needs of elderly individuals towards *online social networking* and by complementing naturally occurring social interactions with specifically configured and designed SNS functionalities will not only result in increased satisfaction with and adoption of SNS, but facilitate social benefits through the active participation in *online social networking*. Satisfaction with an information system and intention to use it are recognized indicators of users' experience of using the system. Both, conducted *explorative* and *applied science research* in course of the thesis supported me in designing and conducting the *laboratory experiment* and *longitudinal field test* in order to rigorously evaluate a selection of proposed design principles, whereas prior *theoretical research* available in the IS and HCI knowledge base informed and supported me in selecting appropriate theories and methods for evaluating selected design principles.

At this point, I intentionally exclude accurate descriptions of applied research methods, which I explain and describe in detail in the corresponding sections.

In the following section, I provide a brief overview of the thesis structure in the form of short summarizations of each chapter.

1.5 Outline of the thesis

The outline of the thesis is aligned to the research questions and research approach presented in preceding sections and is structured as follows.

> **Chapter 1** comprises the introductory sections of the thesis including the primary motivation for the conducted research and further outlines the fundamental underlying research problem. The chapter accordingly delineates the objectives and research questions and closes with a brief depiction of the thesis structure.

Chapter 2 describes the foundations for the underlying thesis, provides the reader with the general background and context the conducted research is embedded in and additionally depicts the underlying phenomenon of interest – namely the fundamental adoption of *online social networking* among the total Internet user population. Furthermore, it comprises a review of literature and previous research focusing on *online social networking* to anchor the underlying thesis within the IS and HCI research disciplines.

Chapter 3 covers the explorative research executed in course of the underlying thesis by firstly outlining the conducted *explorative qualitative* – and subsequently describing the *explorative quantitative study* on expectations, needs and concerns elderly individuals exhibit regarding *online social networking*. Both explorative studies include a brief description of chosen methodology, sampling and data collection, as well as demographic data and discussion of findings and their potential limitations. The chapter concludes with (i) a summary of major findings on expectations, needs and concerns towards *online social networking* in the context of elderly individuals as well as (ii) a classification of elderly SNS users to explain elderly target groups in the context of *online social networking.* The established classification could support designers in building *personas* in order to conceptualize and design adequate social systems and functionalities that especially cater to elderly individuals during design and development of human computer interactions.

Chapter 4 focuses on the pivotal empirical research conducted in course of the thesis and is structured as follows. Firstly, I provide a review on and introduce the theoretical notion of *social capital* as the overarching theoretical framework in scope of the underlying research. I consequently identified the constructs *social connectedness* and *social support* as means of overcoming social isolation, and enhancing social integration in the lives of elderly people – and define both constructs as theoretical determinants of *social capital*. Since the theoretical understanding of the notion of *social connectedness* in the context of *online social networking* is underdeveloped in IS and HCI as well as socio-psychological research disciplines, I accordingly executed two studies that extensively examine the formation of *social connectedness* in SNS use and subsequently presented their execution and findings. Gained theoretical understanding helped me in developing and testing a structural model to examine antecedents of the formation of *social capital* in *online social networking* as well as their effects in the form of psychological *well-being.* Findings and limitations are additionally discussed.

Chapter 5 not only compasses the *theory-driven* and *evidence-based* deduction and compilation as well as descriptions of proposed social design principles, but also their evaluation with the objective of assessing the extent to which proposed social design principles (i) fulfill requirements based on expectations, needs and concerns towards *online social networking* expressed by elderly individuals as well as (ii) bear the potential to leverage social beneficial outcomes such as *social connectedness*, *social capital* and psychological *well-being* through the use of SNS functionalities among elderly individuals. The chapter concludes with and discusses a set of evaluated social design

principles that aim on fostering social benefits and potentially increasing subjective *well-being* for the elderly.

Chapter 6 outlines limitations of the conducted research and findings in scope of the thesis and additionally provides an outlook on future intentions related to the underlying research.

Chapter 7 concludes on findings generated within the scope of presented research and summarizes theoretical and practical contributions and implications.

The subsequent chapter specifies the foundations of the underlying thesis and, at this, focuses on the demographic shift as well as its negative effects on societies and individuals in specific, and identifies *social exclusion* as a major threat to especially elderly individuals – and its containment as the fundamental motivation for the conducted research. Furthermore, I outline the *phenomenon of interest* – namely the enormous adoption of *online social networking* – and present a review of literature on related work primarily originating from the IS and HCI research disciplines.

2 Two trends – the demographic shift and online social networking

In the following chapter, I briefly describe and outline the two *phenomena* that not only primarily motivated me in composing the underlying thesis, but also justify the relevance of conducted research – namely the progressive *demographic shift* in societies and the tremendous adoption of *online social networking* that increasingly shapes our social interactions and coexistence.

I commence by depicting the evolution and causes of an occurring demographic shift in most societies of today. I then focus on its predominantly negative effects on our societies at large and elderly individuals' social integrity and modalities of social interaction in specific (section 2.1). Continuative, I derive a definition and comprehension of the terminology '*old age'*, which I consecutively adapt in the context of executed studies and consistently apply in course of the thesis (see section 2.1.2). To further strengthen the relevance of the underlying thesis research, I briefly describe physiological changes that accompany the aging process of human beings and exemplarily illustrate their predominantly negative effects on ICT and system use (see section 2.1.3).

I then depict the emergence of *online social networking* from its early years to its prospective permeation of our everyday life in order to demonstrate its present and future relevance in shaping the way we socially interact with each other. Accordingly, I briefly elaborate on differences between *social* and *organizational computing* systems and approximate to a definition of *'social networking sites'*.

Before I conclude on the underlying chapter, I illustrate an occurring demographic shift in SNS user compositions and therefore argue that *online social networking* progressively becomes a significant modality of social interaction for the elderly.

2.1 The demographic shift and 'old age' in context of the thesis

For a few decades our world has witnessed an unprecedented demographic shift towards an older demographic composition of the total global population that has affected almost all countries – both developed and developing nations. The occurring demographic shift is a reality in most societies of the European Union, e.g., Germany and Italy, and in various other industrialized countries, such as Japan, in which the relation in quantity between young and old population is assumed to change at an increasing rate in favor of older age segments.

Figure 3 exemplarily displays changes in age structure of the population in Germany between 1910 and 2008, and additionally includes estimations on its development for the year 2060.

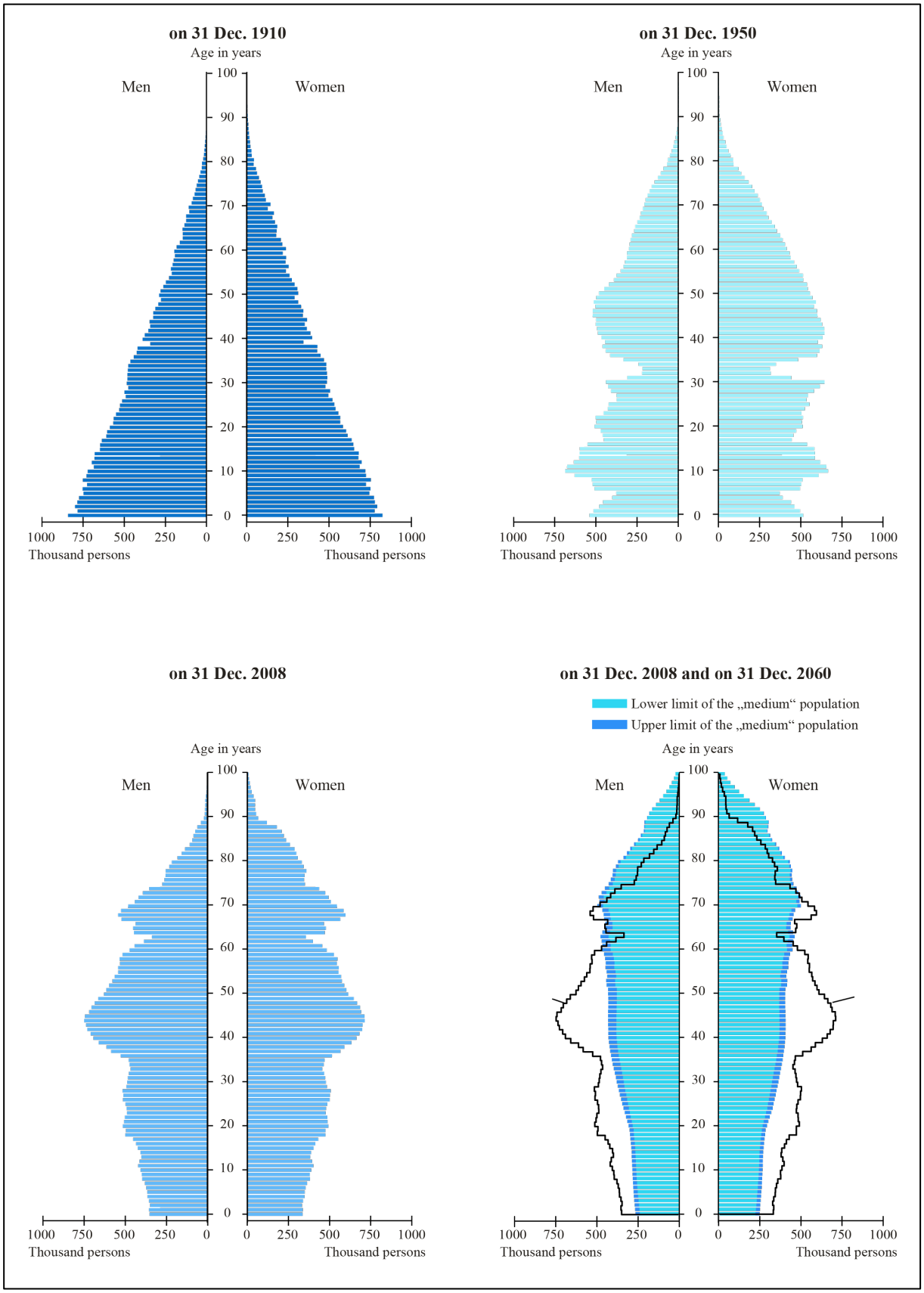

Figure 3: Variations in age structure of the total population in Germany
Source: Own illustration in adoption to Federal Statistical Office (2009, 15)

Illustrative general causes for this phenomenon can be found in decreased fertility rates as well as increased life expectancy whereas progression and intensity of the demographic change significantly varies across regions and countries. For example, due to a general influx of rural population into urban districts and large metropolitan areas, which mostly comprise of younger individuals, effects of the demographic shift are less verifiable in major cities and urban conglomerations compared to rural regions.

Yet the demographic shift is most noticeable in specific developed nations, one example being predictions that demonstrate a proportion of people over the age of 65 years to be more than 30% compared to the total population in Germany by the year 2050 (Eisenmenger/Pötzsch/Sommer 2006, 17). Most notable, a drastic increase of the proportion of advanced senior citizens – a demographic segment generally defined by individuals who surpassed 80 years of age – in the total population has to be expected since their proportion grew from 0.5% in 1900 to 3.9% in 2001 and is estimated to reach 12.1% of the total German population by the year 2050 (Statistisches Bundesamt 2003, 7).

In most countries of the European Union, a specific cause of drastic demographic change is found in the shift of the large cohort of *baby boomers*[2] into older age and therefore resulting in a drift of the relative composition of the total population (see Table 1).

	Year 1950	**Year 2010**	**Year 2060**[3]
< 20 years	21.1 million (30.0%)	15.0 million (18.0%)	10.1 million (16.0%)
20-64 years	41.5 million (60.0%)	49.7 million (61.0%)	32.6 million (50.0%)
65+ years	6.7 million (10.0%)	16.8 million (21.0%)	22.0 million (34.0%)
Total	69.3 million (100.0%)	81.5 million (100.0%)	64.7 million (100.0%)
Old-age dependency ratio[4]	16	34	67

Table 1: Demographic variations in the German population for 1950, 2010 and 2060
Source: Own illustration based on data provided by Statistisches Bundesamt (2009)

Figure 4 displays a graphical representation for the fragmentation of the German population by age segments for the year 2008 and estimated numbers for the year 2060.

[2] Although literature lacks a generally accepted definition of the terminology *baby boomers* – since it is mostly used and applied in a cultural context – the terminology generally refers to the cohort or demographic segment comprised of individuals born between 1946 and 1965 (Federal Statistical Office 2009, 25).
[3] Numbers for the year 2060 are estimated based on three assumptions: (i) a constant birth rate of 1.4 children per female citizen, (ii) a life expectancy of newborns of 85.0 years for males and 89.2 years for females by the year 2060 as well as (iii) a positive migration balance of 100,000 people.
[4] The *old-age-dependency ratio* calculates the ratio of the number of elderly people at an age when they are economically inactive – in most countries of the European Union the age approximates to 65 years and above – compared to the number of people of working age, i.e., 20-64 years (Federal Statistical Office 2009, 6, 19; Giannakouris 2008, 11).

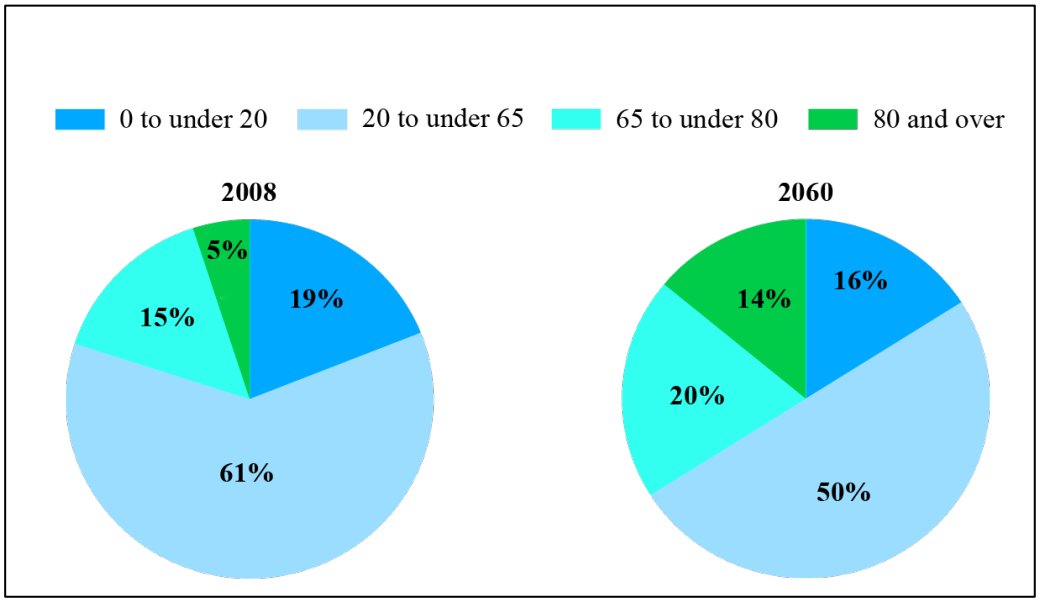

Figure 4: German population by age groups for 2008 and 2060
Source: Own illustration in adoption to Federal Statistical Office (2009, 16)

However, the phenomenon of the demographic shift is not exclusively limited to specific developed countries, but rather occurring with a lag in time globally or varying intensity in almost all nations. Figure 5 exemplifies this phenomenon in the case of the population pyramid for the 27 member states of the European Union for 2008 and 2060.

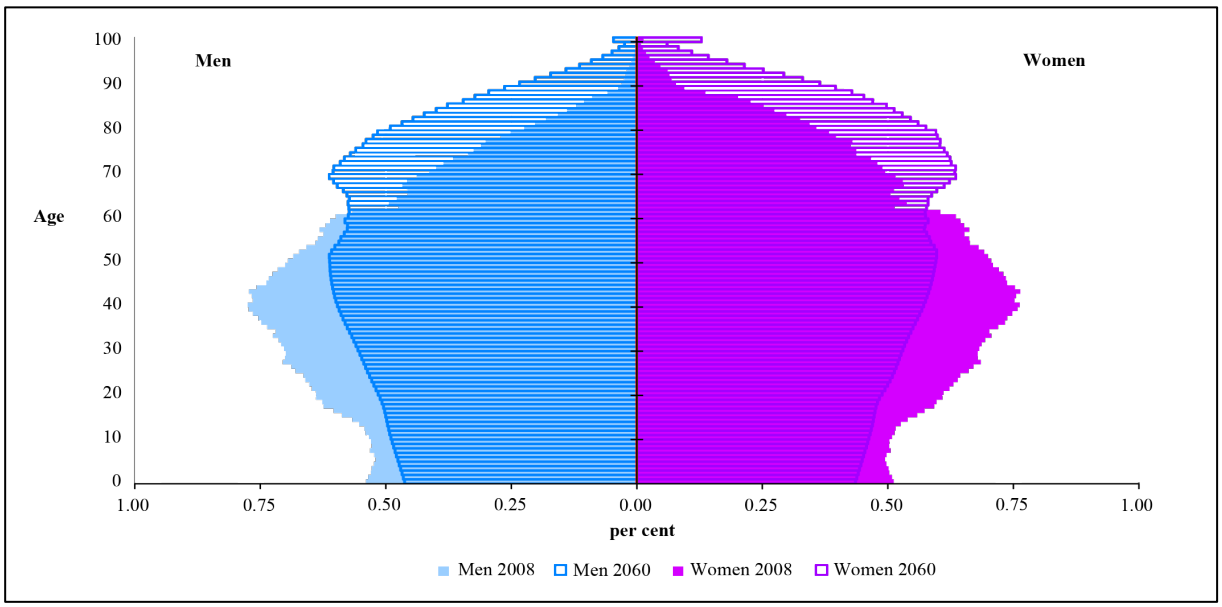

Figure 5: Population pyramid for 27 states of the European Union for 2008 and 2060
Source: Own illustration in adoption to Giannakouris (2008, 3)

The proceeding demographic shift not only incorporates significant economical challenges for affected nations such as increased monetary strains on respective healthcare systems and pension funds, but also displays a threat to existent social structures established within societies. For instance, a report issued by the European Union even mentions predictions in that European countries might enter an economic downward spiral primarily caused by the increasing focus of caring for elder generations. This in turn potentially suffocates economic activity and

growth, and consequently results in reduced *well-being* of the general public (European Commission 2007, 7) (see section 2.1.1).

However, it is also the responsibility of the society as a whole to assure a certain quality of life for its members in general and elderly demographic segments in particular, by helping to assuage and overcome age-related social, physical, and cognitive restrictions in everyday life and modalities of social interaction since social interactions satisfy basic human needs (Maslow 1970, 15ff; Stuck et al. 1999, 459). Research in geriatric science has found that lack of participation in social activities as well as reduced social interaction increases the likelihood of functional decline among elderly individuals. Moreover, since mental fitness and social participation have a strong reciprocal influence, large sections of the elderly population encounter the imminent threat of *social exclusion* (Craig 2004, 95ff).

In order to emphasize the relevance of novel modalities of social interaction and policies to secure social integrity of the general population and elderly individuals in particular, I briefly elaborate on how the demographic shift negatively impacts existent social structures and social integrity of elderly individuals, in the subsequent section. I thereby mostly correspond to reports comprising data compiled in countries within the European Union, with Germany in specific.

2.1.1 A menace to existent social structures and social integrity of the elderly

Declining birth and low fertility rates are declared as one of the primary causes of the demographic shift, whereas these causes in turn pose origin to a number of societal changes that reinforce progression of aging societies. These can be best demonstrated by constantly changing interpersonal relationship behaviors, e.g., people marry at an older age whereas the number of marriages has declined and that of divorces has been steadily growing in the last 20 years, that increasingly disrupt traditional patterns such as being raised and growing up in a parental home, searching and finding a life partner as well as raising a family.

> *"The diversity across the EU in relation to family structures is also reflected in the situation of the elderly. In some countries, it is still common for older people to cohabit with their children. In others, older people typically live alone and a large proportion of the very old live in institutions [...]. Demographic ageing can be expected to have important implications for these family arrangements. […] They will have fewer children to look after them and these may not be able to do so for professional reasons or due to geographic separation."* (European Commission 2007, 11)

Overall, couples have fewer children and this later in life, which consequently leads to a general shift in favor of elderly proportions of the total population. In the long term, occurring societal changes interlinked with the proceeding demographic shift potentially induce weakening and dissolving of traditional family structures that in turn cause a remarkable increase of people who live alone and consequently dilute existing prevalent social structures.

Additionally, due to biological differences and changed mode of life, females exhibit an averaged higher expectancy of life when compared to their male counterparts resulting in a higher

fraction of women within the elderly demographic segments. Therefore elderly females are exposed to a higher risk of being widowed and consequently to a higher likeliness experience to live in single households or institutions in their last period of life. In Germany, for example, the proportion of women amounts to approximately three fifths of the total demographic segment *65+*, while the proportion within the demographic segment *80+* actually is three quarters in relation to the total respective segment. Consequently, more than 12% of the population in the European Union lived alone in 2007 compared to 8% in 1981 (European Commission 2007, 10). The changed household composition even entails a more severe implication since the risk of poverty among women within the demographic segment *65+* who live alone is twice as high as for women who share a household with someone else (European Commission 2007, 11).

My preliminary conclusion is that demonstrated drastic societal developments and changes in family arrangements not only convey the risk of *social exclusion* on the individual level, but also result in reduced social and psychological *well-being* of affected individuals and moreover in the degradation of conventional social structures.

In the following, I would like to elaborate on the drastic consequences related to health and social care provisioning in greater detail which potentially amplify from the time when the substantial *baby boomer* cohort reach the age of *80 and above.* Although per capita spending power of individuals residing in the demographic segment *50+* in Germany considerably exceeds its younger demographic counterparts (GfK 2005), individual financial assets have been increasingly uneven distributed in developed and to a greater extent in developing countries, and only prove true for a minority of advanced senior citizens in most countries. Since considerable untapped amounts of income and savings at disposal to spend on improving quality of life or to pay for health and social care related services are only limited available, the majority of health and social care is informally provided today whereas informal health and social care provisioning is expected to increase in future[5].

> *"At present, most social care is provided informally. Around 20% of people over 65 receive some kind of informal care while for people over the age of 75 this proportion ranges between 30 and almost 60%, depending on how informal care is defined. (...) Providers of informal care often suffer financially, physically as well as mentally and there is often not enough financial and non-financial support for informal carers. It can be expected that in the future an increasing number of older people will be living alone so that informal care from other household members will not be available. Increased labour force participation of women will also reduce the supply of informal care."* (European Commission 2007, 18f)

[5] Based on the assumption that the fraction of disabled and elderly individuals receiving informal care remains constant, evidence from research suggests that the number of individuals who are informally cared by their spouses or life partners potentially double between 2005 and 2041, while the numbers receiving care from their children are projected to increase by approximately 90% (Wittenberg et al. 2008, 4).

In contrast to formally provided health and social care by professional home care agencies or service providers, informal care is mostly provided by family members such as spouses or children, friends and other unpaid volunteers, e.g., honorary community workers or neighbors (Arber/Ginn 1991, 174). Based on studies in the area of informal care (Pickard et al. 2007, 1, 4-16), I assume that most causes of the demographic shift are potentially directly linked to a prospective major decline in informal care provisioning including (i) a generally decreased family size (Clarke 1995, 19ff), (ii) a decline of co-residence of elder individuals and younger generations (Grundy 2000, 193ff) as well as (iii) a gain in childless younger and older adults or couples (Evandrou/Falkingham 2000, 27ff) and (iv) in the fraction of employed women (European Commission 2007, 19). Nussbaum et al. (2000, 263) found that the help and support by friends, neighbors and acquaintances increasingly play an important role for social support of the elderly generation. Although the majority of elderly people mostly rely on family structures when in need of social support and health care (Shanas 1979, 169ff), more and more elderly individuals expand or even replace family social networks by (weaker) social ties such as neighbors, friends and acquaintances.

Furthermore, increased fractions of females among the working population in most developed countries and first and foremost in countries of the European Union mark only one of many changes and transformations within national and international labor markets in last decades. Due to advanced life expectancy and fast growing elderly demographic segments in the majority of countries within the European Union, a raise of the currently effective retirement age is discussed in a number of countries. An extended active participation of elderly demographic segments in the commercial and societal shaping of current workforce not only implies general economic advantages for a nation's economy, but also allows elderly individuals to benefit from social structures established or evolving during employment (Bundesministerium für Familie Senioren Frauen und Jugend 2011; Statistisches Bundesamt 2009). By withdrawing from active labor force and by entering retirement these established social relationships and ties in most cases weaken and increasingly become fragile over time after actual retirement (Mollenkopf/Doh 2002, 3). Therefore entering retirement not only marks a major change in an individual's life, but also changes and limits individuals' social interaction and behavior – and in cases is accompanied by various other changes among elderly individuals' social circles such as diseasing or occurring death of the life partner, family members, relatives or close friends. In general, a proceeding globalization of economies, industries and businesses have resulted in a greater allocation of work and therefore invoked an increased labor mobility which in turn potentially propels degradation of social ties, dispersion of family structures and friendship relationships.

To recapitulate, the occurring demographic shift in most nations not only implies negative consequences for their affected societies and economies at large, but also negatively impacts their entire populations whereas its implications are most critical and complex for the elderly. Addressing issues related to an aging population and emerging (social) needs of the elderly (e.g., increased need for interregional communication and social interaction) in a more effective and efficient manner by making use of novel advancements in ICT to provide meaningful socio-technological interventions, is therefore of growing interest among policy makers and researchers in various disciplines. Hence, research and efforts to secure elderly people to perpetuate their lives without being socially excluded from society by strengthening their indi-

vidual social networks and to facilitate and thrive social interactions in novel and innovative ways gain importance (State Planning Organization 2007, 54, 120).

The reading of the previous sections raises the following questions: When is an individual considered being *old*? Does a certain *age* (e.g., measured in years of one's life) define an individual as being *old*? Does psychological and gerontological research provide an adequate and generally accepted definition of *old age*? Therefore, in the subsequent section I approximate to an understanding of the terminology *'old age'* and derive a definition consecutively applied in scope of the thesis since psychological and gerontological literature lacks to provide an adequate and generally accepted definition.

2.1.2 Defining 'old age' in context of the thesis

The terminology *'old age'* is a vague description of an individual's state in relation to her average life span, and no consistent definitions can be found in literature. The paraphrasing *old person* or *old people* are synonymous to commonly used terminologies such as *senior*, *senior citizen,* or *elderly individual.* In the underlying thesis, I chose to primarily apply and use the notation *elderly*, e.g., as in *elderly user, elderly individual,* or *elderly demographic segment*.

A number of specialized research areas and disciplines study the impact of aging on human beings; examples are *senescence* (research focusing on biological aspects of the aging process), *gerontology* (research primarily addressing psychological aspects of the aging process), and *geriatrics* (research studying medical aspects and diseases resulting from the aging process). Although various definitions on the terminology '*old age'* exist in literature, no common agreement on the absolute age at which a human being is considered as *old* has been established. Hence, multiple considerations and factors have to be taken into account in order to derive a definition, which highly depends on its context and field of application. A definition is required to consider factors such as *physical*, *psychological,* and *societal* aspects of the aging process as well as contextual factors imposed by environment such as *geographical* and *economical* aspects. Gorman (1999, 3-21) provides a comprehensive aggregation of aspects defining the aging process that I attempt to consider in order to approximate to a definition of '*old age'* in the following.

To coincide with the biological aging process of human beings, specific external physical and visible changes can be observed which determine to consider an individual as being *'old'* such as change of hair color to grey or white, formation of wrinkles on the skin due to loss of subcutaneous fat, or changes to the vocal cords. Non-visible physical changes, e.g., reduced lung capacity and immune system functions, diminished eyesight and loss of hearing capacity, are aspects from a medical perspective to define '*old age'*. Nevertheless, human beings in the same age range can have great psychological and medical differences (Martin/Kliegel 2008, 24) and consequently constitute a highly heterogeneous cohort regarding these aspects.

> *"The term elderly (also known as 'old age' or 'older people') is used to describe the last period of time in human life. Similarly to other periods in life; childhood and adolescence for example, it is impossible to have an absolute chronological definition.*

> *There are many objective and subjective factors that can separate somebody from being 'elderly' from somebody who is biologically old. For example chronological age does not correlate perfectly with 'functional age' i.e. two people may be the same age, but differ in their cognitive and/or physical capacities."* (VICON 2011)[6]

In contrast to above quoted considerations, a number of definitions of '*old age'* consider social and legal aspects, which in turn highly depend on a nation's legal framework and legislation. The World Health Organization (WHO) has suggested that the age at which people become eligible for occupational retirement can be considered as an acceptable definition (World Health Organization 2012), and the retirement age in most developed countries is 65 years of age[7]. For example, in 2004, the average individual retired at the age of 63 years in Germany (Radl 2007, 516). However, the definition lacks generalizability given that social and legal aspects vary between developed and non-developed countries.

Since conducted studies in the scope of the underlying thesis mostly include participants from developed countries, e.g., United States of America and Western European countries, the most appropriate definition and approximation for a working definition might be the retirement age in industrialized countries. A similar argumentation can be found in the context of the *VICON* research project which concludes that the

> *"(...) age for defining the start of old age in these countries [UK, Germany and Ireland] can be assumed to be the age at which the state will first offer a pension."* (VICON 2011)

However, a definition of '*old age'* based on an absolute value (i.e., measured in years of one's life) also lacks precision on the background of increased life expectancy and consequently motivates a definition that considers an individual's current age relative to her life expectancy. Accordingly, an individual would be considered as *being old* if she surpassed the average of her expected life span, which in turn depends on environmental and societal aspects amongst others and their potential implications, respectively. On the contrary, various studies suggest absolute values to define *old age* that approximate to specified retirement ages in developed countries, e.g., 55 years of age (Wright 2000, 107), 65 years of age (Kanayama 2003, 274) and exceeding 60 years of age (Pfeil/Arjan/Zaphiris 2009, 644).

Following the considerations on contextual aspects, I attempt to deduce my own definition for the underlying thesis by relating the concept of '*old age'* to ICT.

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[6] The *VICON - Virtual User Concept for Supporting Inclusive Design of Consumer Products and User Interfaces* project is co-founded by the European Commission under the 7th Framework Programme for Research and Technological Development (FP7). I would like to point out that publicly available information has been deleted during the writing process of the underlying thesis, and in cases, textual references are not available anymore.

[7] It should be mentioned that various Western European countries started a debate on increasing the retirement age, examples are the UK and Germany where the pension age will be increased to 66 years of age by 2024 and 67 years of age by 2029, respectively.

Prensky (2001, 1-6) introduced the concept of *digital natives* and *digital immigrants* whereas *digital natives* are individuals who "represent the first generations to grow up with (…) [digital] technology" and "*think and process information fundamentally differently* from their predecessors" (Prensky 2001, 1). Consequently, *digital immigrants* "were not born into the digital world but have, at some later point in [their] lives, become fascinated by and adopted many or most aspects of the new technology" (Prensky 2001, 1f). I therefore conclude that individuals considered as *digital natives* are individuals who were born during or after the general introduction and diffusion of digital technologies such as personal computers – and in a narrower sense during or after the introduction of (social) digitally networked ICT systems such as the Usenet and Internet. Consequently, individuals considered as *digital natives* were approximately born after 1980 and therefore are below 30 or 35 years of age by the year 2012.

Continuative, in biological and sociological science the concept of *generations* has been introduced to provide an approach to classify cohorts of individuals born in a similar date range, cf., *familial* and *cultural generations*. From a sociological perspective, a *familial generation* time span in Western countries is defined to be approximately 25 years in the United States of America (Matthews/Hamilton 2009, 1) and approximately 30 years in Germany – influenced by a slight progression due to increased life expectancy and other social influences (OECD 2011, 1) (see section 2.1). Therefore, the preceding generation to the cohort of *digital natives* who were approximately born in 1980, are individuals born before the year 1955 or respectively 1960. Consequently, these individuals are older than 50 to 55 years of age by the year 2012.

In scope of the thesis, I define individuals **above the age of 50 years** as ***elderly*** representing the precedent generations of *digital natives.*[8]

I claim no generalizability for the derived definition of '*old age'* and allude that the validity of the definition has to be assessed in regard to the context of ICT and scope of the thesis. Based on the stated definition, individuals who surpassed 50 years of age constitute the demographic segment *Age 50+* and are referred to in expressions such as *elderly users* or *elderly individuals*, in the following. Consequently, I will refer to individuals born after 1980 as, e.g., *younger users* or *young adults*, to clearly distinguish between younger and elderly demographic segments in interpretations and discussions of findings in course of the thesis.

[8] The underlying thesis research was conducted in the context of the research project Mobil50+ (Innovative NFC- and IT-based Services for Mobile and Active Life for the 50+ Generation). Mobil50+ is funded by the Bundesministerium für Bildung und Forschung (German Federal Ministry of Education and Research) (BMBF - FKZ: 01FC08046). It was a joint project of the Technische Universität München and various partners. The age and age range for defining elderly individuals in scope of the underlying thesis is in line with definitions specified in the context of the conducted research project.

In the following section, I briefly describe factors of the aging process that affect an individual's abilities in use of ICT systems. Since these factors induce varying effects and highly depend on the physical and psychological condition of an individual, elderly user segments are consequently characterized by a high heterogeneity of physical and mental capabilities for use of ICT systems, and respectively SNS (Arning/Ziefle 2009, 23).

2.1.3 Age-related restrictions in ICT system and SNS use

Previous studies that investigated effects of aging and advanced age on ICT systems use, document clear age-related differences in adoption and use of such systems (Morris/Venkatesh 2000, 375-403) – that, I assume also prevail for SNS.

Among other factors, barriers to use ICT and systems such as SNS include complexity, ergonomic impediments, and lack of interest (Carpenter/Buday 2007, 3012-3024). Barring a few examples (Kanayama 2003, 267ff; Wright 2000, 100ff), there has been little research and barely no systematic investigation of *online social networking* among the elderly, the motivations that elderly might have in participating in such networks and factors that can facilitate or inhibit them. Consequently, there is sparse understanding on how SNS and comparable systems need to be designed to foster adoption and use as well as to leverage (social) benefits from system use for elderly individuals.

Accordingly, there have been suggestions that the design of ICT systems targeted towards the elderly should take into account elderly users' perceptions of applied technologies as well as age-related cognitive, perceptual, and motor impairments that they may suffer from (Carpenter/Buday 2007, 3012-3024). In particular, impairment of visual and cognitive abilities influences requirements for conceptualization and design of ICT systems for the elderly (Dickinson et al. 2007, 282). For instance, user interface characteristics such as text formatting, layout, colors, navigation, and content presentation (textual as well as multimedia content) need to be taken into account when designing ICT systems for an elderly target audience (Becker 2004, 387-406). A further implication of lowered cognitive abilities of elderly users displays potential distraction caused by presentation of irrelevant information such as animated multimedia content or highly complex layouts (Hwang et al. 2001, 1-9). Nevertheless, evidence suggests when offered proper training and support to learn and developed specific skills in interacting with ICT systems, elderly users might exhibit effective use of such socio-technological systems including SNS (Trocchia/Janda 2000, 605ff).

The most prevalent interaction mode between humans and most technical devices that provide computing power to users such as personal computers, laptops, and tablets are based on operational input provided via a mouse and/or keyboard, keypads, and in the case of tablets via a touch-sensitive screen. Nevertheless these interaction concepts premise a certain level of dexterity abilities, which need to be understood, learnt, and trained by a prospective user. Dexterity abilities of human beings degrade in the course of the aging process and thus lead to increased complications in interacting and using of ICT and Internet applications that base on prevalent interaction modes of today. Examples for more complex interaction concepts are (i) double-clicking an object which requires a specific sequence and speed of inputs executed via the mouse; (ii) dragging an object which requires the user to execute to operations at the same

time, similar to using a scroll bar; and (iii) clicking on and selecting very small objects which requires a certain level of motor functions and dexterity abilities of elderly users (Czaja/Lee 2007, 341-349). For the underlying thesis and conducted research, I presuppose elderly subjects to possess a certain level of skills and necessary abilities to execute these basic interaction activities.

Continuative, elderly users are also likely to encounter complexity in interpreting the language and phrasing commonly used in Internet applications and especially in SNS. For example, terminologies such as 'friend request', 'scribble on the wall', 'poke' which are specific to and commonly used terminologies in the SNS Facebook might appear totally alien to elderly users encountering such systems for the first time. In contrast to previously mentioned interaction skills, I do not presume elderly subjects to possess knowledge specifically related to *online social networking*.

Furthermore, lowered cognitive abilities of elderly individuals resulting from, e.g., reduced short-term memory capacity, negatively impact the ability to solve navigational tasks, to execute functionalities, and to understand the implications of operations carried out in ICT and systems (Meyer et al. 1997, 296). For example, browsing within such systems implies the ability to understand their predetermined composition and logical navigational paths and consequently the demand for cognitive abilities such as short-term memory exposure, e.g., to memorize previously visited sites (Lopes 2001, 101f). Since SNS are highly complex systems in terms of implemented functionalities, elderly individuals have difficulties in using such systems and are unable to fully understand implications of implemented functionalities and the system at large. Therefore, I motivate the underlying thesis research and consequently focus on the design and evaluation of existing and novel SNS functionalities that especially cater for elderly SNS users.

Nevertheless there are some indications that elderly individuals are increasingly joining predominant SNS, although penetration of *online social networking* is still quite low among elderly since dominant SNS primarily target younger individuals currently constituting the largest user group. In one of the subsequent sections, I demonstrate a demographic shift in SNS user populations and argue that aging SNS user populations constitute the growing relevance and importance of *online social networking* in our social interactions and everyday lives.

2.2 On the emergence and characteristics of social networking sites

Online social networking is a relatively recent phenomenon that has gained significant popularity over the last decade. It is a novel form of computer-mediated communication facilitated by advances in ICT and the advent of Internet-based systems – so called *social computing platforms* (SCP). Systems that primarily allow its users to present themselves, create online social networks, establish or maintain connections with other individuals, and enable individuals to follow the lives of friends, acquaintances, and families are in turn termed *social networking sites* (SNS). This specific form of online social interaction is increasingly consuming a significant and growing portion of our time and attention (Bapna et al. 2011, 2). Prominent examples of current SNS are Facebook, Twitter, and Google+.

The following sections are composed as follows: First, I provide a chronological outline on the emergence of SNS and continuatively speculate on prospective developments in *online social networking*. I then briefly cover specific characteristics of *social computing* systems[9] to demonstrate differences to traditional *organizational computing*[10]. Subsequently, I approximate a definition for *'social networking sites'* for the underlying thesis.

2.2.1 The early years of online social networking

Online social networking has evolved since the first conceptualized description of the computer-based educational tool *Plato* that has been introduced at the University of Illinois in the 1960s (Gross/Acquisti 2005, 71), to contemporary large-scale user populations bundled in SNS such as Facebook, Twitter, and Google+. Enormous advancements in ICT led to implementation of functionalities generating a highly participative human-centric virtual environment and resulted in different manifestations of *social computing* systems by today.

In the late 1990s, parallel to socio-technological developments such as the considerable enhancements in Internet technologies and high adoption rates of corresponding systems, the first contemporary SNS was launched under the name *SixDegrees.com* (boyd 2004, 1279). The system implemented functionalities to create user profiles and enabled its users to make connections between different member profiles to document and represent social relationships and structures among the user population. Years later at the turn of the century, another leap in the development of ICT occurred with the most prominent and significant advancements made in communication bandwidth and data storage technologies. Dwyer (2008, 3, 11) assumes that especially notable improvements in data storage technologies resulted in a significant drop in provision costs and therefore potentially influenced business and operator models of prevalent – and yet emerging systems.

In 2002, the first commercial SNS *Friendster* launched attracting approximately five million users until 2004 (boyd 2004, 1280). In the early years, users primarily used the system to form communities of specific interests and therefore Friendster mainly provided functionalities that were adapted from *virtual communities* (VCs) (see section 2.2.4.2). However, it was the first system that based on a *social-circles network model*[11] enabling users to establish and document social relationships by providing a "friending" functionality (boyd/Ellison 2007,

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[9] Literature lacks to provide a consistent definition of the terminology 'social computing', however Parameswaran/Whinston (2007, 763) specify that *social computing* systems comprise "applications and services that facilitate collective action and social interaction online with rich exchange of multimedia information and evolution of aggregate knowledge" (Parameswaran/Whinston 2007, 762).

[10] In course of subsequent sections and overall thesis, I distinguish between *organizational computing* and *social computing*, such that traditional *organizational computing* systems are determined by underlying or supported business processes or administrative procedures, whereas *social computing* systems enable individuals to socially interact and collaborate (see section 2.2.4.1).

[11] Literature distinguishes between four different (social) network models: the (i) regular lattice network model, (ii) random linking network model, (iii) small world network model and (iv) preferential attachment or scale-free network model. The *social-circles network model* is based on the concept of social circles forming an egocentric network, which can be best illustrated by placing an individual as the center of a (social) circle and (social) nodes spanning a circle around the individual. Further reading can be found in Hamill/Gilbert (2010, 81f).

218). boyd/Ellison (2007, 218) assume that the introduction of the "friending" functionality resulted in clear distinction to other contemporary (Internet-based) systems. Furthermore, according to Dwyer (2008, 11f), Friendster was the initial SNS to include functionalities for electronic self-presentation and cyber-identity construction, and thus converted the modality of user interaction from a purely static to a highly creative, competitive, and dynamic form of interaction.

In the years between 2005 and 2009, various SNS were initiated followed by the introduction of various successive and diverse systems in the early years of the millennium such as *Myspace*, *Facebook*, and a high number of local or domestic systems, e.g., *Mixi* in Japan, *Hyves* in the Netherlands, and *Lokalisten* and *StudiVz* in Germany, as well as business-orientated SNS such as *Linkedin* and *Xing*. According to Gross/Acquisti (2005, 71), high adoption rates and colossal increase in user participation led to an intensified diversification and sophistication of purposes across multiple contextually distinctive SNS. Most established SNS in this period share a common set of functionalities such as to maintain individual user profiles that feature bio- and photographical user information, to display individual social network structures of confirmed friendships, and to direct message other users.

To conclude, SNS that emerged between 2005 and 2009 provided a common set of functionalities allowing its users to generate, share, and combine information and therefore virtually address human (social) needs like self-representation, communication, and curiosity (Bilandzic et al. 2009, 1517) (see section 3.3).

2.2.2 The rise of Facebook, Twitter, and Google+

Between the years 2009 and 2011, due to high adoption rates and intensified frequency of SNS use, *online social networking* provoked a shift from pure offline social interactions to an increased convergence between an individual's offline and her online social networks. In contrast to VCs which are primarily used to establish and maintain online social ties based on shared interests or common purpose, current research findings indicate that people increasingly use SNS to primarily map and maintain their real-life social networks online (Joinson 2008, 1029; Lampe/Ellison/Steinfield 2006, 169f) (see section 3.3). This colossal adoption of *online social networking* can be quantified by the fact that SNS reached over 84% of the total Internet population in Europe (comScore 2011b, 7) and approximately 82% of the global Internet population – which represents about 1.2 billion people worldwide (comScore 2011, 4) (see Figure 6).

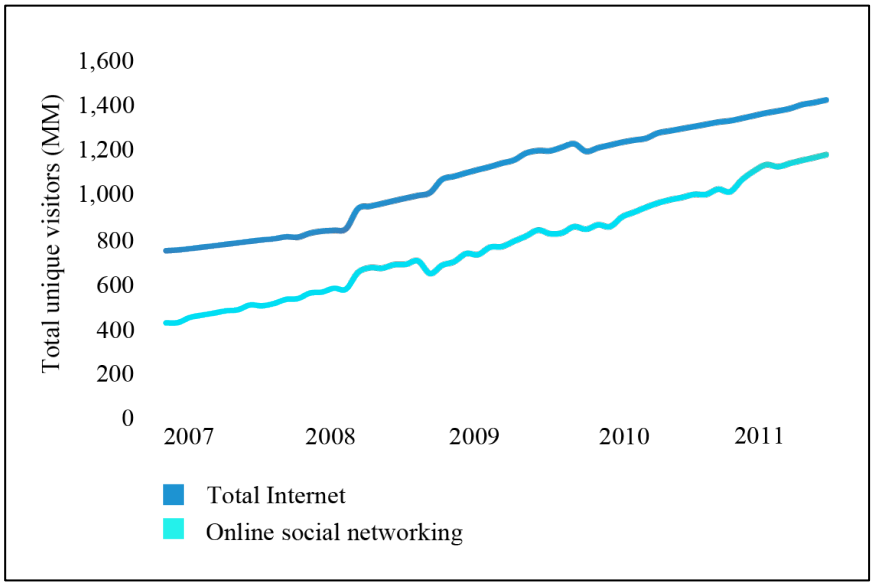

Figure 6: Rise of global online social networking population (in millions)
Source: Own illustration in adoption to ComScore (2011, 4)

The largest SNS by the year 2012 – Facebook – serves over 900 million active users worldwide (Facebook 2012) with each user maintaining an average of 130 social ties on the SNS. In addition more than 50% of Facebook users login everyday which equals to approximately 500 million daily users (Facebook 2012). SNS Facebook use by itself accounted for approximately three in every four minutes spent on *online social networking* and one in every seven minutes spent on general Internet use (comScore 2011, 7). I therefore assume that the majority of users already accept *online social networking* as a supportive means of their daily lives as well as an integral part in their communication and social interaction routines. According to comScore (2011, 4), SNS Facebook alone reached more than half of the global Internet audience (55%) in the year 2011.

After a phase of diversification, multiple SNS were affected by the order of magnitude growth in number of active users on the SNS Facebook from 30 million in July 2007 to more than 900 million in March 2012 (Facebook 2012). While the tremendous success of the SNS Facebook might be explained by a number of factors (comScore Data Mine 2012) (see sections 2.2.2 and 2.2.3), it evoked an emigration of users from various SNS to join Facebook, initiating an intense consolidation of platforms. By the year 2012, the consolidation resulted in three globally relevant and dominant SNS – namely Facebook, Twitter, and Google+, which I briefly depict in the following.

> ***Facebook*** started as a college-oriented SNS in 2004 and was founded by undergraduate students at Harvard University. According to Gross/Acquisti (2005, 74) "college-oriented social networking sites provide opportunities to combine online and face-to-face interactions within an ostensibly bounded domain" that might be a reason for the exponential adoption and later growth of SNS. In recent years, the SNS Facebook lifted its limitation on college affiliation and opened itself to an international audience (see section 2.2.2). Facebook provides its users a variety of functionalities that enable users to share user-generated content (e.g., embedding pictures or videos), to comment on and process content and information of other users, to communicate with other us-

ers (e.g., text-based messaging), and to establish online social networks based on a *social-circles network model.* Furthermore, Facebook implemented a status message update functionality enabling users to post ad-hoc status reports about their emotional and situational states in a novel modality of *one-to-many communication* (see Figure 7).

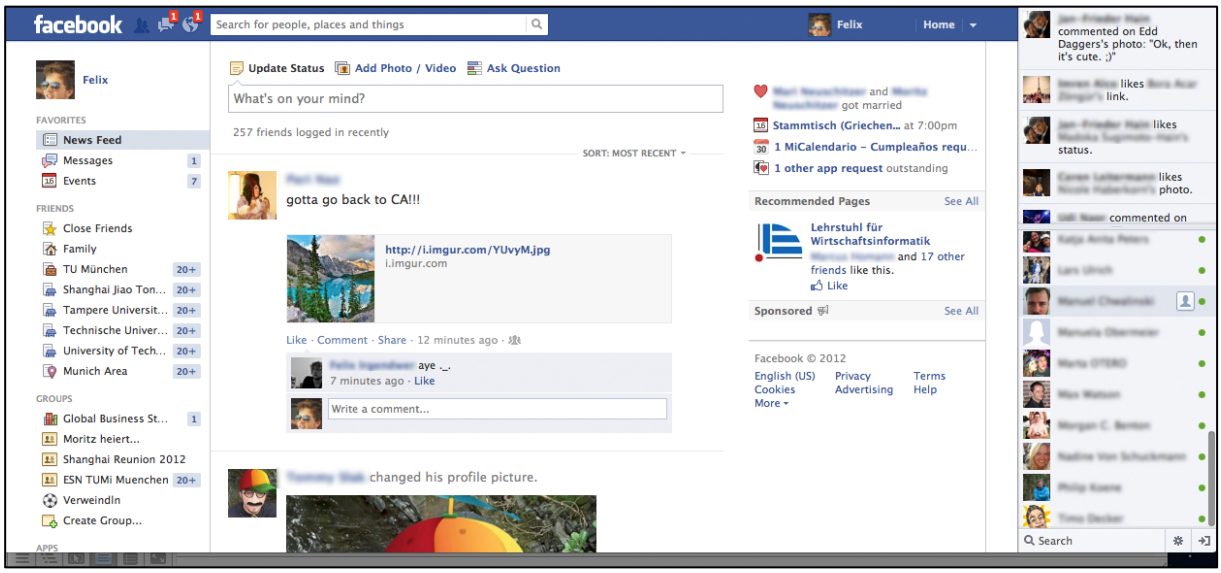

Figure 7: Anonymized SNS Facebook user profile
Source: Own illustration

Twitter was founded in 2006. Although Twitter officials describe the system as a "real-time information network" (Twitter 2012), the system allows its users to manage social relationships among each other and thus provide functionalities to establish and maintain an online social network (Huberman/Romero/Wu 2008, 2f), thus classifying the system as a SNS. Twitter no longer publishes official user statistics regarding the size of the network, but it was believed to be around 500 million registered users in early 2012 with approximately 800,000 new accounts created every day (Dugan 2012). Given that Twitter fundamentally differs in its mode of operation and basically provides a lower range of functionalities to users compared to Facebook and Google+, I briefly explain its basic mode of operation at this point and in greater detail where needed in corresponding subsequent sections (see section 5.2.2).

At the heart of the Twitter system are short messages termed *tweets*[12] of a maximum of 140 characters in length. Tweets can contain any type of textual information, including hyperlinks to other online resources. By default, all messages posted are publicly available in an unrestricted fashion in the global stream of Twitter messages. To filter this global stream, users can choose to *follow* other Twitter users, i.e., a user subscribes to message streams of other users to get these messages displayed on her Twitter profile. In return, these users are termed *followers*. *Followers* and *following* are

[12] A *tweet* is a (status) message published through the SNS Twitter, which is publicly visible by default and limited by its character length.

means of forming a network resulting in a directed graph of social ties within the Twitter system[13]. In this *social graph*[14], Twitter users represent nodes and following-follower relationships represent directed edges between the nodes with the followers relationship resulting in an incoming connection (i.e., in-degree) and the following relationship in an outgoing connection (i.e., out-degree). Two special types of messaging are possible: *re-tweets* and *replies*. Re-tweets are citations of existing tweets that are sent without edits to a user's followers. This type of message is a means of spreading information through a user's network of followers. For any tweet, a list of all re-tweets is maintained on the system level and can be directly accessed. Replies are messages directed at a specific user while still being publicly available[15].

For the sake of completeness, I briefly mention ***Google+,*** which constitutes one of the three dominant SNS measured by its user population and global relevance by the year 2012. I refrain from providing a detailed description of the SNS Google+, given that the system is highly consistent with the SNS Facebook in terms of its functional range as well as mode of operation. Furthermore, Google+ was introduced during the compilation of the thesis and therefore excluded as object of research in underlying conducted studies.

To conclude the underlying section, *online social networking* is currently the most popular online activity worldwide (comScore 2011, 4) and has spread from a primarily younger user audience, e.g., students, to a more diverse demographic user population in the recent years (comScore 2011, 12) (see section 2.2.3). In 2012, the three dominant and globally relevant SNS by 2012 are Facebook, Twitter, and Google+.

In a next step, I speculate on prospective developments in *online social networking* in order to demonstrate the enormous prospective potential of this novel modality of social interaction and its implications on our social life, as we know it today. The following depictions and assumptions raise no claim to completeness and correctness.

2.2.3 The prospective permeation of our everyday life

Technological advances are generally highly continuous and penetrative in the field of ICT, but currently most ascertainable in the evolution of mobile and ubiquitous computing technologies include enhanced user interfaces, improved processing power, and increased mobile bandwidth. These technological developments strongly influence advancements of mobile devices – so called smartphones and tablets. Progressive adoption might result in ubiquitousness of online connectivity leading to a completely novel 'always on' lifestyle and total pene-

[13] A bilateral *follower* and *following* connection between Twitter users would correspond to a "friending" connection between users on the SNS Facebook.
[14] The terminology *social graph* emanated from research applying graph theory to social aspects and basically describes a sociogram that "essentially refers to the global mapping of everybody and how they're related" (CBS News 2010).
[15] The Twitter system also supports private direct messaging between the users but this functionality is not within the scope of research being further detailed later in the underlying thesis.

tration of *online social networking* in our daily lives. Therefore SNS providers have released respective mobile versions of their applications. For instance, the SNS Facebook reports more than 488 million active users who access the SNS through mobile devices in 2012 (Facebook 2012).

Studies show that the fraction of users who access SNS while on the go steadily increases (comScore Data Mine 2011a) and is predicted to make up approximately 18% of the global mobile phone users which is the equivalent of 950 million users worldwide by the year 2012 (Bramson-Boudreau/Arathoon 2008, 2; comScore 2010a). Mobile devices have become a predominant and attractive means to maintain and strengthen social connections in real-time (Humphreys 2007, 341) and entail novel technological and functional possibilities to provide better and enhanced integration between offline and online social interactions (Köbler et al. 2011, 217ff). Consequently, further developments in mobile and ubiquitous technologies enable online social interaction in a highly non-intrusive fashion while real-life social interactions happen. Although twice as many people above the age of *55* accessed SNS via a mobile device in 2011 compared to 2010 according to a report by Nielsen (2011, 8), I like to note that my research focused on non-mobile *online social networking* since this form probably constitutes the primary modality of online social interaction among elderly SNS users over the next years.

I further assume that this novel experience of social interaction might become a decisive component of social interactions and even might change our everyday social life and society at large. This is best exemplified by the convergence of *online social networking* and electronic commerce that led to the emergence of so called *social commerce*[16] systems, e.g., ebay (Stephen/Toubia 2010, 215ff). Yet, novel forms of *social commerce* systems enable users to allocate, share, and offer products or services to other social peers based on a *collaborative consumption paradigm*[17] (Botsman/Rogers 2010, 67ff; Felson/Spaeth 1978, 614). Systems such as *Airbnb*, *Getaround,* and *Taskrabbit* facilitate shared use or consumption of products as well as provisioning of peer-to-peer services, e.g., lodging and car renting.

In conclusion, considering that these novel systems will continue to permeate through our societies and increasingly shape general aspects of our lives, elderly individuals are not only at risk of being left behind in the rapid evolution of *social computing* but also in possible fundamental changes in our societies and economic systems at large. Consequently, contributions of the underlying research might also be partially applicable in building such novel systems more adequately for elderly individuals.

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[16] According to Stephen/Toubia (2010, 215) social commerce is "an emerging trend in which sellers are connected in online social networks and sellers are individuals instead of firms". Social commerce platforms enable users to actively participate in selling and offering products online and additionally support social interactions that occur during and after product sales. Purchase decisions might be influenced by recommendations and ratings of products stated by fellow online social ties.

[17] The terminology "collaborative consumption" was introduced by Felson/Spaeth (1978, 614) and later adopted by Botsman/Rogers (2010, 67ff) to describe "the rapid explosion in traditional sharing, bartering, lending, trading, renting, gifting, and swapping reinvented through network technologies on a scale and in ways never possible before" (Collaborative Consumption Hub 2012).

At this point, I would like to address the question of what makes *online social networking* distinctive to other existing forms of computer-mediated communication and online social interaction in greater detail.

2.2.4 Towards a working definition of 'social networking site'

In this section, I attempt to specify the phenomenon of *social computing* systems from the perspective of an IS and HCI researcher in greater detail and consequently derive a working definition for the terminology '*social networking site'* prevailing in scope of the thesis.

2.2.4.1 Social computing vs. organizational computing systems

Social computing systems such as SCP and SNS can be differentiated from traditional *organizational computing* systems such as Enterprise Resource Planning (ERP) systems by six characteristics that are commonly shared by majority of contemporary implementations (Parameswaran/Whinston 2007, 767f).

> *"Social computing shifts computing to the edges of the network, and empower[s] individual users with relatively low technological sophistication in using the Web to manifest their creativity, engage in social interaction, contribute their expertise, share content, collectively build new tools, disseminate information and propaganda, and assimilate collective bargaining power."* (Parameswaran/Whinston 2007, 763)

Parameswaran/Whinston (2007, 762-780) provide an overview on *social computing* and its diverse instantiations and further elaborate on essential characteristics of *social computing*.

Accordingly *social computing* systems are characterized by:

(1) a *dynamic* nature where individuals continuously share information and accumulated information is subject to a continual propagation process by users that in turn accelerate the dissemination of information across multiple *social graphs* and within the system as a whole. For instance, the *Facebook Like Button* and status message update[18] functionality enable users not only to share information, but also to react on user-generated content, e.g., expressing a certain level of appraisal of shared information, in a highly interactive fashion.

(2) a *bottom-up structure* that discerns these systems from contemporary *organizational computing* systems such as ERP systems, which are commonly implement-

[18] Status messages serve as ad-hoc reports with regards to a user's current emotional and situational state and are typically integrated in the form of an asynchronous messaging functionality in contemporary SNS. In cases, their implementation follows a micro-blogging paradigm that signifies a limitation in potential length of applied characters (cf., Twitter) (see section 5.2.2).

ed in a top-down structure based on specific governance, rules of use, standardized procedures, or supported specific (business) processes.

(3) a *highly flexible structure* that can adjust to specific parameters and attributes based on shared information affected by users, in contrast to coherent and process aligned structures of *organizational computing* systems. For example, the SCP Youtube provides functionalities to display recommended and featured videos and to filter trending or popular video content based on total users' popularity.

(4) a *fluid boundary* in comparison to *organizational computing* systems in which the extent of user interaction is usually limited to organizational boundaries per se and determined by scope of underlying (business) processes or procedures. In contrast, *social computing* systems in cases disperse internal and external organizational boundaries by pervading distinct organizational structures through vertical and horizontal integration of functionalities and consequently enable users to expand their sphere of influence.

(5) an *indirect revenue model* that is usually based on (personalized) advertising as the primary compensation method, e.g., cost-per-view and cost-per-click advertising models, commonly applied in conventional Internet venues.

(6) a predominate *altruistic motivation* and *community-oriented use behavior* that determines a user's adoption and active participation in these socio-technological systems (Parameswaran/Whinston 2007, 768).

Given that *organizational* and *social computing* systems are highly distinct in essential system characteristics and user interactions from the perspective of IS and HCI research, and SNS further constitute a specification of *social computing* systems, I consequently derive a working definition of '*social networking sites'* in the following.

2.2.4.2 Defining 'social networking sites' in scope of the thesis

In order to approximate to a definition, I chose a two-fold approach based on (i) established definitions of *virtual communities* (VCs) illustrating the socio-technological precursor of contemporary SNS and (ii) basic definitions of a '*social network'* from sociological and psychological research.

I intentionally introduce and elaborate on definitions of VC to clearly demarcate both socio-technological phenomena from another. Continuative, I propose to strictly distinguish between both socio-technological phenomena according to their underlying predominant use behavior and prevalent patterns of use – namely *social browsing* and *social searching*.

Virtual communities vs. social networking sites

McMillan/Chavis (1986, 8) define *'community'* as "a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that mem-

bers' needs will be met through their commitment to be together". Meaningful discourses on the definition of the terminology *community* are found in German literature and its origins can be traced back to Tönnies (1887) who in particular distinguished between the terminologies of *Gemeinschaft* ('community') and *Gesellschaft* ('society'). In his understanding, *Gesellschaft* is a mere juxtaposition of independent individuals, whereas *Gemeinschaft* is a lasting and genuine coexistence of (geographically local) individuals. The essence of *Gemeinschaft* is supported by traditional behavioral patterns and norms, customs and traditions, and is based on social ties such as family, kinship, or friendship (Tönnies 1976, 228).

Due to the geographically limited character of a community, Hillery (1955, 115ff) suggested two perspectives on communities and thus distinguishes two types: (i) communities based on geographical areas (*geographical perspective*) and (ii) communities based on social relationships (*social-psychological perspective*). With regard to increased computer-mediated communication and online social interaction in the last two decades, the formation of communities underwent a virtualization by applying concepts adapted from offline community building to create so called *virtual communities*. In light of the formation of pure VC, the distinction proposed by Hillery (1955, 115ff) triggered criticism since the formation of geographically and temporally distributed VCs would therefore be theoretically not possible. Given that this assumption can be rejected based on the emergence of VC, later definitions dismissed geographical and physical characteristics. Hence, the *social-psychological perspective* gained higher interest among scholars in efforts to define the socio-technological phenomenon of VCs (Preece 2000, 10; Rheingold 1993, 413). Consequently, I adopt a *social-psychological perspective* in defining *social computing* systems such as SCP and SNS, in the following.

Literature lacks in providing a homogenous definition of the terminology '*virtual community'*, which Porter (2004, Article 3) defines as "an aggregation of individuals (…) who interact around a shared interest, where the interaction is at least partially supported and/or mediated by technology and guided by some protocols or norms" to be a *'virtual community'*. Blanchard (2004, 55) paraphrased the terminology '*virtual community'* as "groups of people who interact primarily through computer-mediated communication and who identify with and have developed feelings of belonging and attachment to each other" (Blanchard, 2004, 55). Leimeister et al. (2008, 353) define '*virtual community'* by merging key aspects and characteristics that are repeatedly mentioned by other scholars (Haythornthwaite 2007; Preece 2000, 10; Rheingold 1993, 413) and conclude that '*virtual communities'* are groups of individuals who "meet and interact with others, are connected by a specific interest, are brought together by means of a technical platform and can establish social relationships or a sense of belonging to this group". Table 2 provides an overview on prevalent definitions from IS and HCI research literature.

Definition of the terminology 'virtual community'	Authors (References)
"Virtual communities are groups of people with common interests and needs who come together on-line. Most are drawn by the opportunity to share a sense of community with like-minded strangers, regardless of where they live. But virtual communities are more than just a social phenomenon. What starts off as a group drawn together by common interests ends up as a group with a critical mass of purchasing power, partly thanks to the fact that communities allow members to exchange information on such things as a	**Hagel III/Armstrong** (Hagel III/Armstrong 1997, 143)

product's price and quality.”	
"Virtual communities are social aggregations that emerge from the Net when enough people carry on those public discussion long enough, with sufficient human feeling, to form webs of personal relationships in cyber-space.“	**Rheingold** (Rheingold 1993, 413)
A virtual community is “a technology-supported cyberspace, centered upon communication and interaction of participants, resulting in a relationship being built up (…)”.	**Lee/Vogel/Limayem** (Lee/Vogel/Limayem 2002, 2)
A virtual community “consists of people, who interact socially as they strive to satisfy their own needs or perform special roles, such as leading or moderating, a shared purpose, such as an interest, need, information exchange, or service that provides a reason for the community, policies, in the form of tacit assumptions, rituals, protocols, rules, and laws that guide people's interactions and computer systems, to support and mediate social interaction.”	**Preece** (Preece 2000, 10)
“A virtual community consists of people who interact together socially on a technical platform. The community is built on a common interest, a common problem, or a common task of its members that is pursued on the basis of implicit and explicit codes of behavior. The technical platform enables and supports the community’s interaction and helps to build trust and a common feeling among the members.”	**Leimeister/Sidiras/Krcmar** (Leimeister/Sidiras/Krcmar 2006, 279)

Table 2: Overview on definitions of the terminology ‘virtual community’
Source: Own illustration in adaption to Leimeister (2004, 36f)

Various attempts to derive typologies of VCs have been documented in literature (Laudon/Traver 2006, 766f; Porter 2004, Artcile 3) in order to gain a better understanding of the underlying socio-technological phenomenon.

In the following, I attempt to apply a typology formulated by Armstrong/Hagel III (2000, 85) to approximate a definition of ‘*social networking sites’*. Both scholars distinguished between four types of VC based on their goals, or respectively, on their benefits to the particular user: (1) *communities of transaction*, (2) *communities of interest*, (3) *communities of relationship,* and (4) *communities of fantasy*. In a broader sense, contemporary SNS based on a *social-circles network model* (Hamill/Gilbert 2010, 81f) approximate a *community of relationship* and partially incorporate functionalities adapted from VCs, e.g., to create and maintain an individual profile aggregating bio- and photographical user information.

However, I argue that a distinction must be made between VCs and SNS and therefore mostly agree with boyd/Ellison (2007, 219) who clearly depict the major difference between both socio-technological phenomena that is:

> *“[…] early public online communities […] were structured by topics or according to topical hierarchies, but social network sites are structured as personal (or ‘‘egocentric’’) networks, with the individual at the center of their own community.”* (boyd/Ellison 2007, 217f)

I would go even further, insisting on a clear distinction between VC and SNS based on their differing predominant use behavior and prevalent use patterns. Various studies suggest that in VC use relationships are typically initiated online based on shared interests, and were likely to transcend into users’ offline worlds (Cummings/Butler/Kraut 2002, 103ff), often resulting in face-to-face meetings and offline social interaction. However, SNS users mostly initiate

online social ties with individuals they already know in their real lives in order to maintain or strengthen these relationships in the offline world.

These two different prevalent use patterns have been referred to as "social browsing" and "social searching" (Lampe/Ellison/Steinfield 2006, 169). While *social browsing* is the dominant use pattern in VC and refers to finding (previously unknown) individuals or groups online in order to establish connections with them, *social searching* refers to looking up offline contacts and acquaintances, finding out more about them, and establishing online connections with them. For instance, on the SNS Facebook, the direction of use is typically from offline to online, i.e., people are more likely to use it for maintaining their offline social network, rather than creating purely online ties (Ellison/Steinfield/Lampe 2007, 1165; Lampe/Ellison/Steinfield 2006, 169f). Therefore SNS use helps in strengthening and intensifying offline relationships that people already have, which in turn could equal a quasi representation of our *Gesellschaft* in the case of massive user populations such as on the SNS Facebook. However, to date only few rigorous studies examined the changing predominant use behavior and prevalent use patterns between VC and SNS use (Lampe/Ellison/Steinfield 2006, 169).

Concluding on a definition of 'social networking sites'

In a last step, I attempt to approximate a definition from a *social-psychological perspective*. A *social network* can generally be described as a web of social ties in which people interact with each other and can be described by its *structural* characteristics such as the network size, density, strength of ties, homogeneity, and others (Scott 2000, 69ff) as well as its *functional* characteristics such as *social connectedness*, *social support*, *social capital*, social comparison, and social influence (Berkman/Glass 2000, 141ff). While the *structural* characteristics describe the properties of the social network at large, the *functional* characteristics can influence the general *well-being* of network members (Helliwell/Putnam 2004, 1436).

> *„A social network consists of a finite set or sets of actors and the relation or relations defined on them. The presence of relational information is a critical and defining feature of a social network."* (Wasserman/Faust 1994, 20)

Consequently, offline as well as online social networks are characterized by interactions between its members along existing networks of relations. Systems providing functionalities that enable users to establish, document, and manage social relationships according to a *social-circles network model* in a highly creative, competitive, and dynamic form of interaction are termed *social networking sites* (SNS) (Dwyer 2008, 11f). Accordingly, boyd/Ellison (2007) define SNS as

> *„(...) web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site."* (boyd/Ellison 2007, 211)

While boyd/Ellison (2007, 211) focus on technological properties of SNS, van Meurs (2011, 16) highlights the primary intention to use such systems – namely *networking*. To be more specific, van Meurs (2011, 16f) criticizes the definition delivered by boyd/Ellison (2007, 211), as it fails to emphasize the main activity and intention to use SNS, since SNS "not only allow the users to view and traverse the profiles of other users, but also afford interaction between the profiles and therefore between users". Further, van Meurs (2011, 17) claims that a definition of SNS needs to emphasis on (i) the *social-circles network model* characteristic of such systems and (ii) the various forms of social (online) interaction between users. A similar criticism is stated by Beer (2008, 518ff) who also demands for a definition that focuses on the networking aspects of SNS use as the main preoccupation of users and prevalent use pattern.

> *"[Social networking sites are] webbased services centered around individual profiles that allow individuals to network through the connection and interaction with subsequent profiles."* (van Meurs 2011, 17)

Therefore the definition by van Meurs (2011, 16) intentionally implies a clear distinction between SNS and SCP although these systems are similar in their functionalities; and further strictly excludes the latter given that SCP are not explicitly centered around user profiles, but the specific content that is shared via these profiles. In accordance with van Meurs (2011, 15), a blurring of boundaries between SCP and SNS is currently observable. For example, the SCP Youtube increasingly merges functionalities with SNS such as Facebook and Google+ and additionally strengthens functionalities that can be used to build and maintain online social networks between user profiles.

Since I affirm stated criticism regarding established definitions of the terminology *social networking site* and further assess the definition by van Meurs (2011, 17) to be complete and precise, I desist from deriving my own definition for the underlying thesis.

> ***Social networking sites*** are "webbased services centered around individual profiles that allow individuals to network through the connection and interaction with subsequent profiles" and that are based on a *social-circles network model.*

As mentioned above, I would like to elaborate on a significant evolution in *online social networking* observable in recent years that further justifies the relevance of conducted research, namely the progressive demographic shift in SNS user populations in favor of elderly users.

2.3 A constituting demographic shift in SNS user populations

In recent years, the total user compositions of SNS – especially in the case of Facebook and Twitter – are subject to a continuous shift towards elderly user segments. I argue that progression of demographic shift in user populations constitutes the growing relevance and importance of *online social networking* in our social interactions and everyday lives. I demonstrate these changes in user demography with the example of the SNS Facebook

whereby my line of reasoning is mainly based on secondary data since Facebook only publishes highly limited demographic data about its active user population.

According to numbers officially released by Facebook the system listed more than 900 million monthly active users at the end of March 2012 (Facebook 2012). Taken into account that Facebook started as a SNS that was mainly restricted to a younger audience – namely college and university students – based on rigorous verification of college/university affiliation during registration, the SNS subsequently traversed an immense internationalization and diversification in regard to its demographic composition.

I argue that to date the shift in demographic user composition is dividable into two prevalent stages: (1) a stage of radical opening and internationalization and (2) a stage of continuous growth due to attraction of highly heterogeneous users in terms of their demographic backgrounds.

(1) Around the year 2008, dissemination of the SNS Facebook to a general audience was initiated by (i) abandoning the rigorous student verification process, which in early stages only allowed individuals to register with the SNS who were affiliated with a college or university residing in the United States of America; (ii) introducing an application programming interface (API) to attract third-party application developers; and (iii) offering language aligned and specific national representations of the SNS, to name but a few.

    These changes resulted in an order of magnitude growth in registered and active users in the following years, and consequently induced a shift from primarily college or university students to a more diverse demographic user composition in favor of teenagers and younger adults (comScore 2007).

(2) Continuative, dissemination and internationalization then conveyed in continuous growth in terms of registered and active users as well as attracting highly heterogeneous users with regard to their demographic characteristics. Various reasons might serve as explanations for recent and current changes in the demographic composition of the total user population: (i) parallel to renunciation of the limited registration policy, Facebook started to diversify and broaden the range of implemented functionalities; (ii) increased and fundamentally integrated third-party applications and integrated functionalities in external systems so-called *Social Plugins*, e.g., *Facebook Like Button*, *Facebook Activity Feed Plugin*; and (iii) constituting implications of network externalities[19], to name but a few.

    As a result, one of many implications of *network effects* is the ongoing migration of users from other SNS to Facebook resulting in immense decline of registered users on SNS such as Myspace, Orkut, and StudiVZ, and in their potential discon-

[19] *Network externalities* or *network effects* are significant in many important industries and generally „entail the provision of a durable good and a complementary good or service" (Katz/Shapiro 1986, 821).

tinuation. I further reason that previously illustrated functionalities highly increased the overall presence of Facebook on the Internet in general as well as in third-party applications and systems in specific. This resulted in intensified awareness and omnipresence of the largest SNS among the total Internet user population, and hence virtually reaching the entire demographic population of Internet users.

Consequently, the demographic composition of SNS users shifted from a primarily homogenous and younger to a heterogeneous and highly distributed demographic composition. The change is best observable in data reporting on *online social networking* penetration among demographic groups on a global scale between July 2010 and October 2011 (see Figure 8). The data shows that the demographic segments *Age 45-54* and *Age 55+* increased by 8.4% and 9.4% respectively[20], whereas the latter represents the fastest growing demographic segment in *online social networking*[21].

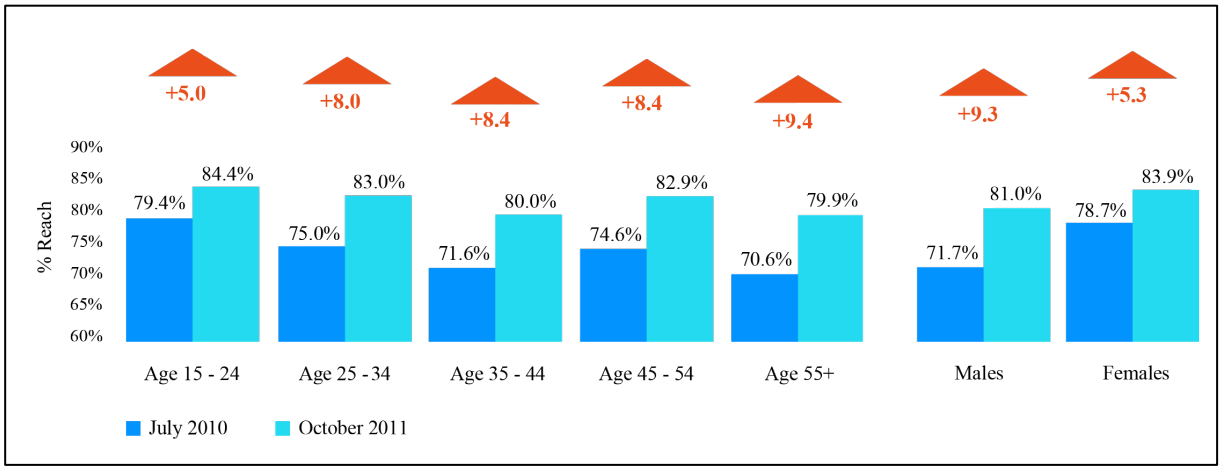

Figure 8: Changes in global online social networking between 2010 and 2011 (in %)
Source: Own illustration in adoption to comScore (2011, 12)

I further assume that the demographic shift in SNS user populations potentially intensifies in the next years since elderly individuals exhibit deferred use patterns in regards to *online social networking* when compared to their younger counterparts. In the following, I attempt to briefly demonstrate my assumption and therefore interpret data on (i) user engagement on SNS and (ii) prospective changes in dominant computer-mediated communication modalities across all demographic segments.

Regarding intensity of *online social networking* use quantified by the amount of average hours per SNS user, data collected by comScore (2011, 13) shows differences between the youngest demographic segment *Age 15-24* and the oldest demographic segment *Age 55+*,

[20] The lower relative growth rate in the demographic segment Age 15-24 can be explained by a high basic value in use and absolute adoption of *online social networking* in the year 2010, which approximates a saturation of the Internet population in the corresponding demographic segment.
[21] Other studies on the demographic composition of the SNS Facebook reveal comparable results and document the demographic segment *Age 55+* to constitute the second fastest growing demographic segment in *online social networking* use relative to other segments (istrategylabs 2011).

with averaged 8.6 (female users) and 7.5 (male users) hours in the youngest segment compared to 4.9 (female users) and 2.7 (male users) hours of use (per month), respectively. Notable, data describing *online social networking* engagement retrieved for the demographic segment *Age 45-54* in comparison to the segments *Age 35-44* and *Age 25-34* shows less differences. Further it reveals that female users in the segment *Age 45-54* are the third strongest user segment in regard to intensity of SNS use across all demographic and gender segments. Male users assigned to the *Age 55+* segment exhibit the lowest intensity of *online social networking* use when compared to all other segments[22].

Potential future developments in demographic compositions of SNS might be additionally derived by consulting data that depicts trends in current dominant computer-mediated communication and online social interaction modalities – namely *email*, *instant messaging,* and *online social networking*. A general trend to *online social networking* use is observable in all demographic segments whereas the segments *Age 15-24* and *Age 25-34* mark the largest gain (34% and 25% respectively) while these segments concurrently display the largest decline in email (-22% and -9% respectively) and instant messaging (-42% and -32% respectively) use[23]. Furthermore, the shifting trend away from computer-mediated communication via email and instant messaging to *online social networking* is essentially weaker in the demographic segments *Age 45-55* and *Age 55+*, but potentially traverses a similar trend observable in younger user segments (see Figure 9).

[22] The fact that female users seem to display higher *online social networking* activity and intensity of SNS use compared to their male counterparts across all demographic age groups could partially serve as an explanation for the occurrence of referral bias in favor of female survey participants within the conducted studies presented in later sections of the underlying thesis.

[23] However, I allude that functionalities allowing users to communicate via email and instant messaging are additionally supported by most SNS, especially in the case of the SNS Facebook and Google+.

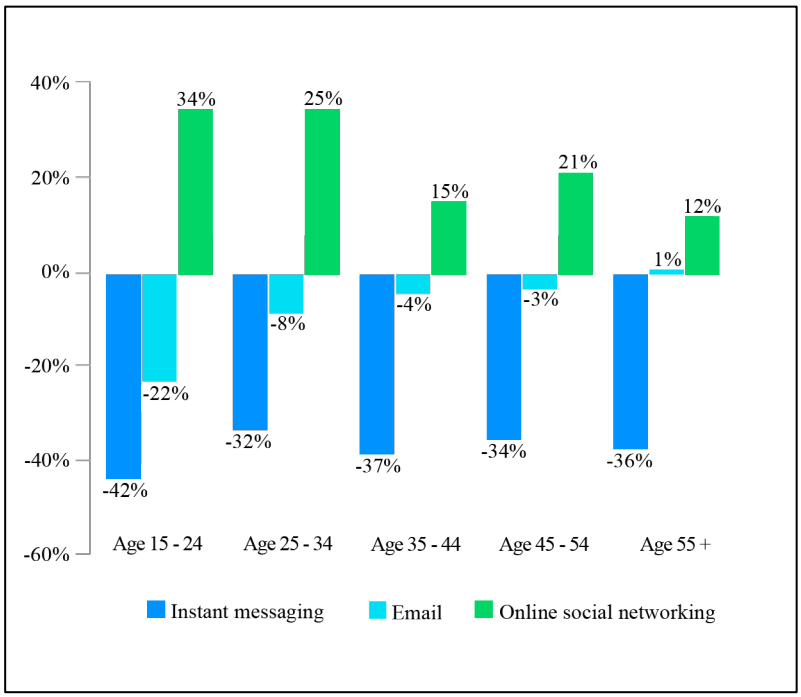

Figure 9: Changes in dominant computer-mediated communication modalities (in %; July 2010 vs. October 2011)
Source: Own illustration in adoption to comScore (2011, 14)

To summarize, I illustrated a potential demographic shift in SNS user populations in general and attempted to demonstrate these changes in user composition by means of past and recent developments in the example of the SNS Facebook. Concurrent findings of various studies constitute almost total saturation rates among *digital natives* (demographic segments *Age 15-24* and *Age 25-34*) regarding *online social networking* use relative to the total Internet population in corresponding segments; and an occurring potential trend towards *online social networking* as the primary computer-mediated communication and online social interaction modality (comScore 2011, 4, 14). I therefore assume that *online social networking* or its natural successor could be the primary mode of computer-mediated communication and online social interaction among *digital natives* as well as *digital immigrants* in the future. This in turn might especially result in higher adoption rates among elderly demographic segments thus leading to an intensified demographic shift in SNS user populations.

These observations amongst others serve as a primary motivation for the underlying thesis constituting the growing relevance and importance of *online social networking* in social interactions and everyday lives for the elderly.

2.4 Summary of the contextual background of the thesis

Aging population is a reality in most developed societies today. I depicted a dramatic shift towards elderly age segments within populations such as in the case of Germany, and further argued that this phenomenon potentially evokes deferred implications on a global scale. The current demographic shift in most nations not only implies negative consequences for their affected economic structures such as health care systems and pension funds as well as socie-

ties at large, but also negatively impacts their entire populations on an individual level whereas its implications are most critical and complex for the elderly. For instance, I demonstrated that drastic societal developments and changes in family arrangements not only convey the risk of *social exclusion* on the individual level, but also result in reduced social and psychological *well-being* of affected individuals and moreover in the degradation of conventional social structures in total.

Hence, research and efforts to secure elderly people to perpetuate their lives without being socially excluded from society by strengthening their individual social networks, to facilitate and thrive on social interactions, and to realize (social) benefits for the elderly in a more effective and efficient manner by making use of novel advancements in ICT to provide meaningful socio-technological interventions, is therefore of growing interest among policy makers and researchers in various disciplines.

In previous sections, I not only provide reasoning for the potential application of *online social networking* as a means to counteract negative effects such as *social exclusion* among the elderly, but also develop an understanding and consequently derive a working definition of '*old age'* in context of the thesis. I therefore contextualize the terminology with the degree of familiarity in ICT use and define individuals above the age of 50 years as *elderly* constituting the precedent generations of *digital natives.*

Since SNS are highly complex systems in terms of their mode of operation and implemented functionalities, I determine that elderly individuals have difficulties in using such systems and are unable to fully understand implications of implemented functionalities and the system at large due to age-related limitations. This motivated the underlying thesis research and consequently focus on the design and evaluation of existing and novel SNS functionalities that especially cater to elderly SNS users to leverage (social) benefits through *online social networking*.

Online social networking is a relatively new phenomenon that has gained significant popularity over the last decade and is rapidly changing the way people communicate and socially interact. I briefly outlined past and present developments in *online social networking* and make assumptions on prospective evolutions in *online social networking* in order to demonstrate its present and future relevance in shaping the way we socially interact with each other. In the course of approximating a definition of *social networking sites* (SNS), I differentiated these novel systems from traditional *organizational computing* and strictly demarcate SNS from *virtual communities* based on their prevalent use patterns "social browsing" and "social searching" (Lampe/Ellison/Steinfield 2006, 169) in the scope of the underlying thesis. I then illustrated an ongoing demographic shift in SNS user populations and argued that progression of aging SNS user populations constitutes the growing relevance and importance of *online social networking* in our social interactions and everyday lives.

To conclude, the outlined phenomenal growth and adoption of *online social networking* over the last decade has accordingly resulted in increased research and practical interest in SNS and especially serves as a fertile ground in research disciplines such as IS, HCI and social sciences (Ji 2010, 1003ff; Oinas-Kukkonen/Lyytinen/Yoo 2010, 62ff).

In the following chapter, I therefore provide a brief literature review on *online social networking* aligned to the scope of the underlying thesis primarily based on IS, HCI and social sciences research literature.

3 Related work

Although academic research on *online social networking* has so far been relatively sparse, it has gained significant popularity over the last decade and thus making it a recent focal point in various research disciplines such as IS and HCI research. In the following, I provide a brief review of related work to anchor the underlying research within the IS and HCI disciplines since researchers commenced to identify and understand the different implications of participating in online social networks. However, I attempt to outline a current gap in research on *online social networking* that essentially is research devoted to (i) elderly individuals as primary subjects of investigation as well as (ii) the formation of (social) benefits through SNS use and how these benefits could be realized by adequate design of implemented functionalities.

Much of the early research on *online social networking* was influenced by a stream in IS and HCI research that developed from studies on computer-mediated communication enabled by the advent of digitally networked systems such as email and instant messaging, to research focused on online social interaction and collaborative behavior resulting from active participation in VCs. Most studies have been based on the assumption that individuals participating in VCs would be using these systems to connect with individuals outside their pre-existing social circles or location due to shared interests or circumstances in life (Wellman et al. 1996, 230ff). For example, the role of VCs in providing informational, emotional, and appraisal support to elderly and special patient groups has been investigated (Kanayama 2003, 267ff; Leimeister et al. 2008, 364).

However, current SNS can be distinguished from VCs by the fact that they are primarily used for the maintenance of existing social ties since direction of SNS use is typically from offline to online, i.e., people are more likely to use these systems to map their offline social networks, rather than creating purely online social ties (see section 3.3). Consequently, *online social networking* is assumed to differently affect individuals when compared to VC use since use of SNS helps in strengthening and intensifying offline relationships that people already have rather than to create purely online relationships (Ellison/Steinfield/Lampe 2007, 1155; Lampe/Ellison/Steinfield 2006, 170). Accordingly, there has been research focusing on the structure and nature of relationships on SNS (Heer/boyd 2003, 35ff) and attempts have been made to classify different SNS user types (Hargittai 2008, 290-293), which in turn for the most part excluded elderly subjects (see section 3.1).

Initial research on SNS additionally investigated how these systems can be used for keeping up with acquaintances (boyd 2004, 1281) and how SNS use impacts our social interactions (boyd 2006, 1ff). Therefore studies examined motivational aspects and potential gratifications users derive from active participation on SNS (Lampe/Ellison/Steinfield 2006, 167) as well as potential implications of SNS use on individual and collective behavior (Brown/Broderick/Lee 2007, 12). Research documents multiple reasons and motivations for joining and actively using SNS as these socio-technological systems are found to virtually address various human needs like self-representation, communication, and curiosity by generating, sharing, and combining information (Bilandzic et al. 2009, 1517). In addition, studies

also addressed privacy and security concerns that users of such systems perceive and how these might affect their adoption and use behavior (Acquisti/Gross 2006, 42ff). For example, Gross/Acquisti (2005, 73) depicted the diffusion of a novel type of intimacy in SNS use through sharing of private and personal information online with a population of friends and in cases even unknown individuals. However, they found that SNS could advocate a meaningful interaction of individuals with others "while the ability of others to access the person is significantly enlarged" (Gross/Acquisti 2005, 73).

More recently, studies increasingly investigated potential benefits and gratifications of *online social networking* such as perceived feelings of *social connectedness* (Köbler et al. 2010, 7f) and formation of *social capital* among individuals (Koroleva et al. 2011, 16f) as well as access to a wide variety of resources that SNS users experience such as *informational* and *emotional support* (Ellison/Steinfield/Lampe 2007, 1157; Lampe/Ellison/Steinfield 2007, 435-444) (see section 5.1.1.2). However, research not only focused on beneficial aspects of SNS use, but also on latent negative consequences for individuals that might result from this novel modality of social interaction (see section 3.2). For instance, it has been discussed that *information overload* caused by frequent SNS use might result in reduced levels of user activity, consequently evoking negative attitudes towards shared information and therefore potentially degrading beneficial effects of *online social networking* (Koroleva/Krasnova/Günther 2010, 6f).

Noteworthy, in most documented research on *online social networking* the target population has been teenagers or college students, i.e., predominantly younger individuals who are usually the early adopters and more active users of such technologies. While in the beginning Facebook users were primarily young college students who wanted to stay connected, the user population of the SNS Facebook has nowadays been transferred to a complete cut through modern society (boyd/Ellison 2007, 216; Hargittai 2008, 276) – currently traversing a demographic shift towards elderly user segments as indicated above (see section 2.3). This change leads to increased importance of *online social networking* for the way online and offline social interaction works in our everyday life and between generations (Ellison/Steinfield/Lampe 2007, 1144).

In the subsequent sections, I firstly assert that studies on *online social networking* within the IS and HCI research disciplines for the most part ignored elderly individuals in their target audience. I then provide a brief overview on studies that implicate negative and beneficial aspects of *online social networking* and further conclude that consolidated scientific findings on the interplay between offline and online social interaction as well as the realization of social benefits from SNS use in daily life are yet emerging[24].

[24] At this point, I like to note that the conducted review of related work excludes studies that embrace specific use cases of *online social networking* such as in political elections (Williams/Gulati 2009, 4f), marketing campaigns or other economical-oriented domains as well as research that methodologically bases on social network analysis (Heer/boyd 2003, 35ff). I further should like to point out that detailed descriptions and reviews of theoretical concepts considered and applied in scope of the thesis are found in the respective section (see section 5.4.1).

3.1 Research on online social networking ignored the elderly

Barring a few examples, there has been little research investigating *online social networking* among the elderly (Kanayama 2003, 267ff; Wright 2000, 100ff), the motivations that elderly might have in participating in such networks, and factors that can facilitate or inhibit them. Initial research aimed at understanding the incitements of elderly individuals to register with SNS found cross-generational social interaction to be the primary motivational factor for active participation on SNS among the elderly – yet a systematic approach to understand their expectations towards *online social networking* has not been undertaken.

A recent study identified younger SNS users to encourage elderly individuals among their close offline social circles, e.g., parents and grandparents, to register with SNS of their choice (Koppen 2010, 14). In the study sample, the majority of subjects who were above 50 years of age and registered with a SNS reported that they have learned about *online social networking* and consecutively joined an online social network by reason of social ties other than their spouses. Accordingly, about 70% of SNS users over the age of 50 years indicated that either their children or grandchildren have motivated them to join a SNS. Furthermore, 62% of elderly subjects indicated to primarily interact with their own children on SNS and 36% with their grandchildren, respectively. Overall, 73% of the respondents reported to primarily communicate with very close social ties except their own children or grandchildren (Koppen 2010, 14). More recently, studies attempted to identify differences in SNS use behavior between younger and elderly users to gain a better understanding on needs of the elderly towards *online social networking*. In the example of the SNS Facebook, a study found differences between younger and elderly SNS users in their online social interaction behavior and communication patterns. For instance, younger users actively employ SNS use as a novel modality of social interaction to complement real-world social interaction and mostly embed *online social networking* in their daily routines, while elderly users exhibit a rather passive interaction behavior, exemplified by inert reactions on received direct messages or processed status messages posted by their online social ties (Catone 2009).

Since the sharing of information is an integral part in SNS use implemented by groundbreaking novel functionalities, researchers were motivated to comprehend specific needs of the elderly towards *online social networking* and to better understand their requirements for these contemporary socio-technological systems. Studies therefore focused on age-related differences in behaviors towards provisioning and sharing of (personal) information in online social networks and found elderly users to preferably share textual information in the form of personal stories, advices, and memories with their online social ties (Kanayama 2003, 267), while younger users excessively share media-rich user-generated content such as images and videos (Berg 2011, 3). Moreover, the same study revealed that elderly SNS users not only provide more information on their SNS profiles, but also exceptionally specify truthful information such as a their real name, address and telephone number, when compared to their younger counterparts who appear to tend to have more constricted self-portrayal on SNS profiles by using nicknames or fake names (Berg 2011, 3).

However, except initial efforts that focused on SNS use behavior among the elderly, up until now research within the IS and HCI disciplines mostly ignored this specific target audience

and failed to generate a thorough understanding of their social needs towards *online social networking*. Hence, I argue that prospective research and further studies could fill this gap by focusing on differences between younger and elderly individuals in the modality of SNS use in order to gain understanding of needs expressed by the elderly towards *online social networking*.

While an average Facebook user is connected with 130 online social ties, evaluation of survey data collected among German users showed that individuals below 30 years of age are connected to approximately 200 social ties, while users who exceed 50 years of age maintain less than 30 social ties on average (Berg 2011, 3). Further data revealed that one third of users between 30 and 35 years of age are even connected with more than 200 social ties on the SNS Facebook. These results were partially confirmed by a study on size and characteristics of individual online social networks on the SNS Myspace which documented that elderly users not only maintain smaller social networks of confirmed social ties but share information with a more heterogeneous circle of social ties compared to younger users, e.g., higher span of age (Pfeil/Arjan/Zaphiris 2009, 648). Possible explanations for these differences are that elderly SNS users more cautiously choose their online social ties and consequently only accept online relationship requests by stronger social ties previously formed in offline interactions when compared to their younger counterparts. Furthermore, younger SNS users maintain online social networks that to a higher degree consist of weaker social ties, e.g., random and short-term social acquaintances and in cases solely online social ties.

Additionally, the study indicates that beneficial aspects of SNS use such as increased feelings of *social connectedness* and perceived *social capital* are assumed to be higher among younger SNS users since they maintain a highly homogenous network of social ties and interact with a higher degree of weaker social ties which potentially results in a higher degree of (bridging) *social capital* when compared to elderly users. Another explanation could be that elderly users are more cautious in sharing information among their social ties and rather hold back information and hence reduce the potential of beneficial aspects gained from *online social networking* interaction. Nevertheless, there seems to be evidence that especially elderly SNS users potentially benefit from a predominantly asynchronous communication modality in SNS and its advantages compared with synchronous communication such as real-time instant messaging applications. Predominant asynchronous communication modality in SNS therefore enables elderly SNS users to take their time in compiling user-generated content such as writing textual messages, to reconsider or revise shared content as well as to communicate information in individual pace (Kanayama 2003, 283; Wright 2000, 102). In contrast, a recently published study that embraced elderly subjects in its data sample found advanced age not to affect the realization of social benefits through active participation on SNS such as increased perceived psychological *well-being* (Burke/Marlow/Lento 2010, 1911), and moreover no significant differences between younger and elderly SNS users considering their *online social networking* behaviors.

However, I conclude that the possible ways of using these technologies to leverage socio-psychological benefits in general and to support social interaction among the elderly by addressing their specific expectations, needs, and concerns towards *online social networking* in particular, are much less understood.

Yet research on SNS not only focuses on potential beneficial aspects that might result from the active participation on SNS, therefore various studies explore potential negative results of *online social networking*.

3.2 Efforts to understand downsides of online social networking

One of many possible negative aspects of *online social networking* constitutes *information overload* which in cases results in reduced levels of user activity, a negative attitude towards shared information by causing an emotional state of dissatisfaction or potentially diminished beneficial aspects such as reduced perceived *social connectedness* and *social capital* (Koroleva et al. 2010, 3ff). *Information overload* is caused by a constantly growing amount of information shared through an individual's social network and thus dependently increases at enormous rates with the general amount of shared information within an individual's network of social ties and the SNS in general. Research suggests that *information overload* might even cause confusions and dysfunctional effects in the form of stress and anxiety among SNS users (Eppler/Mengis 2004, 333) and in cases lead to a diminished decision quality (Chen/Shang/Kao 2009, 50-56). Therefore, users have to establish certain strategies to filter user-generated content of their social peers within their corresponding social networks. Accordingly, I assume that especially elderly SNS user might be prone to *information overload* since they might not be capable in developing such strategies. For instance, the SNS Facebook reacted to this problem by introducing specific algorithms that refine displayed information by picking the most relevant status message updates based on criteria such as time, post-type and communication intensity. In parallel, functionalities were introduced that assist users in channeling shared information to specific lists or groups of social ties. In consequence of *information overload* and SNS overuse, anecdotal evidence and studies report on certain boredom towards *online social networking* use (Koroleva et al. 2010, 1) or "Facebook fatigue" (Coventry 2011) that might result from predictable posting and sharing patterns of social peers. Recent research consequently focuses on the reduction of potential and perceived *information overload* for users of SNS Facebook or Twitter (Koroleva et al. 2010, 4ff).

Other studies suggest that SNS use might result in the *elimination of real (social) interaction* and lead to *friend inflation* (Milov 2004). While the latter can be demonstrated with the help of random sample of data obtained from public Facebook profiles, the former might be difficult to demonstrate in verifiable research. Besides various studies indicate the contrary – precisely because SNS use is assumed to help in strengthening and intensifying offline relationships that people already have (Ellison/Steinfield/Lampe 2007, 1153; Lampe/Ellison/Steinfield 2006, 170). Friend inflation can be demonstrated by randomly browsing public Facebook profiles which results in profiles that connect up to 2,000 or 3,000 social ties to one individual. The average registered user on the SNS Facebook has approximately 130 social peers within her individual social network (Facebook 2012). Research conducted by Dunbar (1992, 486ff) suggests the existence of a theoretical cognitive limit of (offline) social ties connected to one individual which is estimated to vary between 100 and 230 social ties with whom an individual can perpetuate stable and meaningful social relationships (Dunbar 1992, 486ff; 1993, 687). The number comprises all social ties an individual knows and maintains a close social relationship with. A recent study attempted to validate the

application of *Dunbar's number* to SNS in the case of Twitter (Gonçalves/Perra/Vespignani 2011, e22656). To conclude, I assume that elderly SNS users might be prone to a reduction of real social interaction due to overuse of *online social networking*, but rather profit from SNS use which instead potentially countervails the elimination of real social interaction. Furthermore, I presume that the likelihood of friend inflation through SNS use among elderly users might be low since studies attest online social circles of elderly users to be generally smaller when compared to their younger counterparts (Pfeil/Arjan/Zaphiris 2009, 648).

Various studies documented that active participation on SNS may result in *depression* or *envy* as well as *jealousy* of other individuals (Muise/Christofides/Desmarais 2009, 443; O'Keeffe/Clarke-Pearson 2011, 802ff). Early research on SNS use suggests that individuals who are more socially isolated in real life tend to be more isolated on SNS and additionally maintain less online social ties compared to individuals that are more active in the offline world (Sheldon 2009, Article 1). Accordingly, feelings of depression or envy perceived by more introverted individuals could result from being directly confronted with use behavior and shared content of more extroverted individuals on the SNS. However, a recent study suggests no relationship between SNS use and potential depression in older adolescents (Jelenchick/Eickhoff/Moreno 2012). Research addressing jealousy in conjunction with *online social networking* use found that frequent SNS use potentially exposes an individual to jealousy-provoking information about current or former life partners. The study could not only show that the majority of participants were at least somewhat likely to add previous romantic or sexual partners to their social network and their current partner to display a highly similar behavior, but that the exposure to jealousy-provoking information through SNS use creates a feedback loop whereby perceived increased jealousy results in a more frequent surveillance of a partner's SNS profile and shared content. In turn, constant monitoring of shared information especially of information shared by current partners or former partners results in a higher exposure to jealousy-provoking information. Furthermore, the study found that if an individual is more likely to be a jealous person, this individual is also more likely to feel jealous based on SNS use and consumption of shared user-generated content.

3.3 Review of beneficial aspects of online social networking

Being part of a community and feeling a sense of belonging can potentially positively influence the quality of life of individuals as well as their social and psychological *well-being* (Putnam 2000, 92). Through social interaction with each other, human beings build and maintain social networks, which support them to satisfy human needs, e.g., love and belonging (Maslow 1970, 20f).

Primary benefits are inherent benefits that result from forming a social group or network and therefore enable individuals to exchange information, give and receive social and emotional support, develop friendships, and have fun (Ridings/Gefen 2004, 00ff). Coleman (1988, S105ff) documented benefits that are created by the existence of social structures such as friendship development. Previous research additionally identified several beneficial outcomes of *social support* and *social connectedness* gained from social networks and showed that these factors help people in overcoming social disadvantages like isolation, in strengthening their integration into society and in achieving and maintaining a good health condition

(Bowling/Farquhar/Browne 1991, 559ff; Rook 1990, 226). Similar findings are reported considering computer-mediated social interaction in VCs (Leimeister/Ebner/Krcmar 2005, 177ff; Leimeister et al. 2008, 364ff; Leimeister/Sidiras/Krcmar 2006, 283ff). Various studies in the context of VCs have further shown that computer-meditated social interactions generate positive effects for community interaction and social involvement (Hampton/Wellman 2003, 293ff; Kavanaugh et al. 2005, Article 3; Kavanaugh/Patterson 2001, 501ff) and demonstrated beneficial outcomes of collective actions for a group of individuals or a community (Blanchard/Horan 1998, 300ff; Chaboudy/Jameson 2001, 54ff).

Burke/Marlow/Lento (2010, 1909) recognize SNS as a complement network of relationships to the "offline world by providing a platform for active communication between friends and more passive observation through aggregated streams of social news" and consecutively found that participation on SNS is associated with increased perceived *social capital*[25] and lower loneliness (Subrahmanyam et al. 2008, 425ff). Comparable findings are supported by Ellison/Steinfield/Lampe (2007, 1155) and Steinfield/Ellison/Lampe (2008, 435) who demonstrate a relationship between an individual's activity on a SNS and the level of perceived *social capital* in that the higher the activity level on the SNS, the higher the levels of perceived *social capital*, emotional support, and in turn lower perceived loneliness.

Studies suggest that social ties created on SNS foster socialization (Steinfield/Ellison/Lampe 2008, 440ff), satisfy individual need for belonging as well as desire to get updated on one's social context and entertained (Krasnova et al. 2008, 9; Rosen/Sherman 2006, 1220). Furthermore, Ellison/Steinfield/Lampe (2007, 1136) found that use of SNS potentially results in social and psychological *well-being* and therefore especially generates benefits for users with low self-esteem and life satisfaction. Continuative, a more recent study conducted by Koroleva et al. (2011, 12-16) empirically showed that the notion of *social connectedness* within SNS is a qualitative source of *social capital*, in that *social connectedness* activates and maintains social relationships and in turn results in beneficial outcomes for individuals such as a higher *social capital* (see section 5.1). Additionally, the study empirically identified a relationship between the role of network structure and *social connectedness*, and the dependent variable *social capital* that was defined through beneficial outcomes such as horizon broadening, networking values, emotional support, and offline participation.

Social capital is an outcome of (online and offline) social network membership and refers to the value of social relations within and between social networks as well as the ability to produce collective or individual benefits from network members. Multiple definitions of the concept of *social capital* can be found in sociology (Woolcock 1998, 154ff). It has been defined as the source of positive externalities for members of a social network that are generated through shared trust, norms, values, and their consequent effects on expectations and behavior

[25] Facebook use was related to support all three types of perceived *social capital* documented and described in literature — *bridging social capital*, which consists of the resources that are potentially gained from an individual's weaker ties, *bonding social capital*, which consists of the resources that are potentially gained from an individual's more intimate ties, and *maintained social capital*, which consists of the resources that that are potentially gained from an individual's prior ties.

and broadly refers to the benefits received from social relationships (Adler/Kwon 2002, 23ff; Durlauf/Fafchamps 2004, 154ff). Similar to physical, financial, and human capital, *social capital* may facilitate productive activity to individuals or groups (Coleman 1988, S97ff; White 2002, 260ff). In turn, beneficial effects of *social capital* could be of psychological, emotional, and economical nature (Lin 1999, 28ff; Lin 2000) whereas (online and offline) social networks are the causal agents or moderators of *social capital* (Williams 2006, 594). *Social capital* that emerges from computer-mediated social interaction through the use of modern ICT has been referred to as "socio-technical capital" (Resnick 2001, 248), and can be thought of as an artifact of users' technology use behavior. However, Koroleva et al. (2011, 2) noticed that most studies on *online social networking* exclude and neglect the process by which potential (social) benefits are gained. Yet, previous research has documented that not every modality of SNS use and participation (Burke/Marlow/Lento 2010, 1911f), and not every social network (Granovetter 1973, 1361ff) hold the same potential to create social value for an individual. I provide an explicit explanation and definition on the theoretical notion of *social capital* in section 5.1.

Valenzuela/Park/Kee (2009, 888) found in their study that SNS users, who exhibit highly frequent use of SNS and socially interact online with other individuals, also display higher social trust and civic participation. Consequently, research focused on the overlap and interaction between offline and online social networks and how activities influence individual's offline and online social interactions and lives (Subrahmanyam et al. 2008, 421). For instance, I previously mentioned that the direction of use is typically from offline to online in SNS, i.e., individuals are more likely to use SNS for maintaining their offline social network, rather than creating purely online social ties. Therefore SNS use is assumed to help in strengthening and intensifying offline relationships that people have (Ellison/Steinfield/Lampe 2007, 1153; Lampe/Ellison/Steinfield 2006, 169). A blurring between online and offline social networks can be observed which is assumed to be based on the fact that users of SNS are interactively co-constructing their online environments (Subrahmanyam et al. 2008, 421) and consequently implies that online and offline social interactions are increasingly psychologically connected. A few studies have already examined the role of VCs and online social networks for supporting offline communities and social networks (Arnold 2003, 80ff; Carroll/Rosson 2003, 381-393; Hampton/Wellman 2003, 292ff; Meredyth/Ewing/Thomas 2004, 85-101). Since it has been suggested that being a member of online social networks gives access to various forms of network resources such as the provision of social capital, and additionally satisfies various kinds of (social) needs such as informational needs (boyd 2004, 1280), I therefore assume a potential in applying SNS as means for enhancing social engagement and interactions for elderly individuals in scope of the underlying thesis.

Consequently, SNS might be an easier, cheaper, and more adequate means for elderly individuals to keep their social ties active and potentially draw various benefits from frequent SNS participation compared to other initiatives, given that elderly individuals are likely to have better access to relevant information that foster the generation of social benefits such as *social connectedness*, *social support,* and *social capital* by participating on SNS. In particular, the underlying research attempts to identify the role played by SNS use and specific SNS functionalities in determining and leveraging social benefits such as *social capital*.

3.4 A gap in IS and HCI research

Although academic research on *online social networking* has so far been relatively sparse, in recent years, researchers of different domains are trying to identify and understand the different implications of participating in online social networks. Scientific research focusing on the novel phenomena of *online social networking* in context of elderly user populations is just emerging. Accordingly, there is little understanding of motivations that elderly might have in participating in such networks and factors that can facilitate or inhibit them.

- In general, previously conducted research on *online social networking* ignored elderly individuals and focused on target populations composed of predominantly younger users who are usually the early adopters and the more active users of such technologies, research on elderly users and *online social networking* is relatively sparse in IS, HCI, and social sciences research disciplines.

- The possible ways of using these technologies to support social interaction and to leverage social benefits for (elderly) individuals is therefore much less understood and consequently serves as the main motivation for the underlying thesis research.

- There has not been any systematic investigation on attitudes of elderly individuals such as their expectations, needs, and concerns towards *online social networking*.

- Current IS and HCI research lacks studies that attempt to identify the role played by SNS use and specific SNS functionalities in determining and leveraging social benefits such as *social capital*.

- Furthermore, there is only scarce research on how SNS functionalities need to be adequately designed for elderly users to foster adoption and to realize potentials of *online social networking* given that current SNS are particularly targeted towards younger individuals.

Therefore, in an initial step in the underlying research, I attempt to gain an understanding on expectations, needs, and concerns elderly individuals have regarding *online social networking* as well as specific and prospective socio-technical needs of elderly individuals towards SNS and *online social networking* in general.

4 An empirical exploration of expectations, needs, and concerns of elderly (non-) users towards online social networking

The purpose of the conducted explorative study was (a) to examine expectations, needs, and concerns elderly individuals have regarding *online social networking* and (b) to gain an initial understanding of specific and prospective socio-technical needs of elderly individuals towards SNS and *online social networking* in general. The chosen explorative approach was two-fold comprising an (i) *explorative qualitative study* and (ii) *explorative quantitative study* that additionally focused on the analysis of use behaviors and preferences elderly SNS populations exhibit towards specific SNS functionalities – based on the example of the most dominant contemporary SNS Facebook.

The *explorative qualitative study* was based on a series of *semi-structured interviews* and the application of *focus group interviews* – an accepted and established method in explorative research utilized in multiple disciplines such as IS, HCI, and social sciences research (Morgan 1996, vii) – involving subjects from a primarily elderly target audience (see section 4.1).

In the course of the conducted *explorative quantitative study* two questionnaires have been developed while one was formulated focusing on *online social networking* in general, the other was adjusted to functionalities, characteristics, and terminologies specific to the SNS Facebook. Both questionnaires were iteratively refined based on gained insights and findings from previously conducted *semi-structured* and *focus group interviews*. The questionnaires were then converted into online surveys and accordingly distributed to a potential elderly target audience by applying two tactics: (i) the questionnaire composed of Facebook-specific items was distributed applying *snowball sampling* (see section 4.1.1) among an elderly target audience within the SNS Facebook; in parallel, (ii) the more generally formulated questionnaire was primarily promoted within a set of VCs and smaller SNS that specially cater to elderly individuals. While the later efforts solely resulted in a rather small data sample ($N_{Non\text{-}Facebook}$ = 7) that was later excluded from statistical analysis, the distribution efforts based on *snowball sampling* resulted in an adequate data sample of elderly Facebook users ($N_{Facebook}$ = 102) for descriptive statistical analysis. The low rate of return in the former distribution tactic is assumedly caused by concerns regarding data privacy in conjunction with specific questionnaire items, the main reason for refused participation by individuals when asked for rationales deciding against survey participation.

It should be noted that in the course of the underlying thesis, numerous informal interviews and casual discussions with elderly individuals on the phenomenon of *online social networking* as well as their expectations, needs, and concerns towards SNS have been additionally held to above mentioned *semi-structured* and *focus group interviews*. These rather informal inquiries provided a secondary empirical foundation not only for interpreting findings in scope of the thesis, but for compiling a classification of elderly SNS users presented in a later section (see section 4.3).

The following sections are organized as follows: I firstly outline the conducted *explorative qualitative* – and subsequently describe the *explorative quantitative study* on expectations,

needs and concerns elderly individuals exhibit regarding *online social networking*. Both explorative studies include a description of chosen methodology, sampling, and data collection, as well as demographic data and a discussion of findings and their potential limitations.

4.1 Qualitative explorative study

The IS research discipline commonly distinguishes between *qualitative* and *quantitative research methods*. While "quantitative research methods were originally developed in the natural sciences to study natural phenomena" (Myers 2008, 8), they provide a rich set of methods and techniques to collect and analyze data and are well-accepted in the IS discipline including survey methods, laboratory experiments, formal methods (e.g., econometrics), and numerical methods such as mathematical modeling. In contrast, according to Myers (2008, 8), "qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena. Examples of qualitative methods are action research, case study research and ethnography. Qualitative data sources include observation and participant observation (fieldwork), interviews and questionnaires, documents and texts, and the researcher's impressions and reactions".

Semi-structured interviews represent a widely accepted method to collect qualitative data in explorative studies within the IS, HCI, and social sciences research disciplines and have proven to generate reliable, comparable qualitative data. This specific data collection method allows subjects the time and latitude to express their opinion and attitude towards a particular topic in great detail and in their own terms; and accordingly its "purpose is to gather descriptions of the life-world of the interviewee with respect to interpretation of the meaning of the described phenomena" (Kvale 1983, 174) – which in the underlying research constitutes to the phenomenon of *online social networking.* While the insights of *semi-structured interviews* can be regarded as (highly) valid and in cases generalizable; generated findings from *semi-structured interviews* are often criticized since they highly depend on the representativeness of the collected data sample – which in cases is hard to achieve and additionally for producing (highly) unreliable findings given that questions and sequences of items are not predetermined and subjects are encouraged to talk freely in depth and detail. Furthermore, the method has drawn criticism from scholars in the IS and social sciences research disciplines since rigor data collection highly depends on the interview skills of the researcher.

All *semi-structured interviews* were conducted face-to-face and followed a standardized instrument as an interview guide. In some cases, a subject's specific circumstances did not allow every question to be asked in each interview, however each question item inquired was phrased and presented in the same way to each subject to minimize bias. The interview guide was designed based on prior observations and informal conversations with prospective interview subjects and assessed by two researches at Technische Universität München primarily in regard to wording and logical structure. The interview guide comprises five sections including question items on (i) demographic data of subjects; (ii) general understanding, attitude and experience with *online social networking* – and aligned to the structure of the subsequently conducted quantitative study – question items on (iii) expectations, (iv) needs, and (v) concerns of elderly individuals towards *online social networking*. With execution of *semi-*

structured interviews, I attempted to gain an initial understanding of expectation, needs, and concerns elderly individuals potentially exhibit towards *online social networking*.

In the following sections 4.1.3 and 4.2.3, I provide a brief overview on initial insights by an aggregation of derived findings. I then discuss and relate findings from the *semi-structured interview* series to findings discovered in the conducted *focus group interviews* in order to establish coherence between both collected data samples. Consequently, I approximate an initial set of design principles for SNS functionalities catering to elderly individuals.

Parallel to *semi-structured interviewing*, I conducted *focus group interviews* (or *focus groups*), which illustrate an accepted and established method in explorative research and have been utilized in multiple disciplines. Although the method originates from academia, it has been mostly neglected by researchers, especially in the IS discipline since studies applying *focus group interviews* have been subject to criticism concerning difficulties in demonstrating rigor. However, the method has been proven to be an adequate method in industry-related research (Stein Wellner 2003, 30ff; Stewart/Shamdasani/Rook 2006, 3ff) such as product development and design as well as most recently in software development for *usability engineering*, cf., in activities concerning *user experience, user interaction,* and *user interface design*. Since various scholars in the IS discipline made demands on a broader variety of empirical qualitative methods to improve relevance of research (Benbasat/Weber 1996, 389-399), one can witness increased application of *focus group interviews* in qualitative studies in IS and HCI research (Jarvenpaa/Lang 2005, 7-23; Mantei/Teorey 1989, 257-274).

Literature differentiates between *exploratory focus groups* (EFG) and *confirmatory focus groups* (CFG) whereas both are generally defined as a moderated discussion among six to 12 individuals who debate a topic under guidance of a moderator who caters for an interactive ambience among participants and steers the discussion on the topic of interest (Stewart/Shamdasani/Rook 2006, 69-86). While CFG can be applied as a confirmatory method to test hypotheses or design artifacts (see section 6.2.1.2), EFG can be highly useful in exploratory research approaches when little is known about the underlying *phenomenon of interest* – in the underlying case *online social networking* and an elderly target user audience – and is recommended to expand understanding without needing to reach consensus (Stewart/Shamdasani/Rook 2006, 109-133). No defined size of a *focus group* exists in literature, however a lower boundary of four and an upper boundary of 12 participants is suggested by Morgan (1996, 42ff). Potential advantages and disadvantages result from the chosen size of *focus groups* and are widely discussed in literature; e.g., given that smaller groups imply higher level of activity and greater contribution of each participating member whereas individuals in larger groups potentially tend to *social loafing* and therefore exhibit diminished efforts. In contrast to *semi-structured interviews*, *focus group interviews* provide a more natural environment and allow for interaction between participants to both influence and be influenced by other individuals (Krueger/Casey 2000, 5) which is important in not only establishing a shared understanding but capturing different opinions and diverse attitudes towards discussed issues and topics (Krueger/Casey 2000, 11; Morgan 1996, 12).

In general, the execution of a *focus group* is threefold and consists of (i) preparation, (ii) execution, and (iii) analysis of collected data. *Preparations* include the expression of research

questions as well as the outline of the research problem or underlying *phenomenon of interest*. In the underlying thesis, the later constitutes to *online social networking* while the former explicitly conforms to the first research question targeted in the underlying thesis (see section 1.3).

Further researchers need to identify an appropriate sample frame as well as assess the number of groups, the size of groups, source of participants, and recruitment (see section 4.1.1). In the conducted *focus groups*, I primarily served as moderator in the *execution* of both EFG interviews and closely followed a pre-set script including a recommended "questioning route" (Krueger/Casey 2000, 42) to guarantee for comparable findings among both conducted *focus group interviews*. Additionally, two researchers were present to take notes and record observations in both *focus groups*. Since the execution of the *focus group interviews* required approval through the ethics commission of the Ludwig-Maximilians-Universität München, data collection with means of audio- and video-recording devices was not possible. Collected data was then independently analyzed by two researchers and subsequently discussed. Findings of the initially held focus group were additionally discussed with participants in the successive *focus group interview*.

4.1.1 Sampling and data collection

Potential participants for the *semi-structured interviews* were recruited from close social environments of two researches at Technische Universität München and were chosen with regard to prior experience in ICT, gender as well as SNS membership to ensure an equal distribution and balanced sample (see Table 2). *Semi-structured interviews* with SNS non-users approximately lasted 30 minutes, while interviews carried out with SNS users were slightly longer and lasted between 30 and 45 minutes. The total duration of *semi-structured interviews* approximately sums up to 450 minutes of conducted interviews for both SNS users and non-users.

All *focus group* participants came from a Southern German town and its surrounding communities and were recruited based on a mail distribution list at the Generation Research Program of the Ludwig-Maximilians-Universität München. Prospective participants from different social and professional backgrounds were shortlisted and invited to participate in the *focus group interviews* based on their demographic background. Individuals who responded to the invitation were distributed into two groups, one comprising eight members and the other group made up of 12 members. The groups were equally distributed in terms of gender. While, no attempt was made to control for prior acquaintance among the participants, it was later found that some of the participants already knew each other (from sport clubs or other interest groups). Both *focus group interviews* lasted approximately two hours, tallying to a rough total of 240 minutes with 20 participants. Two researchers additional to the moderator attended both sessions in order to brief participants regarding the purpose of the *focus group*, asking questions and facilitating discussions. Furthermore, they were mostly responsible for data documentation by taking notes and audio recordings.

The non-probability sampling suitable in exploratory research for both *semi-structured* and *focus group interviews* followed a *quota sampling*[26] approach since specific characteristics of subjects such as gender, age, and level of ICT literacy as well as SNS membership were pre-defined for selecting individuals to provide for a balanced sample of SNS user and non-user.

4.1.2 Demographics

Table 2 summarizes the demographical composition of the *semi-structured interview* sample (N = 12) composed of six elderly individuals registered with a SNS (R_I*x*) and respectively six elderly individuals not registered with any contemporary SNS (NR_I*x*) during the period of interviews.

	Gender	**Age**	**Retirement**	**Relationship status**	**Children**	**Grand-children**	**Internet use since**	**Frequency of Internet use**
R_I1	Male	54	No	Divorced	3	0	2002	Daily
R_I2	Female	50	No	Divorced	2	1	1997	Weekly
R_I3	Male	59	No	Partner	0	0	1996	Daily
R_I4	Female	59	No	Partner	1	0	1999	Daily
R_I5	Female	55	No	Partner	2	1	2006	Daily
R_I6	Female	55	No	Partner	3	0	1996	Daily
NR_I1	Male	62	No	Partner	2	1	1997	Daily
NR_I2	Male	60	No	Partner	2	0	1992	Daily
NR_I3	Female	65	No	Partner	1	0	1997	Daily
NR_I4	Female	59	No	Partner	0	0	2009	Weekly
NR_I5	Female	57	No	Partner	0	0	2001	Weekly
NR_I6	Male	67	Yes	Partner	1	0	2005	Daily

Table 2: Demographical composition of retrieved semi-structured interview sample
Source: Own illustration

The sample displays a tendency towards individuals who were still active in workforce and therefore retired individuals are underrepresented in the sample. However, the majority of individuals that participated in the *focus group interviews* were retired from their primary professions, although some of them were involved in different community and social service related part-time occupations. Both groups were equally balanced concerning the highest obtained educational achievement. Since the execution of the *focus group interviews* required approval through the ethics commission of the Ludwig-Maximilians-Universität München, the collection of demographical data for each participating individual was highly restricted and therefore a detailed description of the underlying sample in regard to demographical data on the individual level is not possible. However, all participants in the *focus group interviews*

[26] According to Crawford (1997, 73) "quota sampling is a method of stratified sampling in which the selection within strata is non-random. Selection is normally left to the discretion of the interviewer and it is this characteristic which destroys any pretensions towards randomness."

were between 50 and 75 years of age and therefore comply with the underlying definition of *old age* in scope of the thesis (see section 2.1.2).

4.1.3 Findings and discussion

All individuals who were registered and active users of the SNS Facebook indicated in the *semi-structured interviews* that the primary reason to register with the SNS was based on recommendations of very close social ties such as relatives and close friends who were already registered and are active on the SNS. However, in contrast to findings documented in the conducted explorative survey (see section 4.2) and studies found in literature, most individuals claimed that children or grandchildren were not the primary reason to register with a SNS (Koppen 2010, 14). Although evidence suggests that the existence of children and grandchildren who are active on the SNS Facebook positively influence the attitude to join and use the SNS among their parents or grandparents, respectively.

The majority of participants who were not registered with any SNS stated to be familiar with the concept of *online social networking* attributed to media coverage reporting on the influence of SCP and SNS in conjunction to political movements, e.g., the revolutionary movements in Arabic countries as well as the Occupy movements, by the time the research was conducted. Further detailed inquiries regarding the general comprehension of SNS and its underlying concepts revealed that the majority of individuals exhibit a lack of understanding and highly divergent perceptions and, in most cases, even a false conception of *online social networking* and their underlying functional range. A deficient comprehension of SNS and implemented concepts as well as negative reports on issues related to data privacy are major concerns towards SNS and primary reasons to decide against registering with such sites.

In both *focus group interviews*, participants were mostly familiar in general ICT and Internet use, and reported on frequent access to personal computers and the Internet. It was also found that the majority of participants were familiar with current developments in *online social networking*, although participants in both groups experienced significant problems in interpreting or understanding novel terminologies and concepts of SNS. For instance, when the terminology ‘online social networking’ was mentioned, participants could not promptly understand. However, when the example of the SNS Facebook was suggested, many of the participants mentioned that they knew about Facebook. Most of the participants who were SNS non-users by the time of the study had heard about the SNS Facebook (and other contemporary SNS) from their children, grandchildren, and (younger) relatives as well as from different media sources that mostly accord with evidence found in the *semi-structured interviews*. Only few participants were familiar with basic functionalities of existing contemporary SNS. Furthermore, participants registered with a contemporary SNS, experienced significant problems in understanding the complexity of SNS such as the online representation of social relationships, the application of content sharing among diverse groups, and general SNS-specific terminologies such as ‘Friend Request’, ‘Share’, or ‘Wall’. Findings from the conducted *semi-structured interviews* were consecutively discussed with participants in the *focus groups*, however gain of further findings was highly constricted since most participants in the *focus group interviews* were not registered and familiar with SNS.

In both, the conducted *semi-structured interviews* and *focus group interviews*, participants were explicitly surveyed regarding their expectations, needs, and concerns towards *online social networking* since direct elicitation of requirements towards SNS was not practicable among the specific elderly target audience due to low previous knowledge of and general low experience in *online social networking*.

4.1.3.1 Expectations towards online social networking

The majority of interviewed SNS non-users mentioned to have absolutely no expectations regarding such systems and therefore could not think of any potential benefits resulting from active participation on and use of SNS. One possible explanation is a general misunderstanding of the underlying fundamental concepts of SNS, how these sites are structured and how social circles are established, maintained, and managed online. There also exists a misconception of the primary mode of communication in SNS, which is vitally different to existing and accustomed (online) one-to-one communication routines such as in email communication or telephone conversations. The primary mode of communication in SNS is characterized by a user-controlled *one-to-many communication* exemplified in sharing of user-generated content on the SNS Twitter or status message updates in Facebook. An integral misconception of SNS came to light when individuals were asked to describe the concept and mode of operation of such sites in own words and consequently failed in their explanations they intended to make although participants previously declared sufficient comprehension of SNS. Consequently, I assume that the majority of interviewed SNS non-users prospect contemporary SNS (i) to be conceptualized in the form of (offline) bulletin boards in which published and posted information is mostly accessible by all participating members; or (ii) to be conceptualized similar to VCs in which all user profiles are automatically linked with each other. These misconceptions also result in greater concerns about data privacy of shared and published user-generated information. Furthermore, another possible explanation for quasi non-existing and low expectations towards online social networking can be found in the fact that social circles of non-registered SNS users in turn exhibit a very low rate of registered and active SNS users, which consequently leads to a low level of experience with this novel form of online social interaction and absence of potential network effects among social peers.

Participants also stated that they expect no expansion of their existing social circles due to registration with a SNS, which follows previous findings that prospective users potentially tend to exhibit *social searching* behavior in SNS use with intent to primarily map existing social ties rather than establish completely novel ties (Lampe/Ellison/Steinfield 2006, 170). By contrast, data collected through the previously described online survey in a German-speaking VC focusing on elderly users – Platinnetz[27], which was later discarded from in-depth analysis, shows evidence that all registered individuals indicated *social browsing* behavior and the majority of individuals deliberately register with the expectation to find novel social ties or a life partner (Lampe/Ellison/Steinfield 2006, 170). Although most interviewed indi-

[27] Platinnetz is a German SNS that primarily targets users between 40 and 65 years of age. The SNS was established in 2007 and accounted more than 100,000 registered users in 2008.

viduals displayed a general disfavor towards the use of SNS as a primary means for online social interaction. However, they mentioned negative major life course events such as the loss of marriage partner and other close social ties, to potentially trigger prospective registration with SNS and therefore expect active participation in *online social networking* to potentially counter loneliness.

The majority of SNS users among interviewees mostly expected faster and more frequent communication with close family ties such as children and grandchildren and wished this communication would result in a more intensive exchange of information and real-life social interaction. Likewise, they stated that communication via SNS is exchanged in a highly ad-hoc fashion and most interviewed SNS users expect to be more involved in the daily lives of their close family ties. Additionally, they expected SNS use to result in an efficient and effective novel way to search and keep in touch with long-time closer and in addition weaker social ties. Nevertheless, a minority of participants anticipated and feared the communication exchanged within SNS among closer social ties to potentially result in superficial communication and exchange of information. However, most participants expected a necessity to be constantly connected to SNS and accessible to prosper a meaningful use and beneficial effects of *online social networking*.

Interestingly, most participants consequently approved general implemented concepts and the egocentrically configured individual social networks (according to a *social-circles network model*) in contemporary SNS such as in the SNS Facebook (see section 2.2.2), since this specific egocentric mapping of offline social networks constitutes a natural and inartificial modality in organizing online social networks. Therefore all participants would not advocate a fragmentation of established structures in SNS in regard to content, age, or other (demographic) variables.

In both *focus group interviews*, motivations to register and prospectively use SNS were primarily based on expectations towards the novel feasibility of cross-generational communication with close social ties and relatives. Especially the novel possibility in being able to keep in frequent touch with children, grandchildren as well as other close relatives of subsequent generations such as nephews and nieces, were major expectations mentioned and discussed by the majority of *focus group* participants since they assumedly expect that especially cross-generational communication would enable them to be a more significant part of their family members' and close relatives' lives.

Most participants indicated to use ICT and systems that primarily facilitate one-to-one communication and demand for similar functionalities to be implemented in contemporary SNS. When further asked about their expectations regarding community aspects of SNS, participants exhibited a preference for networks that restricted membership, minimizing the chances of possible harassment from unknown users. In parallel to evidence from the conducted *semi-structured interviews*, I assume that most *focus group* participants have not yet fully understood the formation of individual social networks in contemporary SNS since these networks are structured in an egocentric modality and appear as closed and private networks in conjunction with adequate privacy settings.

Participants also expressed that they would like to have clear guidelines of how to manage their personal settings and specify characteristics of existing social relationships more adequately. Additionally they called for simplified settings concerning data security and privacy settings. Further, they expected very simple means to establish ties with their offline social circles and acquaintances and to be supported in their intention to mostly execute *social searching* behavior on SNS (Lampe/Ellison/Steinfield 2006, 170).

Overall findings from *semi-structure interviews* and *focus group interviews* in regard to functional range of SNS suggest that contemporary applications such as the SNS Facebook currently support most of the expectations that elderly registered participants have towards *online social networking*.

4.1.3.2 Needs towards online social networking

Most of *interviewed* non-registered SNS users indicated and presumed a strong need for social interaction and bonding to social peers in later stages of life, however there is strong evidence that most people disregard registration and active participation in SNS as a potential option to meet these expressed needs.

In most cases, individuals suspect and even fear SNS to be a complete replacement of offline social interactions and as a result ignore the potential of SNS to support and convey offline social interaction through *online social networking*. Hence, most participants favor traditional means of communication such as telephone conversations to novel ICT, however, they mentioned increased fondness of experimenting with and perceived needs towards novel means in communicating with close social peers such as children, grandchildren, and family members – especially with social ties living in distance. Nevertheless, the majority of non-registered SNS users indicated (i) drastic life course events such as death of the spouse or close social ties; (ii) concerns towards the potential risk of *social exclusion*; and (iii) increased loneliness and diminished social interactions to constitute the need for novel means of social interaction to counteract potential negative consequences. In the case of drastic life course events, active participation in SNS was considered to be a potential option.

Continuative, participants called for novel and innovative means to offline socializing and to facilitate social interactions with weaker ties in close proximity since they fear *social exclusion* due to limited mobility, e.g., resulting from reduced motor skills.

Registered SNS users declared that although close social ties were the primary reason to register with SNS, *online social networking* especially supports and fulfills social interaction needs regarding weaker social ties and this in a highly ad-hoc and informal modality. In contrast, most participants displayed differing needs regarding online social interaction with stronger social ties and hence stated to prefer synchronous communication as well as a highly private modality of information exchange to purely SNS use since the majority of participants regard communication on SNS to be impersonal and transparent for other users.

Furthermore, *semi-structured interviews* revealed that previously described expectations towards increased cross-generational social interaction on SNS are based on elevated, actual

needs of elderly individuals for general cross-generational interaction and communication in later stages of their lives. The majority of interviewed SNS users attested activities concerning cross-generational communication to be the primary modality of interaction in their *online social networking* behavior. For example, evidence for cross-generational oriented communication behavior is found in highly heterogeneous compositions of online social circles in regard to age given that in most cases interviewees expressed that their online social circles were mostly composed of younger individuals. For this reason, most interviewed individuals rejected alternative participation on SNS (or in VCs) that exclusively carter to an elderly target audience. However, these exclusive SNS (or VCs) solely display an alternative for elderly individuals who maintain smaller social circles primarily composed of elderly ties, or who live alone due to divorce or death of the marriage partner. I therefore assume that general needs towards *online social networking* highly depend on (i) the underlying composition of existing individual, real-life social circles and (ii) current living situation of elderly individuals and consequently affect the primary SNS use behavior – the tendency to *social searching* and *social browsing* behavior (Lampe/Ellison/Steinfield 2006, 170).

In conjunction with computer-mediated cross-generational communication and online social interaction, most participants expressed the need for a highly non-intrusive and asynchronous modality of communication when interacting with younger SNS users due to differences in and changed way of life of younger generations in regard to higher mobility and modified human-human communication and interaction patterns. The majority of registered users perceive communication and interaction on SNS to differ from traditional modalities of online communication such as email conversations, since direct messages or status message updates are shorter in length and more frequently exchanged in comparison to traditional means of communication. By way of example, participants stated that these contrasts are even more evident in the use of Facebook-specific functionalities such as *Comment*, *Poke* and *Like Button* since, especially with the use of the latter two functionalities, information is being conveyed without any textual input of users. Interviewed SNS users affirmed that functionalities specific to *online social networking* address the need to be part of the lives and aware of the emotional situation of close social ties such as children or grandchildren. Therefore, contemporary means of computer-mediated cross-generational communication and online social interaction need to be adjusted to the modern way of life of younger generations and their predominant communication behavior and additionally to prevailing communication patterns of elderly individuals, in such a way that primarily younger SNS users presumably take on the role of *information providers* and elderly users that of *information consumers* on SNS.

In summary, most conducted interviews showed evidence that even registered and active elderly SNS users (i) potentially misconceive general applied (functional) concepts of contemporary SNS or (ii) only use a variety of provided functionalities and thus presumably are not fully aware of the full range of provided functionalities in contemporary SNS. Therefore I assume that elderly SNS users have yet to entirely exploit maximum potential of implemented functionalities in SNS and thus have yet to leverage the best possible potential to satisfy various communication and social needs.

Since the majority of participants in the *focus group interviews* were SNS non-users, they mostly stated everyday (social) needs and a demand for information regarding these needs to

be conveyed on contemporary SNS. For example, to organize their social life most participants indicated that they would like to have information regarding locally organized social and community events, being able to set up meetings with friends, and schedule get-togethers through SNS. It should be noted that the SNS Facebook currently supports most of expressed (socio-technical) needs since functionalities enable users to setup public or private events as well as initiate open and closed groups for varying intentions, which – in their functional specification – are similar to functionalities adopted from VCs.

Further, participants stated that they would also like to have updated information regarding local health-care and emergency services that could be accessed through SNS as well as location-dependent information, such as that of price deals at local shops, availability of specific products in neighborhood shops and so on. These references indicate a need for functionalities supporting a more localized orientation of SNS and advocate that locally or geographically bounded sub-networks might be able to allay some of the fears and concerns elderly individuals exhibit in regard to SNS, and consequently be better suited to address their needs. Consequently, most references suggested that not only are elderly people concerned with *social connectedness* related functionalities of SNS, they would also like these applications to provide them with *informational*, *instrumental,* and *emotional support* as well (see section 5.1).

In the conducted *focus group interviews*, participants seemed to be excited by the idea that, a system – such as the SNS Facebook – could act as a single source of information on (i) wide ranging everyday needs, (ii) community support, and (iii) means of keeping up with close social ties such as children and grandchildren who are often geographically dispersed.

4.1.3.3 Concerns towards online social networking

Interviewed SNS non-users strongly indicated data abuse to be the primary concern regarding *online social networking* and therefore fear disclosure of information to third parties without their permission, unauthorized and unintentional sharing of personal information, and data to be inerasable once entered or when deregistering with a SNS. Participants stated (i) negative media coverage relating to *online social networking*, (ii) lack of knowledge about basic conceptualization of SNS, and (iii) available options for privacy settings in contemporary SNS to cause concerns about potential data abuse and integrity.

These concerns were not only mentioned as the primary reason to refrain from registering with SNS among non-registered individuals, but also lead to elderly SNS users sharing less information compared to younger users and rather passive use SNS – and consequently take on the role of *information consumers*. Therefore concerns regarding data abuse and integrity in SNS were rated lower among registered individuals since most of them assessed their use behavior in SNS to be rather passive and aligned to the consumption of shared information than the active sharing of personal information, e.g., by posting status message updates. The minority of registered individuals additionally indicated that customizing privacy settings to suit individual needs mostly lull concerns regarding data security in SNS.

In addition to previously described major concerns regarding data integrity and security in SNS, most registered users indicated doubts in their use of SNS regarding perceived high

complexity in managing social ties especially in the case of fast evolving and rapidly growing online social circles. Consistently with evidence reported in the *focus group interviews*, most registered individuals expressed concerns towards searching for and discovering social acquaintances since they perceive these tasks to be extremely demanding and complex.

Interviewed SNS non-users expressed qualms that once being registered and active on SNS, social interaction could shift from initially purely offline to a dominating online form of social interaction, and in extreme cases to result in a total loss of real-life social interaction.

However these doubts and concerns seem to be unfounded since interviewed elderly SNS users supposed *online social networking* lacking to constitute an appropriate alternative to entirely compensate real-life social interaction, but indicated that SNS offer a supportive means in offline social interactions. As previously mentioned, an entire elimination of real-life social interaction due to intense *online social networking* use might be difficult to demonstrate in verifiable research, yet various studies could show the contrary – SNS use endorses strengthening offline relationships and intensifying social interaction that people already have (Ellison/Steinfield/Lampe 2007, 1143; Lampe/Ellison/Steinfield 2006, 170).

Individuals participating in the *focus group interviews* mostly referred to concerns regarding the complexity of SNS, and a sense of feeling overwhelmed or lost if required to manage many social ties in a vast online social network. Further, they perceived the task of searching for personal social contacts and establishing ties a high-effort task.

In addition to perceived high cognitive load in administrating of social ties on SNS, participants also expressed doubts on the trust-worthiness of the Internet in general, and convey these general concerns on SNS, e.g., participants questioned the authenticity of published profile information on SNS. In particular, most participants were critical of (especially younger) users increasingly utilizing fake profile names and in some cases stating wrong information on their profile sites since false information led to a feeling of insecurity among elderly users.

Furthermore, they expressed significant fear of miscreant behavior going on in the Internet at large, and therefore expect more incidences of similar malicious behavior on SNS – such as identity theft and fraud – in the future. In parallel to conducted interviews, most participants in the *focus group interviews* also showed strong anxiety regarding data security and privacy of personal data published through online profiles on SNS and additionally exhibited concerns regarding complex data security and settings as well as complicated information sharing settings such as level of publicity and mode of dissemination of shared information.

4.1.4 Limitations

The conducted *explorative qualitative study* on expectations, needs, and concerns elderly individuals are likely to have towards *online social networking* is subject to various limitations.

Firstly, individuals in both – the conducted *semi-structured interviews* and *focus group interviews* – were mostly married or living in a partnership relationship by the time the study was conducted. Evidence of the conducted *explorative qualitative study* suggests that drastic

changes in a person's life, e.g., the death of a marriage partner or close family members, potentially result in higher expectations towards *online social networking*, potential adoption of such systems, and a stronger need to overcome loneliness and social isolation through active participation in offline and consequently online social interactions.

Yet, the sample composition mostly excluded individuals that encountered drastic major life course events suffering social isolation. Furthermore, the potential impact of major life course events on an individual's attitude towards *online social networking* might be difficult to demonstrate in qualitative research since it requires a highly sensitive approach and empathetic interrogation skills by investigators. However, participants in the *focus group interviews* intended to potentially decide against SNS as the primary online mean to intentionally search for a new life partner and rather tend to use specific VC that specially cater to an elderly target audience. For this reason, the sample of the following *explorative quantitative study* included a significant higher proportion of subjects that specified their relationship status to be single or widowed.

All participants in the *semi-structured interviews* were still in full- or part-time employment, and only a minority of participants in the *focus group interviews* already entered full retirement. Both – the death of close ties and termination of the employment relationship – mark major life course events for elderly individuals that potentially increase the risk of *social exclusion* and additionally seem to affect the attitude of elderly individuals towards *online social networking*. In this regard, both conducted *semi-structured* and *focus group interviews* are limited in meaningful findings given that the majority of subjects within the samples lack these characteristics.

Furthermore, all *semi-structured interviews* were conducted at a single point of time and miss execution over a long-term period to track possible changes in subjects' attitudes towards expectations, needs, and concerns towards *online social networking* overtime due to external factors. Given that the *focus group interviews* were conducted chronologically staggered, I found evidence for changes of subjects' attitudes towards *online social networking* and SNS use over time due to, e.g., previously mentioned coverage in news reports or interchange of experience in SNS use with social peers.

In the subsequent *explorative quantitative study*, I attempted to address previously mentioned major limitations and devoted greater attention to a balanced sample to address limiting demographic characteristics.

4.2 Explorative quantitative study

Quantitative research includes all scientific methods, which focus on the numerical collection, analysis, and representation of empirical data (Raab-Steiner/Benesch 2010, 43). An adequate and established *explorative quantitative research* method in the IS and HCI research disciplines constitutes the *survey* instrument which is commonly operationalized in the form of offline or online questionnaires.

The questionnaire developed in course of the thesis was based on insights and findings derived from initially conducted *semi-structured* and *focus group interviews* (see section 4.1) and composed of items that focus on demographical data including an individual's gender, age, educational, occupational, marital background, and family background and additionally surveyed a subject's close social environment in detail as well as their expectations, needs, and concerns towards *online social networking*. Additional items specifically queried use behavior within SNS – using the example of the SNS Facebook, collected attitudes towards usability and reliability, and subjective assessment of performance of functionalities specific to the SNS Facebook. A detailed overview on the structure and developed items applied in the questionnaire can be found in Appendix B (phrased in English). Most question items were formulated as closed questions and were measured with a 5-point Likert scale.

Where possible, findings are discussed with regard to previously published results documented in comparable studies that also focused on *online social networking* in the context of elderly individuals.

4.2.1 Sampling and data collection

The questionnaire was distributed through *snowball sampling* (or *chain-referral sampling*), an approach that has been proven to be both an efficient and effective method in retrieving large data sets in a short period of time in previous studies (Köbler et al. 2010, 3f; Ledbetter et al. 2010, 466f; Ledbetter 2009, 35f). In contrast to the sampling method described by Goodman (1961, 148) with *s* stages and *k* referrals, I applied a non-probabilistic approach in the underlying study (Biernacki/Waldorf 1981, 154ff). Spreen (1992, 34ff) categorizes *snowball sampling* and other ascending methodologies in the general concept of link-tracing methodologies, in which respondents are prompted to mention other individuals, according to some inclusion criterion defined by the researcher – or in the underlying case respondents were simply motivated to share and distribute the referring hyperlink among their social circles. *Snowball sampling* displays an adequate data collection method in social science research and especially in research on SNS since providers of such systems typically do not allow or limit the number of third-party queries to crawl user-specific data and social graphs (Willinger et al. 2010, 51) (see section 5.2.2.3). Hence an advantage of *snowball sampling* to other data collection methods is the possibility of obtaining data from subjects the researcher has not known before, thus allowing to penetrate a population deeper that one could have done without a mediator (Salganik/Heckathorn 2004, 207).

Snowball sampling was consequently applied in all surveys conducted in the scope of the thesis (see section 4.1.1).

In case of the *explorative quantitative study*, the sampling approach was aligned to *purposive sampling* in which potential subjects are grouped according to preselected criteria relevant to the underlying research objectives – in the underlying case, subjects were required to be registered and active users of the SNS Facebook.

Despite its advantages *chain-referral sampling* suffers from the problem of biased selection of further samples, i.e., subjects that have been recruited for the survey are most likely to recruit

similar subjects and therefore lack additional characteristics other than the initially selected ones (Heckathorn 1997, 176). In case of the SNS Facebook, for example, it is more likely to be chosen as a test subject via *snowball sampling*, if one has a rather large network of social ties, while individuals with a smaller network of social ties – thus less connections within the total network – are less probable to be chosen. Furthermore, subjects only recruit other individuals among their peers that are likely to have a similar mindset to theirs and therefore potentially results in increased bias within the generated sample (Heckathorn 2002, 13).

However, one of the primary reasons this method was applied in the *explorative quantitative study* as well as in later studies conducted within the scope of the thesis, is the fact that SNS such as Facebook and Twitter are rather hard to penetrate, especially when it comes to information that might reveal private and highly personal data (Penrod et al. 2003, 100). In these cases, *snowball sampling* has proven to be more effective since subjects tend to open up to and trust their social peers rather than external questioners.

The questionnaire was distributed as an online survey and was active for approximately eight weeks between April and June 2011, primarily distributed through the SNS Facebook. Prior to distribution, the survey was independently assessed and tested by four researchers at the Chair for Information Systems at Technische Universität München as well as two active Facebook users from the elderly target audience by focusing on general comprehension of question items and integrity. Wherever applicable feedback was used to refine and adjust questionnaire items. After a rigorous data cleaning process conducted by two researchers, which included detecting, correcting, and removing of corrupt or inaccurate records from the retrieved data set, 102 data samples were considered for the subsequent quantitative explorative data analysis. Data analysis was primarily based on descriptive statistical methods (e.g., absolute and relative frequencies).

4.2.2 Demographics

The retrieved data set (N = 102) included 68.6% (n = 70) female and respectively 31.4% (n = 32) male respondents all being active and registered users on the SNS Facebook (N = 102) during the time period of the survey between April 2011 and June 2011. 83.4% of the respondents were between 50 and 60 years of age (see Figure 10) – an elderly demographic user segment that already intensively uses the SNS Facebook (comScore Data Mine 2011b).

The majority (93.1%; n = 95) of participants declared to be parents to one or more children and 28.4% (n = 29) of the respondents have one or more grandchildren. 81.4% (n = 83) of the participants were living in a partnership relation that include individuals that were married or living together in a non-married partnership. A (higher) university degree was stated as the highest obtained educational level by 69.6% (n = 71) of the participants.

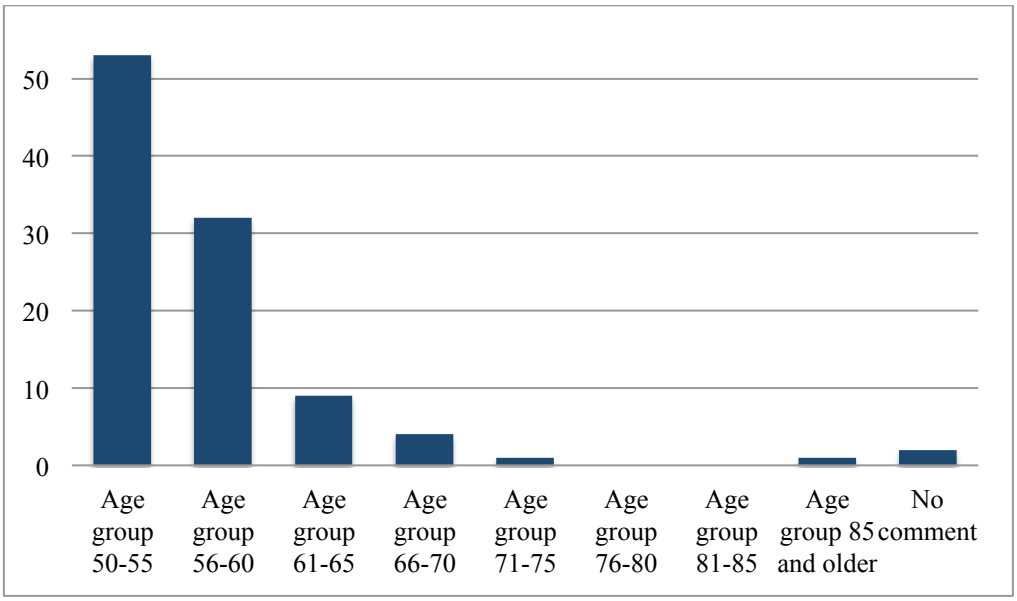

Figure 10: Age distribution within the retrieved sample (in %; N = 102)
Source: Own illustration

The observed gender distribution of the survey differs from the gender distribution of Germany and most countries of the European Union (see section 2.1). With 51.2% (51%) female and 48.2% (49%) male population, the European Union (Germany) shows a very even gender distribution with a light majority in favor for females. The SNS Facebook user population as a whole reflects this almost even gender distribution, but with a slight minority (48.8%) of female users (Hampton et al. 2011, 10).

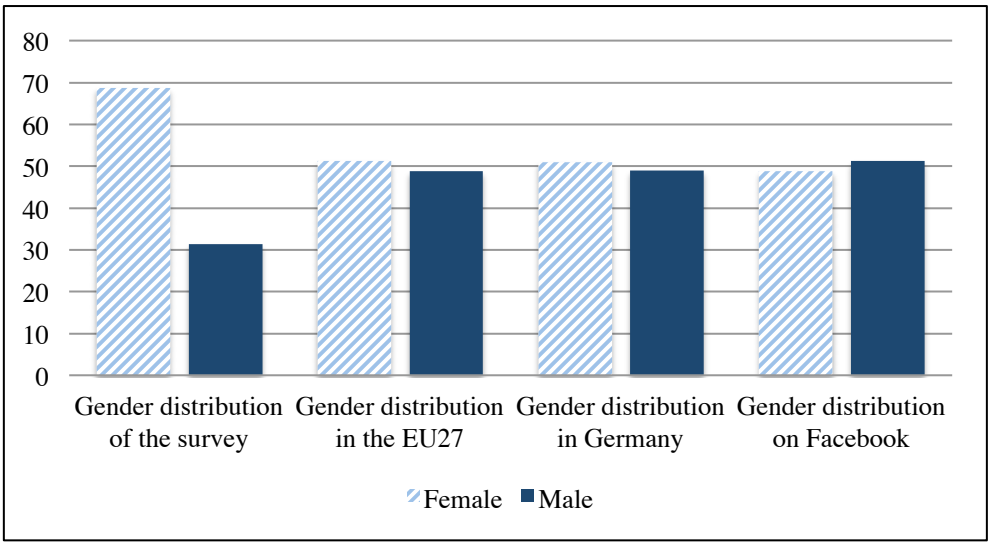

Figure 11: Comparison between gender distributions (in %)
Source: Own illustration based on data from Statistisches Bundesamt (2012) *and Eurostat* (2012a)

Reasons for the deviation of the survey from the reference distributions might be due to the previously described referral bias of *snowball sampling* as well as to a higher general tendency of females to take part in surveys. The latter is a rather common phenomenon and has been observed in various social science studies, e.g., telephone and online surveys (Ross et al. 2003, 396).

The potential effect of referral bias within the collected data sample – might be caused by prevalent use and engagement behaviors on SNS, since female SNS users significantly spend more time on SNS compared to their male counterparts (comScore Data Mine 2011c).

	% Reach	% Composition Unique Visitor	% Composition Minutes	Average Hours per Visitor
Total Audience	72.5%	100.0%	100.0%	4.7
All Females	75.8%	47.9%	56.6%	5.5
All Males	69.7%	52.1%	43.4%	3.9

Table 3: Global online social networking engagement above the age of 15 (May 2010)
Source: Own illustration in adoption to comScore (2010c)

The dominating age groups surveyed in the underlying study reside in the demographic segments *50-60* and are represented by 83.4% of total subjects among the data set. The collected data sample lacks representativeness of actual age distributions within the European Union, since 36.5% of the total population is *50 years of age and older* whereas the demographic segment *50-64* is approximately 52.3% of the population in the demographic segment *50 and older* (Eurostat 2012b). While the actual age distributions in the population of both the European Union and Germany exhibit a slowly declining slope within considered age intervals, the age distribution within the sample declines at an almost exponential rate.

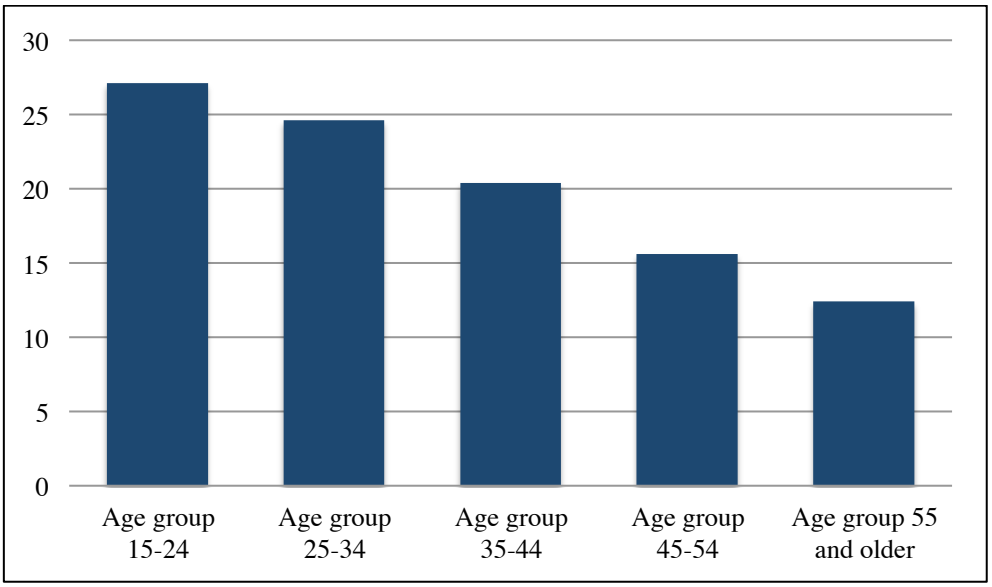

Figure 12: Age distribution of European SNS Facebook user population (in %, 2011)
Source: Own illustration in adoption to comScore (2011b, 8)

The composition of the sample is largely influenced by two prerequisites subjects had to fulfill to take part in the survey, namely (i) being a registered Facebook user and (ii) being at least 50 years of age. When compared to the actual age distribution of the SNS Facebook population in Europe (see Figure 12), the sample appears to distend the rate of decline of Facebook users with increasing age. The assumption of an exponential decline in the total amount of SNS users residing in the age segment *55+* seems more reasonable, since the per-

centage of Facebook users within the age segment *24+* already declines at an almost steady rate.

Although the data sample lacks representativeness in regards to age distributions and demographic composition of most European countries including Germany as well as in regards to the composition of elderly user segments within the SNS Facebook population, following findings and interpretations serve as an initial starting point to further understand specific expectations, needs, and concerns of elderly individuals towards *online social networking* to formulate adequate design principles for an elderly SNS user segment.

4.2.3 Findings and discussion

In parallel to the conducted *explorative qualitative study*, collected data was analyzed according to expectations, needs, and concerns elderly individuals exhibit towards *online social networking* and consecutively interpreted and discussed in the following. Before I elaborate on the analysis in detail, I briefly present findings concerning adoption of and use behavior on the SNS Facebook among the collected sample of elderly users. I attempt to present and discuss findings aligned to the three proposed phases of the *behavior chain model* for online participation: (i) *discovery*, (ii) *superficial involvement,* and (iii) *true commitment* (Fogg/Eckles 2007, 202).

Evidence found in the previously described findings of *semi-structured interviews* and *focus group interviews* suggests that children and respectively grandchildren of elderly individuals stimulate their interest in *online social networking*. Descriptive analysis partially confirm these findings, however the majority of participants exclusively learned about the SNS Facebook and experienced *online social networking* through their children – excluding grandchildren – and close social ties such as close friends – excluding life partners. The study therefore could reproduce results and insights gained in previous studies (Koppen 2010, 14). In contrast, a study conducted on parenting and *online social networking* revealed that approximately 30% of teenagers would prefer to "un-friend" their parents on the SNS Facebook (AOL 2010). In parallel to findings documented in the qualitative studies, traditional media coverage on *online social networking* plays a significant role in how elderly individuals encounter this novel means of social interaction (see Figure 13).

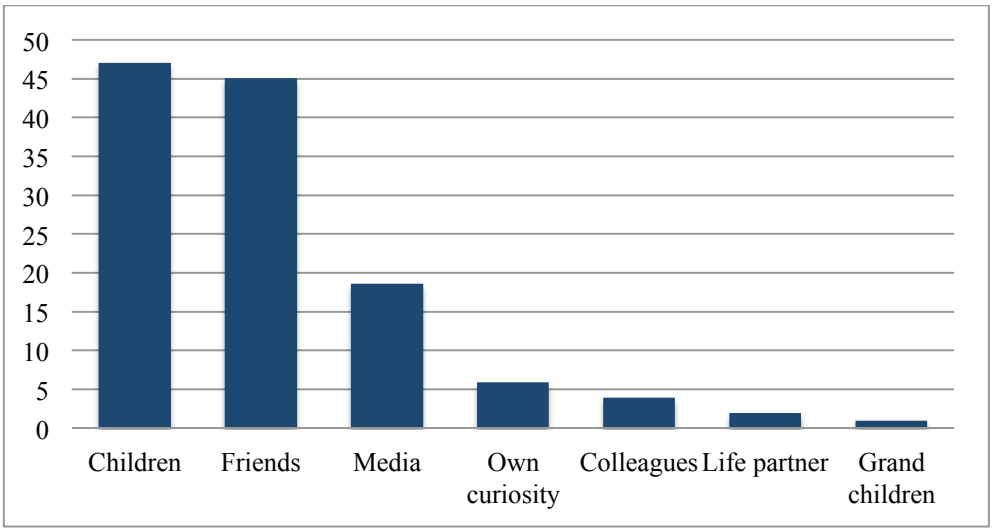

Figure 13: Sources of information about Facebook and online social networking (in %; N = 102)
Source: Own illustration

When asked for their attitude towards adoption of the SNS Facebook, most survey participants potentially aspire a long-time adoption of the SNS – equivalent to the phases of *superficial involvement* and *true commitment* according to the *behavior chain model* – according to analysis of absolute frequencies within the sample. Notably, individuals between the age of *50 and 55* years – representing the lower bound of the sample according to progressed age – tend to long-time adoption of the SNS Facebook and *online social networking* respectively, whereas individuals who are slightly older display the sole age group that tends to deny long-time adoption of the SNS Facebook (see Figure 14).

In total, the majority of participants of the underlying survey intend a long-time adaption of the SNS Facebook based on measured absolute frequencies (N = 95).

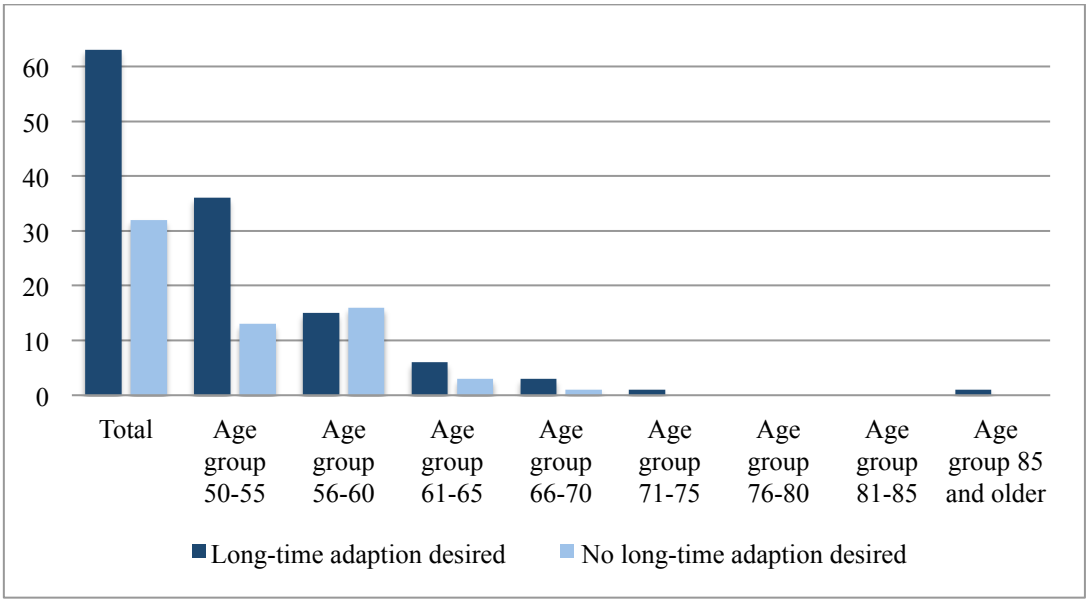

Figure 14: Attitudes towards adaption of the SNS Facebook (absolute frequencies; N = 95)
Source: Own illustration

Additionally, participants were inquired to indicate their first encounter with the SNS Facebook and point in time of actual registration with the SNS (see Figure 15). Findings demonstrate a significant time span between their first contact with the SNS Facebook – equivalent to the phase of *discovery* according to the *behavior chain model* – and actual registration with the SNS Facebook (or SNS) and further suggest that elderly individuals not registered with any SNS strongly deliberate on their prospective joining of a SNS. Continuative, these findings could point to severe concerns of elderly individuals towards *online social networking* and that strong persuasion of (close) social ties is required to result in an actual registration. Furthermore, analyzed data suggests that especially in the last 24 to 36 months elderly individuals were highly exposed to *online social networking* for the first time whereas a decline in first encounters with *online social networking* in a recent lapse of time (during the last 12 months) can be observed among the sample. Accordingly, I assume that first encounters with the novel modality of social interaction approximate saturation among individuals in the demographic segment *50-55*, but constant or even increased numbers of down streamed registrations could be expected and peak within the next 12 to 24 months since the time the study was conducted (comScore 2011a, 12).

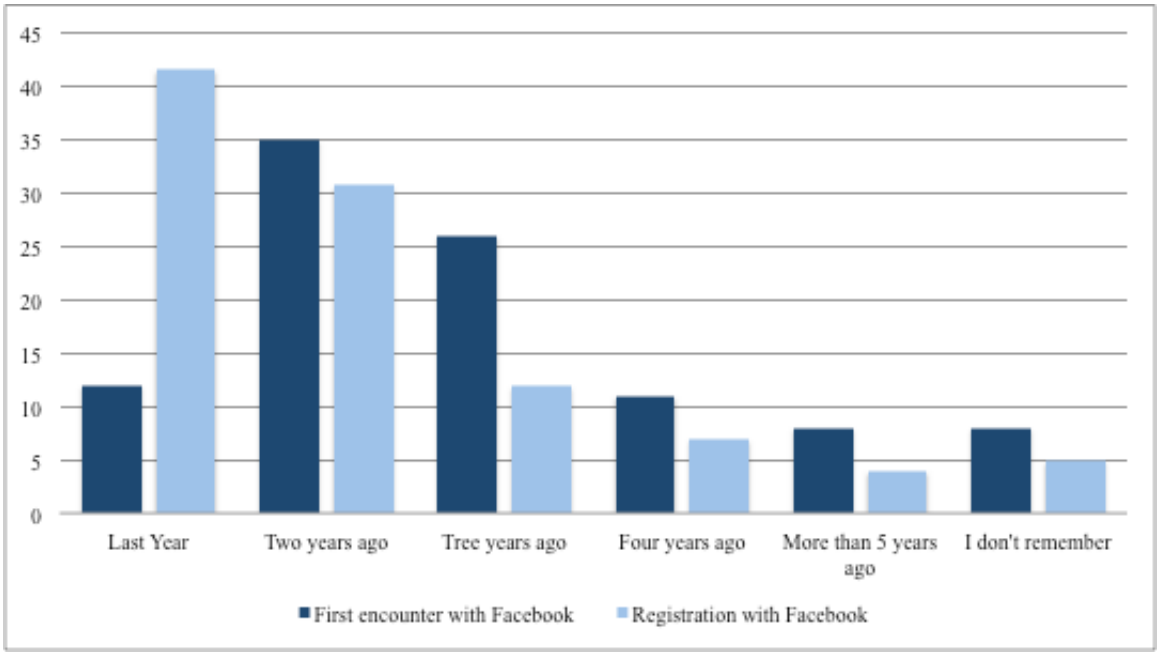

Figure 15: Time between first encounter and registration on the SNS Facebook (in %)
Source: Own illustration

Further analysis of data show significant differences in use behavior (the phases of *superficial involvement* and *true commitment* according to the *behavior chain model*) of the SNS Facebook between elderly female and male users. For example, more than 54% of total female survey participants use the SNS at least once a day since the fraction of *high-frequent users* among females is almost twice as high than male users (approx. 28%). As a consequence, the fraction of elderly male users that solely use Facebook a few times per month (*low-frequent users*) is significantly larger than the amount of elderly female participants (25% compared to 7%). Other studies analyzing use behavior in SNS could generate similar conclusions and have documented that female users tend to be more active on Facebook and tend to spend considerably more time on such sites compared to male users. For example, a study on the

SNS Facebook use found that among the demographic segment *55+*, male users only spent 2.9 hours per day interacting with online social networks, while female users spent 4.9 hours per day on such sites (comScore 2011a, 13). Furthermore, a study that analyzed specific SNS user activities among Facebook users showed that the fraction of female users who update their status message information at least once per day is almost twice as high as the fraction of male users (18% compared to 11%) (Hampton et. al 2011, 15).

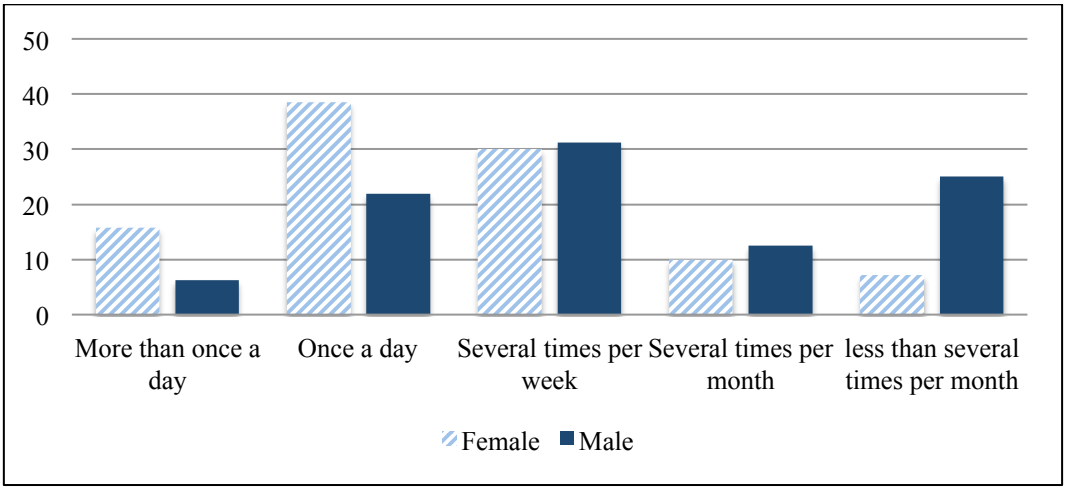

Figure 16: Frequency of Facebook use divided by gender (in %; N = 102)
Source: Own illustration

Due to evidence in conducted *semi-structured* and *focus group interviews* as well as in various other studies based on more balanced data samples regarding the underlying age composition, I reason that elderly female users tend to be more active in *online social networking* compared to their male counterparts and therefore follow that the discrepancy in SNS use between female and male users increases in relation to advanced age (Hampton et. al 2011, 15).

4.2.3.1 Expectations towards online social networking

Active and purposeful use of ICT systems and applications – including SNS such as the SNS Facebook and Twitter – largely depends on how these applications fulfill their users' initial expectations towards them (Oliver 1980, 462). Therefore the conducted study not only surveyed expectations subjects had prior to registration with a SNS, but additionally focused on whether these expectations were fulfilled in later periods of active participation and use of SNS – equivalent to the later phases described in the *behavior chain model.* The underlying study specifically documented expectations elderly individuals exhibit towards the SNS Facebook and *online social networking* in general, which were found to be similar to findings reported in other studies that mostly focused on a younger target audience (Ellison/Steinfield/Lampe 2007, 1144; Lampe/Ellison/Steinfield 2006, 170).

Based on descriptive statistical analysis, expectations concerning prospective SNS use could be grouped based on the two predominant online social interaction mechanisms in *online social networking – social searching* and respectively *social browsing* behavioral intentions (Lampe/Ellison/Steinfield 2006, 170). 85.3% of subjects expect that active participation in

and use of the SNS Facebook supports them in strengthening and intensifying offline relationships that they already have prior to their registration (*social searching*), rather than in creating purely online ties via SNS (*social browsing*). Respectively, 67.6% of subjects expect to be highly supported in keeping in touch with closer social ties such as family members and relatives through SNS use (see Figure 17).

Descriptive statistical results therefore provide evidence that previously documented findings on the two distinct behavioral mechanisms in *online social networking* additionally hold true for elderly SNS user populations, given that analyzed data revealed a strong tendency to *social searching* related intention of SNS use (Lampe/Ellison/Steinfield 2006, 170). However, based on additional findings from the preceding *explorative qualitative study*, I assume that elderly SNS users exhibit an even higher tendency to *social searching* behavior in SNS than their younger counterparts since expectations regarding *social browsing* are found to be significantly less important among subjects. Accordingly, I presume on the background of similar findings (Pfeil/Arjan/Zaphiris 2009, 647) that elderly individuals mostly maintain intimate social ties on the SNS Facebook and online social circles to be exclusively composed of family members, relatives and long-time friends.

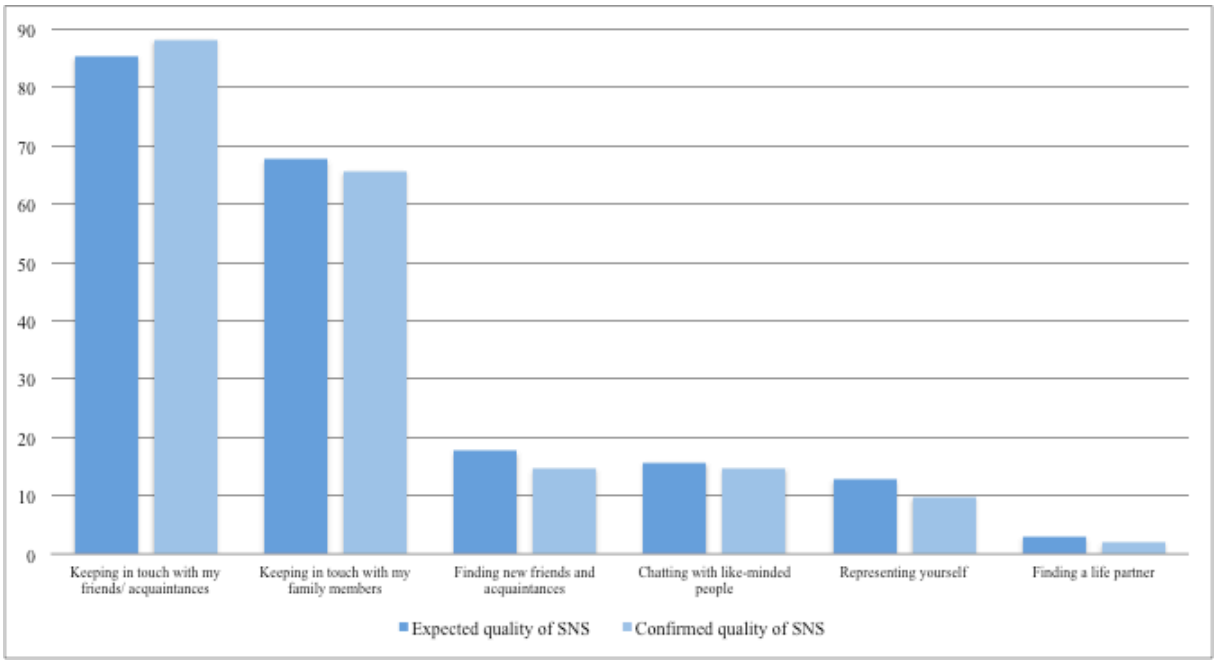

Figure 17: Expected and confirmed qualities of SNS (in %; N = 102, multiple responses possible)
Source: Own illustration

Continuative, expectations towards the formation of completely novel social ties through active participation in SNS were assessed to be considerably low among surveyed elderly SNS users. For example, expectations in regard to *online social networking* behavioral patterns facilitating *social browsing* that relate to the solely online bounding of novel social ties through SNS (e.g., 'finding new friends and acquaintances') were only mentioned by 17.6% of elderly subjects. Additionally, expectations towards other behavioral aspects relating to *social browsing* such as having (random) conversations, online social interaction with like-

minded individuals or the purposeful search of a new life partner via SNS were only mentioned by a minority of participants (15.7% and respectively 2.9%).

In summary, the findings suggest that elderly Facebook users prospectively mimic and adopt use behavior of younger users in regard to *social searching* behavioral patterns and mostly expect that active participation in SNS supports them in strengthening offline relationships and intensifying social interactions with close and intimate social ties that they already maintain prior to registration with the SNS Facebook. On the contrary, the majority of survey participants exhibited rather low expectations towards the discovery of completely unknown individuals via SNS in order to establish novel or ad-hoc social connections with them. In particular, findings suggest that elderly SNS users display a great reluctance to establish solely online social ties and virtually an aversion to seek intimate social ties such as a new life partner through *online social networking*.

Therefore I further assume that elderly individuals obviate SNS as an alternative to fulfill these social needs and rather tend to intentionally choose other online resources such as VC that especially cater to elderly user segments, e.g., online dating communities such as *Senior Friend Finder* and *Senior Match*, or ordinary offline means. However, 81.4% (n = 83) of subjects among the sample were living in a partnership relationship by the time of the study that include married individuals and individuals who live in a non-married partnership. Therefore the collected sample might be exposed to a bias since the majority of surveyed individuals lack expectations towards this specific (social) need.

The data sample provides evidence that *online social networking* via the SNS Facebook has mostly proven to fulfill most expectations to a remarkably high extent among elderly individuals. In particular, this holds true for expectations that relate to *social searching* behavioral intentions in *online social networking* and to implemented functionalities that specifically cater to maintaining and strengthening already established real-life social ties prior to registration. In this regard, approximately 97% of the total subjects assessed active participation on the SNS Facebook and *online social networking* to appropriately help them in staying in touch and socially interact with their close family members and social ties. Furthermore, 10% of elderly survey participants perceived their expectations towards *online social networking* to be confirmed to the highest extent in all assessed items.

Consequently, I suppose that *online social networking* displays an appropriate alternative to other means of social interaction among elderly individuals without even being expected prior to registration with SNS which additionally strengthens the overall argumentation of the underlying thesis research.

Once more, it should be mentioned that online social interaction through SNS displays an alternative modality for social interaction and should be regarded as complement modality for social interaction to offline means. Both explorative studies could confirm that *online social networking* is used as a complementary mean for social interaction among elderly registered SNS users, however elderly SNS non-users expressed a fear towards migration of social interaction in a solely online sphere.

4.2.3.2 Needs towards online social networking

Parallel to previously described *explorative qualitative study* (see section 4.1), the conducted survey assessed specific needs of elderly individuals towards *online social networking*. Analyzed data is based on statements of registered elderly users of the SNS Facebook, intentioned to result in a deeper understanding of the specific (functional and socio-technical) needs of elderly individuals involved with *online social networking* in the two later phases of the *behavior chain model* namely *superficial involvement* and *true commitment* (Fogg/Eckles 2007, 202) of the users.

In the underlying explorative study, elderly subjects were additionally questioned about their general motivations that led to a successful registration with and further resulted in active participation on the SNS Facebook. Since the assessment was conducted at a post-registration point in time, collected data additionally allows the potential effects and implications SNS use entails on their social life to be measured in order to gain an extended understanding of general socio-technical needs of elderly individuals towards *online social networking*.

In parallel to documented findings in the qualitative studies and previously discussed findings concerning the expectations of elderly individuals towards *online social networking*, online social needs can be subdivided into the two predominant online social interaction mechanisms in *online social networking* – namely *social searching* and respectively *social browsing* behavioral intentions (Lampe/Ellison/Steinfield 2006, 170), where data suggests a strong tendency towards *social searching* needs among elderly individuals.

The primary need of elderly individuals towards *online social networking* seems closely linked to an intense *social searching* behavior focusing on family members such as children and grandchildren and very close social ties such as longtime friends. Findings could reproduce earlier insights reported by Lampe/Ellison/Steinfield (2006, 169) based on a sample consisting of primarily younger SNS users and therefore support the assumption that individuals across generations turn to SNS to principally strengthen offline relationships and to intensify social interactions with close and intimate social ties that they already maintain prior to registration with a SNS.

Another explanation for the documented strong tendency towards *social searching* behavior among elderly individuals could be that elderly individuals, i.e., especially parents, are exposed to an intensified social peer pressure as family ties, social communication, and interaction among family members are maintained more and more on SNS. This therefore results in an urge for non-registered individuals to become part of the online social network in order to not only benefit from it, but also to avoid negative consequences of not being part of it (Rohlfs 1974, 16f). I further assume that the majority of survey participants realized the existence of established social ties of real-life friends and stable online connections between family members on the SNS Facebook prior to their actual registration with the SNS and therefore intentionally chose to register with the SNS to connect to family members and close social ties.

Considering the demographic composition of the underlying sample – namely that the majority (93.1%; n = 95) of participants declared to be parents to at least one child and 28.4% (n = 29) of the survey subjects declared to have at least one grandchild – evidence suggests that the existence of children and grandchildren registered with SNS has positive influence on the attitude towards *online social networking* and consequently initiates a registration among elderly individuals. Furthermore, since 81.4% (n = 83) of the participants were living in a partnership relation that include individuals that were married or living together in a non-married partnership, data suggests that life partners additionally influence each other in the decision to join and register with a SNS (see Figure 18).

Similar studies questioning reasons and motivations why elderly individuals join and flock to SNS are relatively sparse, yet a study conducted by the Pew Internet & American Life Project found that the increase of elderly demographic user segments with SNS might be explained by the fact that the novel modality of social interaction "bridges generational gaps" (Madden 2010, 7). Furthermore, the study revealed that elderly SNS users "are much more likely to reconnect with people from their past, and these renewed connections can provide a powerful support network when people near retirement or embark on a new career" (Madden 2010, 6), which in turn could explain the importance of close ties – and, e.g., to a lesser extent stated business reasons – during their decision making to register with a SNS.

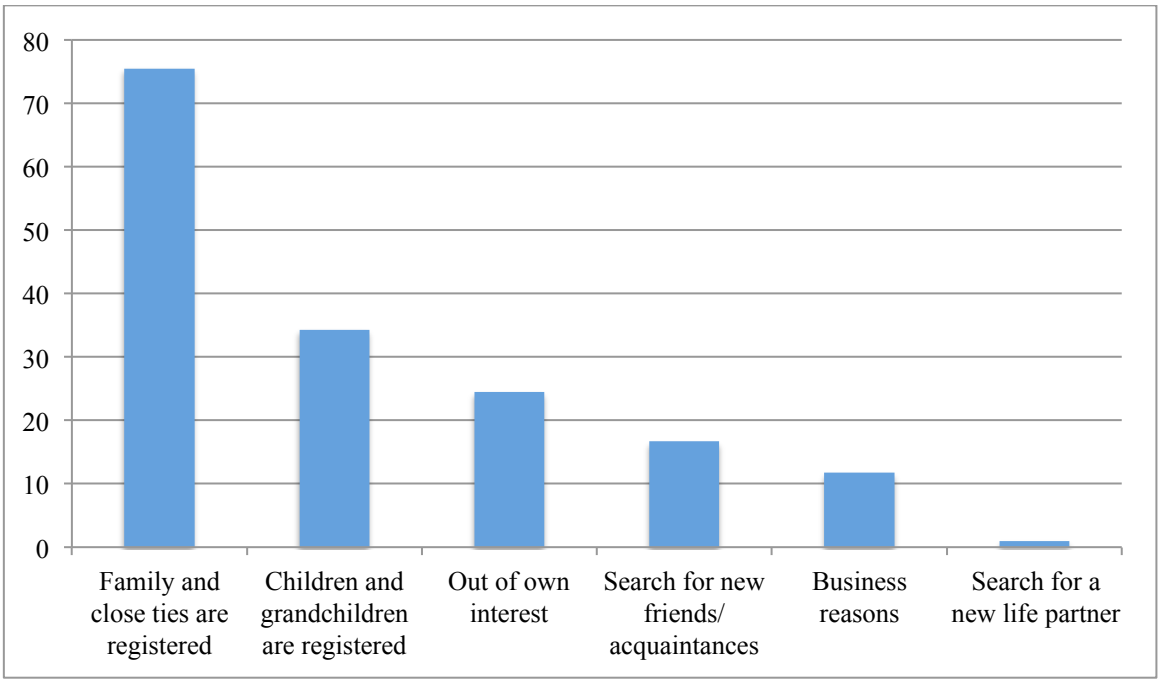

Figure 18: Major reasons to register with the SNS Facebook assessed post registration (in %; N = 102, multiple responses possible)
Source: Own illustration

In contrast, needs towards *online social networking* catering to *social browsing* behavioral intentions are rather marginal when compared to *social searching* related interests of elderly SNS users; only 16.7% of survey participants declared that active search for novel social ties such as new friends and acquaintances – and respectively approximately 1.0% of participants indicated active search for a new life partner – constitute eminent motivations to register with

a SNS. The latter need is assumed to be underrepresented among subjects included in the sample, since 81.4% (n = 83) of the participants were living in a partnership relation that include individuals that were married or living together in a non-married partnership at the time of the survey.

Yet, on the background of the drastic increase of the proportion of advanced *senior citizens* (see section 2.1.1) as well as the increased fraction of elderly individuals living alone, the distribution of expressed (socio-technical) needs towards *online social networking* could change in the future.

When directly asked on their individual preferences and actual implications of SNS use, 75.5% (and respectively 52.9%) of the subjects indicated a perceived increase of social interactions with close social ties and family members ascribed to *online social networking* (see Figure 19). Results not only confirm findings generated in previous studies (Lampe/Ellison/Steinfield, 2006, 169), but also illustrate that online social interactions through SNS use strongly cohere with existing offline social relationships and further strengthens the argumentation that *online social networking* displays a secondary modality and supportive means in addition to offline social interactions.

In consequence, only 5.9% of the subjects indicated that they intentionally use the SNS Facebook to socialize with individuals outside their existing offline social ties or to initiate an intimate relationship. In specific, the rather low assessment of the items '…I have gotten support for my current life situation' and '…I have gotten to know people who understand me' suggests that individuals in particular life situations or health-related problems rather tend to seek offline means to satisfy their specific needs for social interactions, in general, or turn to specifically aligned online venues such as health-related or dating VC. Accordingly, I further reason that the absence of explicit functionalities that potentially support *social browsing* behavior among SNS users, result in similar SNS use behaviors of elderly individuals when compared to younger users (Lampe/Ellison/Steinfield 2006, 169f). Consequently, I assume that elderly individuals might mimic SNS use behaviors of younger individuals active on the SNS Facebook.

However, on the background of the underlying thesis, I would like to draw attention on the four items that were assessed by survey participants not yet addressed and discussed, but which highly corroborate the motivation and necessity of the underlying research. Findings suggest that the use of SNS is expected and potentially could generate a feeling of perceived *social connectedness* indicated by approximately 28.4% of survey participants.

Furthermore, 13.7% of elderly subjects declared that they felt less lonely and 8.8% indicated to have received some sort of support for their current life situation due to intentional SNS use. In addition, 22.5% of survey participants stated to be well informed on current life situations of their online social ties. All four items are either related to the theoretical notion of *social connectedness* or *social support* constituting two fundamental components in the theoretical development of the structural research model in the course of the underlying thesis (see section 5.1). Moreover, results attest that SNS functionalities – and consequently active par-

ticipation on and use of SNS – does not yet fully leverage the generation of social benefits such as *social connectedness* and *social support*.

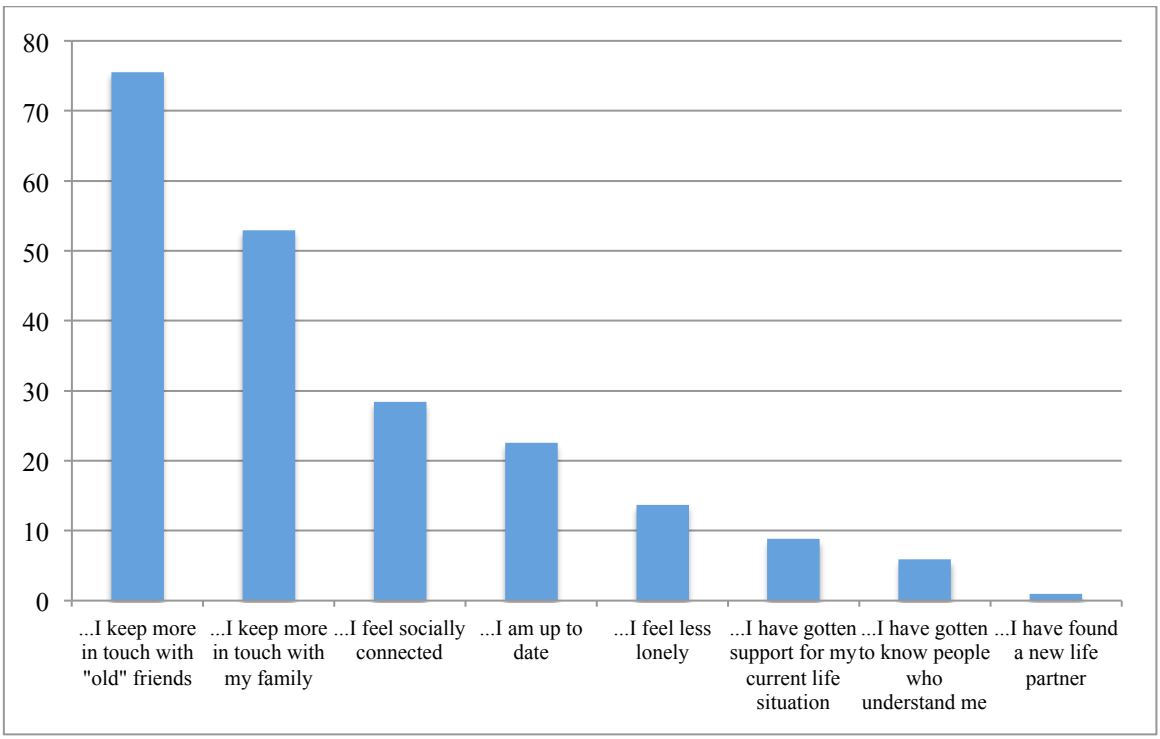

Figure 19: "I use SNS like Facebook, because…" (in %; N = 102, multiple responses possible)
Source: Own illustration

Survey participants were additionally asked which SNS functionalities they would obviate in their prevalent SNS use behavior due to lack of necessity. It is noticeable that 31.4% and respectively 30.4% of survey participants especially reject the use of functionalities that constitute core and prominent functionalities of VC due to indicated absence of necessity. Since 11.8% of elderly survey participants indicated the 'adding friends' functionality not to be essential in their prevalent SNS use behavior, I assume that a fraction of elderly SNS users rather tend to react on received friend requests by other users than to initiate friend request out of their own initiative. Based on findings from the prior *explorative qualitative study*, I assume that elderly users perceive searching for social ties (*social searching*) and subsequently initiating friend requests to be a high effort and complex task, which potentially results in a rejection of supported functionalities.

In the light of subsequently presented research on the generation of potential social beneficial outcomes for SNS users such as *social connectedness* and *social capital* (see section 5.1) through use of status message functionalities on SNS, I would like to mention that only 16.7% of elderly subjects assessed its use as being irrelevant in their SNS use behavior. Results could point to an increased recognition of (social) benefits that originate from status message functionality use by elderly SNS users. In addition, results suggest a shift in relevance of functionalities away from functionalities that facilitate *one-to-one communication* such as the 'chat' and 'internal messaging" functionality to functionalities that support the user in *one-to-*

many communication such as status messaging and the sharing and commenting of user-generated content among online social ties.

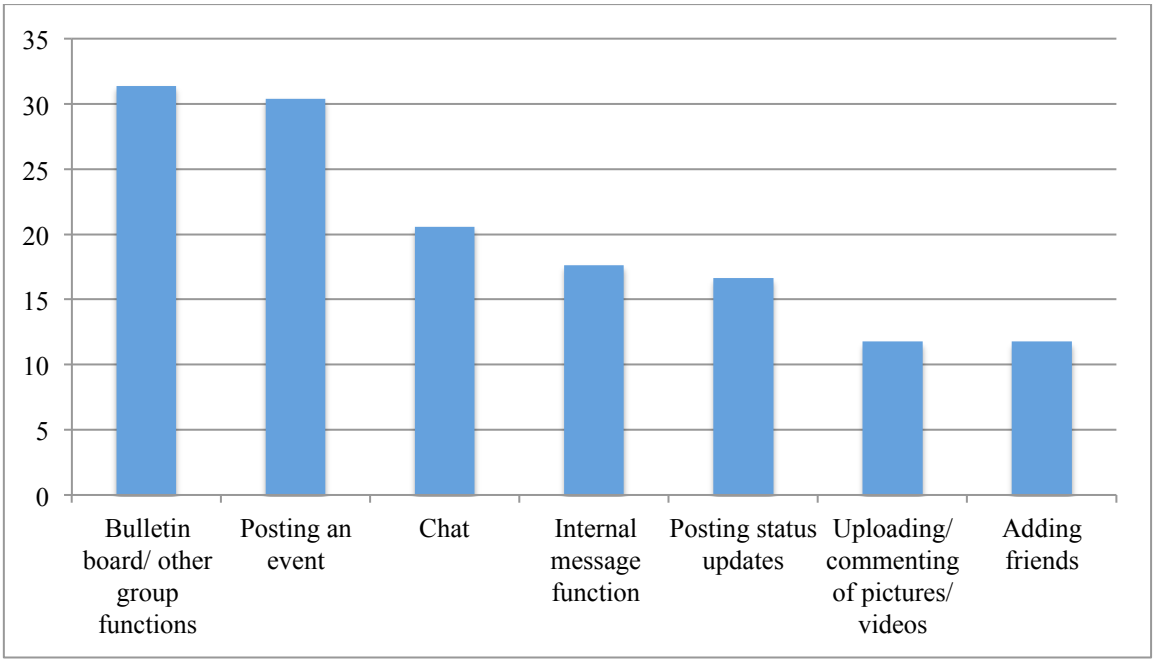

Figure 20: Functionalities not used due to lack of necessity (in %; N = 102)
Source: Own illustration

Given that the evaluation of SNS functionalities in regard to their perceived necessity through elderly SNS required prior user involvement and a time period of active SNS use, results could deliver insights on use behaviors of elderly SNS in the *true commitment* phase when discussed on the background of the *behavior chain model* (Fogg/Eckles 2007, 202). Therefore evidence suggests that commonly displayed target behaviors by active users of SCP and SNS namely (i) to create value and content, (ii) to involve others, and (iii) to stay active and loyal, are primarily realized through the use of highly specific SNS functionalities, e.g., status message and sharing and commenting functionalities, among elderly SNS users.

In the following section, I attempt to elaborate on principal concerns elderly users express towards *online social networking* based on descriptive analysis.

4.2.3.3 Concerns towards online social networking

Alongside the enormous potential of innovative ICT and systems to satisfy specific needs of prospective users, their application and adoption often implicate various concerns among prospective users. Concerns towards privacy issues of functional implementations and deleterious effects on the quality of interpersonal relationships are probably the most generic concerns expressed in assessing computer-mediated communication and ICT (Fischer 1994, 6; Kraut et al. 1998, 1020ff; Nie/Hillygus/Erbring 2002, 217) – whereas *online social networking* makes no expectation (Dwyer/Hiltz/Passerini 2007, 342ff; Ledbetter et al. 2010, 43ff).

Early research on online communication suggests that computer-mediated communication potentially degrades online and offline interpersonal ties (Sproull/Kiesler, 1986, 1509f), a concern also raised by participants in conducted *semi-structured* and *focus group interviews*. However, more current research studies claim computer-mediated communication to be equal or even exceeding the quality and effectiveness of face-to-face communication (Walther 1996, 4, 10). Previously described and following findings suggest that elderly SNS users mainly discard these concerns since *online social networking* is mostly perceived as a supportive mean to real-life social interaction.

Based on evidence collected during the *qualitative explorative study*, discussed in section 4.1.3, I assume concerns regarding data security, privacy, and information disclosure among elderly SNS users to be significantly higher when compared to their younger counterparts, and which constitute the most serious concerns elderly individuals express towards *online social networking*. Yet their concerns are not unfounded. A qualitative assessment of Facebook privacy settings over a period of more than five years between 2005 and 2010 conducted by McKeon (2012) shows that despite continuous criticism on how the SNS Facebook handles private user information, it has not undergone any major efforts to increase data security and privacy as well as limit information disclosure and visibility.

Figure 21 graphically displays the extent of availability of user data and level of visibility in relation to the specific underlying functionality in the year 2005 based on interpretations of the initial and default privacy settings of a Facebook user profile. Noticeably, the default privacy settings in the year 2005 highly restricted access from outside the SNS Facebook and strictly limited user data visibility of non-registered Facebook users. Profile data such as 'name', 'gender' and the 'profile picture' were available to the entire SNS user population by default – a necessity to provide and support meaningful *social searching* behavior of users. Availability of other data was either restricted to the underlying network or social ties of a user[28].

[28] The concept of *networks* included the personal networks a user set up during registration with the SNS Facebook and included a partition concerning institutions such as colleges and universities or companies as well as countries. Since 2009, the *network* concept has been replaced by the concept of *Friends of Friends (FoF),* which is assumed to limit the potential number of visible users inside an individual network.

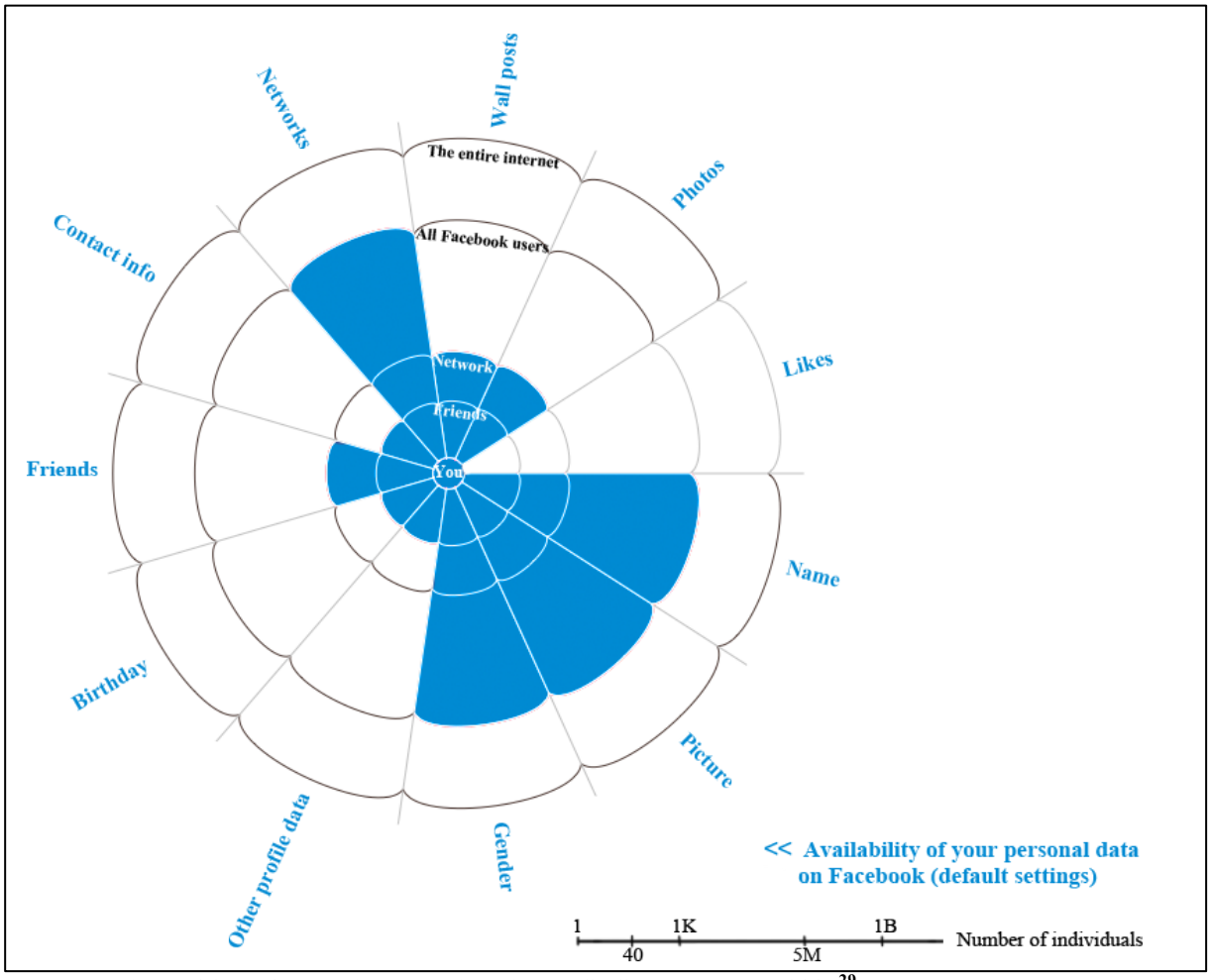

Figure 21: Default privacy settings in the SNS Facebook by 2005[29]
Source: Own illustration in adoption to McKeon (2012)

Comparing the default settings of data privacy between the years 2005 and 2010 both graphically displayed in Figure 21, and respectively in Figure 22, reveal a drastically increased dissemination of user profile data not only inside the SNS but also outside the SNS, visible to the entire Internet user population and accessible for search engine crawlers. I also like to draw attention to the immense increase in total reach of the SNS Facebook alone, which is estimated to more than 900 million monthly active users at the end of March 2012 (Facebook 2012).

[29] It should be noted that the data displayed in Figure 21 and Figure 22 is derived from interpretations of the Facebook Terms of Service over several years by McKeon (2012) and is subject to permanent corrections. The sizes of population are based on averages, interpolations of those averages across time and are mainly based on data obtained from Google and the Facebook Data Team, and estimated in cases data was unavailable (McKeon 2012).

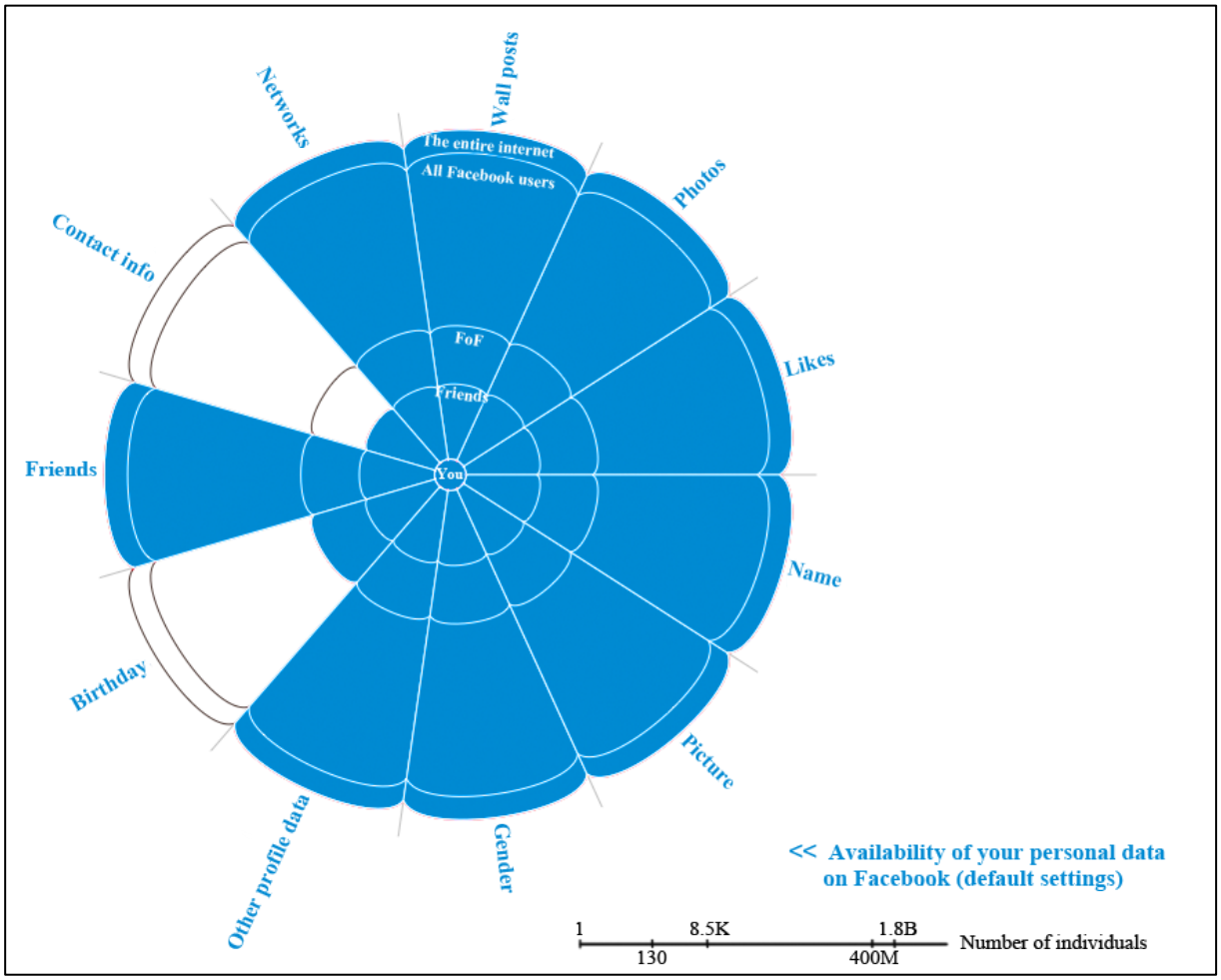

Figure 22: Default privacy settings in the SNS Facebook by 2010
Source: Own illustration in adoption to McKeon (2012)

I assume that especially *Means to an end, Facebook Mommy and Daddy and Skeptical users* (see section 4.3) – who to a greater or lesser extent display intense and frequent SNS use as well as exhibit an above average degree of ICT affinity – could be deterred by above delineated default settings concerning availability of personal data. In turn, this could affect general adoption of *online social networking* and further influence the use behavior of elderly individuals such that elderly SNS user withdraw from active sharing of information.

Therefore, I also attempted to assess and gain an understanding on which functionalities of the SNS Facebook are avoided by elderly users due to fear of information disclosure with the underlying survey (see Figure 23).

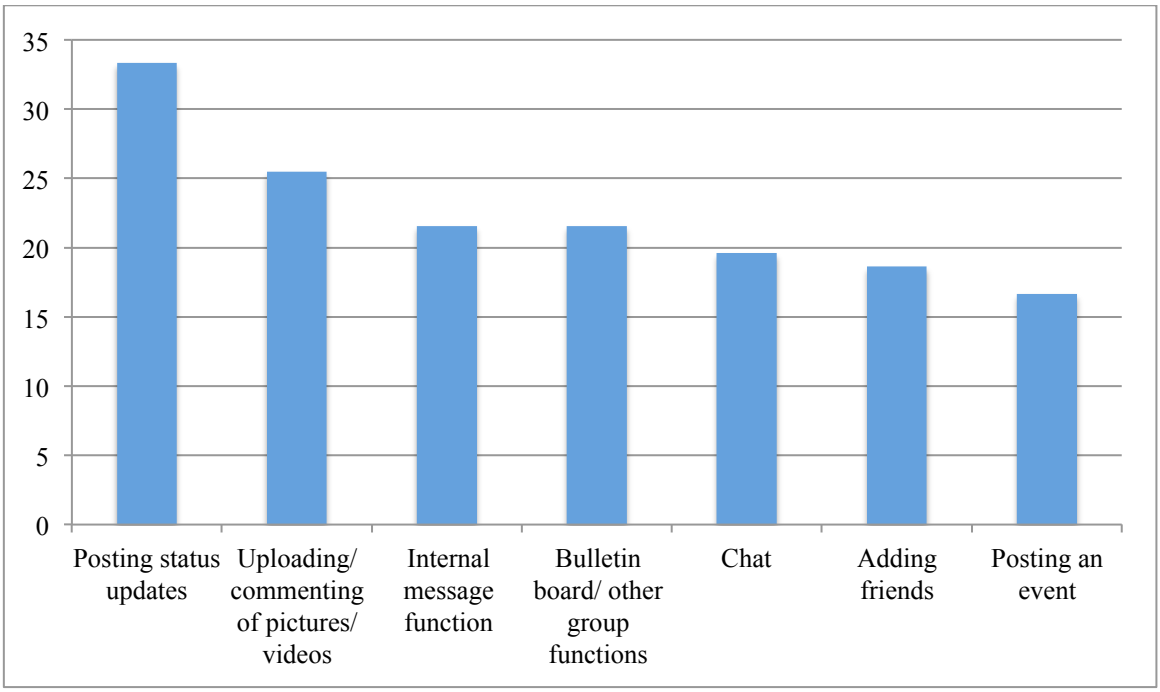

Figure 23: Avoided functionality use due to fear of information disclosure (in %; N = 102, multiple responses possible)
Source: Own illustration

In the light of conducted research on potential beneficial effects of status message functionality use subsequently covered and discussed in later sections of the underlying thesis (see section 5.2.1), data reveals that 33.3% of subjects avoid posting status messages on the SNS Facebook due to fear of information disclosure. According to collected data by McKeon (2012), these concerns of survey subjects are justified since published information via the SNS Facebook status message functionality[30] is publicly available and visible to the entire Internet population by default.

Furthermore, 25.5% of survey participants indicated to be concerned with the use of functionalities that facilitate sharing and commenting of user-generated content such as pictures and videos due to information disclosure and privacy settings. Similar data could be collected on the assessment of functionalities implemented and applied to provide *Facebook Groups* and *Facebook Events*. One explanation for the rejection could be that the mode of action of already addressed functionalities is yet not fully understood by elderly users, since these functionalities (*one-to-many communication*) differ in their modality distributing information when compared to traditional face-to-face communication and most ICT applications (*one-to-one communication*). For example, in the case of the SNS Facebook status message functionality, the change is very recognizable since the mode of interaction shifts from a *one-to-one* to a *one-to-many communication* and dissemination of information to multiple addressees.

[30] The status message functionality corresponds to wall posts according to the terminology used by McKeon (2012).

In contrast, one of the most critically assessed functionalities in regard to information disclosure – namely the uploading and commenting of user-generated content such as photos and videos on the SNS Facebook – at the same time constitutes the most preferably used functionality according to the underlying sample (56.9%) (see Figure 24). Data additionally suggests that 48.0% and respectively 39.2% of participating elderly individuals preferably use functionalities supporting a *one-to-one communication* and online social interaction on the SNS Facebook.

On the background of subsequently outlined research which specifically focuses on status message functionality use and its potential beneficial effects, I would also like to point out that the status message functionality is controversially assessed by elderly survey participants. Consequently, I assume that elderly Facebook users trade potential benefits of its use against the risk of possible information disclosure. Furthermore, I suppose that the majority of elderly Facebook users neither are yet fully aware of the feasibility to adjust privacy settings nor that they fully understood effects of settings to adjust and to control information disclosure and privacy for each underlying functionality. Figure 24 displays results for preferences regarding SNS functionalities among elderly individuals in contrast to indicated concerns regarding data privacy and information disclosure for each SNS functionality.

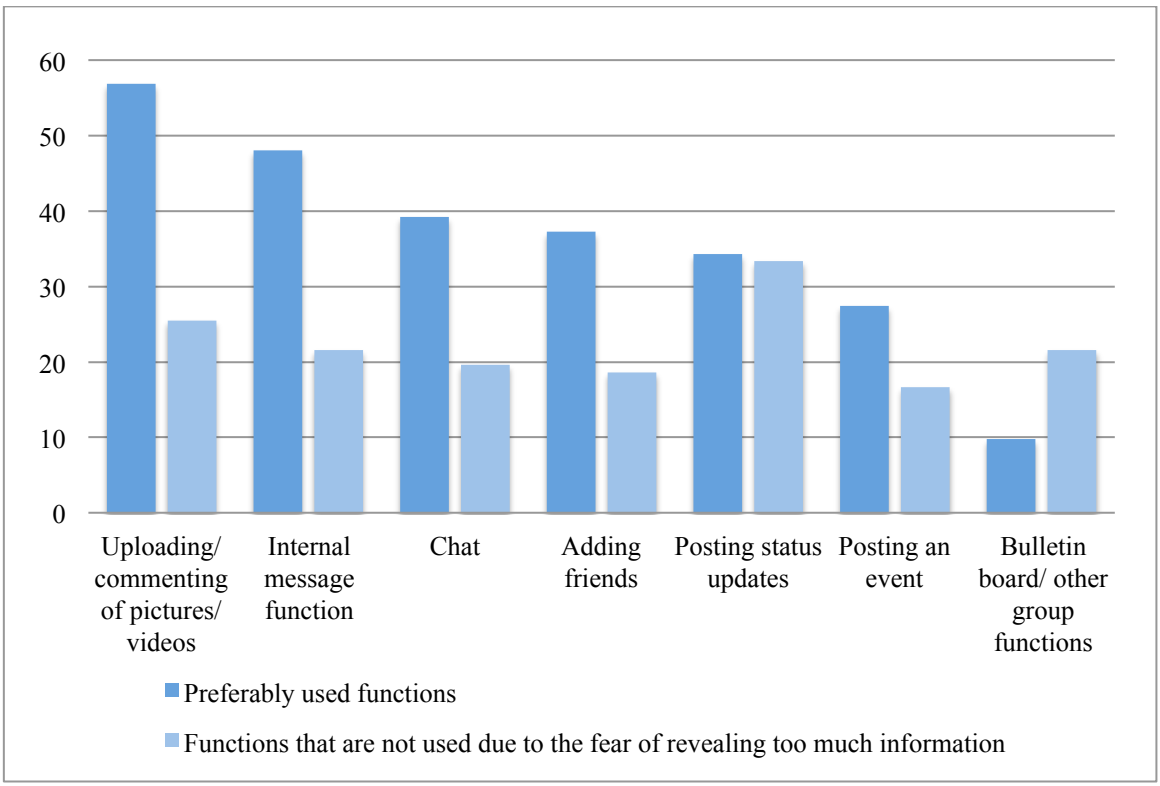

Figure 24: Preferably used functionalities vs. data privacy concerns (in %; N = 102)
Source: Own illustration

Surprisingly, the majority of elderly participants dismissed major concerns they expressed in regard to privacy issues and data integrity in SNS use if a particular functionality is highly useful and beneficial to them.

In particular, major concerns were expressed towards unintentional sharing of information and revelation of excessive amounts of personal data during use of SNS, however these concerns seem to strongly depend on the underlying functionality and strongly vary among elderly individuals.

The subsequent section discusses limitations of the conducted explorative quantitative study by focusing on applied sample method and composition of the collected data sample in specific.

4.2.4 Limitations

Due to given age-specific selection criterion of Facebook users and particular sampling method applied in the course of the underlying survey, the collected data sample displays a deviation from the reference distributions, e.g., the gender and age composition of the general population in Germany as well as the user composition by gender and age within the total SNS Facebook user population. Hence the representation of the collected data sample to both mentioned reference groups is rather low and thus probably leads to inaccurate results and interpretations of findings. Possible reasons are previously discussed in the course of explicating applied methods to retrieve the data sample. Although the chosen selection criteria highly restricted the number of potential participants in relation to the total SNS Facebook user population, the data set included 102 samples and allowed to generate significant findings.

Another limitation of the conducted study constitutes the biased selection of potential participants that is distinctive for *snowball sampling* and thus very hard to control during data collection. For example, since the survey was distributed only among registered individuals using provided functionalities on the SNS Facebook, e.g., through direct messages or shared status messages, the data sample consequently excludes Facebook non-users as well as limited the cultural diversity within the collected data sample to individuals originating from Northern American or Western European cultural backgrounds. Collected data samples retrieved through *snowball sampling* are subject to selection bias since the recruitment of a subject potentially results in the recruitment of a highly similar subject and consequently to selection of prospective subjects by individuals that have already taken the survey. Although this effect could have theoretically be reduced in the underlying study by carefully selecting the initial participants, the option was rejected due to low availability of elderly SNS Facebook users and an assumed general low willingness to participate in surveys distributed through on SNS and in VCs.

Furthermore significance of results is constrained by the conceptualization of the questionnaire given that the majority of items generated nominal data. Since collected data lacks normal distribution and most items also allowed multiple responses, application of various statistical methods for data analysis were not possible. Solely relying on application of descriptive statistics consequently limits expressiveness of interpretations and impedes the deduction of meaningful guidelines.

Given that all survey participants have previously been registered with the SNS Facebook and therefore have been actively using a SNS for a certain period of time, it was not possible to

question subjects on their expectations towards *online social networking* prior to registration, but collect their a priori expectations in a posterior point in time. In some cases, this was done by asking subjects for their perceived gratification of a priori expectations towards *online social networking*.

Although the sample included a higher fraction of individuals who were living alone and declared single or windowed as their relationship status, when compared to the collected sample of the preceding *explorative qualitative studies*, assessed (socio-technical) needs towards *online social networking* of elderly individuals retain a distinct bias in favor of needs related to *social searching* intentional behavior. For example, the majority of the participants stated that their needs related to *social searching*, such as staying in touch with close friends and family, were mostly satisfied by contemporary SNS functionalities, while only a minority of participants stated that needs related to *social browsing* intentional behavior were addressed and satisfied by the provided range of functionalities on the SNS Facebook.

The following section summarizes on obtained insights from both conducted qualitative studies.

4.3 Summary and conclusion of explorative studies

Evidence found in conducted qualitative research suggests that children and respectively grandchildren of elderly individuals stimulate their interest in *online social networking* and motivate use of SNS. Descriptive analysis partially confirm these findings, however the majority of participants exclusively learned about the SNS Facebook and experienced *online social networking* through their children and close social ties such as close friends – excluding grandchildren and life partners. The *quantitative explorative study* showed that individuals between the age of *50 and 55* years aspire long-time adoption of the SNS whereas individuals who are slightly older tend to deny long-time adoption of the *online social networking*. In total, the majority of participants of the underlying survey intended long-time adoption of the SNS Facebook, which confirms results of the previously described study (see section 4.1) and could explain the occurring demographic shift on SNS towards elderly user populations.

Descriptive statistical analysis revealed a strong tendency in *social searching* use of SNS (Lampe/Ellison/Steinfield 2006, 170) since 85.3% of subjects expect active participation in and use of the SNS Facebook supports them in strengthening and intensifying offline relationships that they already have prior to their registration (*social searching*), rather than in creating purely online social ties via SNS (*social browsing*). One explanation for the documented strong tendency towards *social searching* behavior among elderly individuals could be that elderly individuals are exposed to an intensified social peer pressure from family as social communication and interaction among family members shifts more and more towards SNS. I further assume that elderly SNS users exhibit an even higher tendency to *social searching* behavior in SNS than their younger counterparts since expectations regarding *social browsing* are found to be significantly less important among subjects in scope of the *explorative qualitative study*. Accordingly, I presume on the background of similar findings (Pfeil/Arjan/Zaphiris 2009, 647) that elderly individuals mostly maintain intimate social ties on the SNS Facebook and online social circles to be exclusively composed of family mem-

bers, relatives, and long-time friends. To conclude, I would stress the assumption that elderly Facebook users prospectively mimic and adopt use behavior of younger users in regard to *social searching* behavioral patterns and mostly expect that active participation in SNS supports them in strengthening offline relationships and intensifying social interactions with close and intimate social ties that they already maintain prior to registration with the SNS Facebook. In particular, findings suggest that elderly SNS users display a great reluctance to establish solely online social ties and virtually an aversion to seek intimate social ties such as a new life partner through *online social networking*. Both explorative studies could confirm that *online social networking* is used as a complementary mean for social interaction among elderly SNS users, however elderly SNS non-users expressed a fear towards migration of social interaction in a solely online sphere. Therefore, I conclude that *online social networking* displays an appropriate alternative to other means of social interaction among elderly individuals. Results of both studies could point to an increased recognition of (social) benefits that originate from SNS functionality use such as the status message functionality by elderly SNS users and further suggest a shift in relevance of functionalities away from functionalities that facilitate *one-to-one communication* to functionalities that support the user in *one-to-many communication* and online social interaction.

Based on evidence collected during the *qualitative explorative study*, I assume concerns regarding data security, privacy, and information disclosure among elderly SNS users to be significantly higher when compared to their younger counterparts and constitute the most serious concern elderly individuals express towards *online social networking*. Yet their concerns are not unfounded since Facebook has not undergone any major efforts to increase data security and privacy or to limit information disclosure and visibility in recent years (McKeon 2012). However evidence suggests that despite strong concerns regarding privacy and data security of elderly SNS users, most participants ignore these concerns in their actual SNS use if applied functionalities are perceived as reliable, usable, and beneficial to the elderly Facebook user.

Towards a classification of SNS users Age 50+

To summarize findings of conducted explorative studies, I derive a classification of *SNS users within the demographic segment Age 50+* which supported me to gain a better understanding of elderly SNS users and their characteristics. Furthermore, it helped me in better interpreting findings in course of the underlying thesis.

Two researchers independently assessed data collected in semi-structured interviews, explorative focus groups, numerous informal conversations, and various observations in order to derive a classification scheme.

The classification of SNS users within the demographic segment Age 50+ is aligned along two dimensions: (i) the degree of expectations towards online social networking (x-axis) and (ii) the degree of (social-technical) needs towards online social networking (y-axis) (see Table 4). The established classification scheme differentiates four SNS user types, namely (1) Facebook Mommy and Daddy users, (2) Means to an end users, (3) Closed-lipped users and (4) Skeptical users, which I briefly describe in the following.

The *Facebook Mommy and Daddy users* consider SNS use as a novel quasi standard means to communicate with family members, especially with children and grandchildren, kinship, and in-laws. They mostly register and use SNS due to family members already active on SNS. Most individuals are parents of one or more children and in some cases are grandparents with a number of grandchildren, whereas mostly the grandchildren are already registered and active SNS users (demographic segment *Age 15-24*). Therefore, individuals exhibit a high intensity of SNS use and embed *online social networking* in their daily (communication) and social interaction routines. While online social interaction with family members, kinship, and in-laws is the primary reason to join a SNS, *Facebook Mommy and Daddy users* are highly active in sharing of personal information on SNS compared to the other user types. Individuals are mostly still active in workforce or just recently retired. Therefore individuals not only display high expectations towards *online social networking,* but also socio-technical needs that, in extreme cases, are induced by social peer pressure caused by family members and close social peers. In most cases, individuals promote the use of SNS among their offline social ties and circles.

Means to an end users are relatively active SNS users, but exhibit lower expectations towards *online social networking* when compared to *Facebook Mommy and Daddy users*. Registering with SNS mostly results from social peer pressure caused by active SNS users among family members and, in some cases, changed life situations such as divorce or death of a spouse. Activity on SNS is propelled by feelings to not be excluded from offline social circles currently active on SNS, e.g., former colleagues. In most cases, individuals are recently retired and/or have children and grandchildren who are registered and active on SNS. However, individuals would rather avoid computer-mediated communication and online social interaction via SNS and preferably choose synchronous media as an alternative, e.g., telephone conversations.

Strong (Socio-technical) Needs *Weak*		
	Means to an End	**Facebook Mommy and Daddy**
	Close-lipped	**Skeptical**
	Low **Expectations towards online social networking** ***High***	
SNS user types in the hatching indicate the main target audience in scope of the thesis.		

Table 4: Classification of SNS users within the demographic segment Age 50+
Source: Own illustration

A *Skeptical user* exhibits high expectations towards *online social networking* and to a great extent understands the technological and general concepts of SNS, but their intensity of use is low. They exhibit a discerning attitude towards *online social networking* based on weaker

socio-technical needs, disconfirmed prior expectations, and concerns regarding privacy and data security settings on SNS. In the majority of cases, individuals would rather argue against the use of SNS and persuade their social peers not to use SNS or proclaim highly restricted profile settings in favor of increased data privacy. Another implication of the weaker socio-technical needs is that individuals lack comprehension of the general purpose of *online social networking*. In general, *skeptical users* exhibit rather low expectations and weak socio-technical needs towards *online social networking*. Consequently their intensity of SNS use is lower compared to previously described identified user types.

Registered and active *Close-lipped users* normally maintain smaller online social circles when compared to previously introduced user types and exhibit extreme difficulties in understanding the concepts applied in SNS. *Close-lipped users* exhibit a low degree of activity and maintain smaller networks of social ties when compared to other user types, since potentially registered peers from existing (offline) social circles are not active on SNS. In cases, *Close-lipped users* are more likely to be negatively influenced in their attitudes towards SNS use by reports on data privacy published in traditional media.

The developed classification scheme of *SNS users within the demographic segment Age 50+* facilitated better interpretation of findings and understanding of implications in later sections of the thesis. The established classification makes no claim to be complete or fully generalizable since it has been derived from a rather small data sample size. However, it could support designers in building *personas* in order to develop and design adequate social systems and functionalities that especially cater to elderly individuals. In recent years, *personas* represent an interaction design technique increasingly applied in activities included in *user-centered design, scenario-based design,* and *interaction design* during design and development stages of human computer interactions and broadly constitute fictional characters to represent different user types within a targeted demographic (Pruitt/Grudin 2003, 1).

5 Determinants of social capital and its effects in SNS use

Sense of belonging and community are important aspects of people's overall quality of life (Putnam 2000, 89) that influence both psychological and physical *well-being*. Communities or social networks result from interaction with other human beings, and are essential for satisfying various human needs (Maslow 1970, 15ff), giving access to several forms of *social capital* (Huysman/Wulf 2004, 1ff). A social network represents the web of social ties within which an individual lives and can be characterized by its *structural* properties such as network size, density, strength of ties, and homogeneity (Scott 2000, 69ff) and *functional* characteristics such as *social support*, *social connectedness*, social influence, and social comparison (Berkman/Glass 2000, 141ff). While the *structural* characteristics describe the properties of the social network at large (e.g., network size and density), the *functional* characteristics can influence the general physical and psychological *well-being* of network members.

Previous research has identified several beneficial outcomes of *social connectedness* and *social support* among human beings (Bowling/Farquhar/Browne 1991, 549ff; Rook 1990, 226) and showed that these factors help human beings to overcome social disadvantages like social isolation and strengthen their integration into society. According to Tobin/Neugarten (1961, 344) there is a positive effect of *social connectedness* on the overall *well-being* of humans and various studies document a relationship between *social capital* and an individual's health (Hawe/Shiell 2000, 871ff; Lomas 1998, 1185) (see section 5.1).

The theoretical constructs *social connectedness* and *social support* are therefore identified as means of overcoming social isolation, and enhancing social integration in the lives of elderly people. While the latter theoretical construct has been well-documented in previous research primarily originating from psychological and sociological research disciplines – literature provides established operationalization and validated measurement items – the former construct especially lacks theoretical grounding and understanding in the context of *online social networks*. Therefore, in the course of the underlying thesis, two studies have been conducted with the objective (i) to develop a deepened theoretical understanding of *social connectedness* in the context of online social networks, (ii) to test and refine appropriate established measurement items, and (iii) to identify and refine potential novel measurement items (see sections 5.2.2.4 and 5.4.1) in order to deliver first insights on how to leverage *social connectedness* and various other benefits through the use of SNS.

The following sections briefly depict the theoretical notions of *social connectedness*, *social support,* and (subjective) *well-being* whereas the notion of *social capital* is applied to provide an overarching theoretical framework. The following review of the underlying constructs is used to rigorously derive the proposed measurement and structural model (see section 5.4) as well as to develop the underlying hypotheses applied within the subsequently proposed research model (see section 5.4.3).

5.1 Review of the theoretical notion social capital

Social capital can be understood as an outcome of network membership and generally refers to the value of social relations within and between social networks as well as the ability to produce collective or individual (economic) benefits from network members. Therefore (social) networks are the causal agents or moderators of *social capital* (Williams 2006, 594) and various studies cite evidence that this is not only true for offline social networks, but also for online social networks (Koroleva et al. 2011, 15ff; Steinfield/Ellison/Lampe 2008, 435).

Multiple definitions of the notion *social capital* can be found in sociology (Woolcock 1998, 159ff) (see Table 5). According to Coleman (1988, S98) it can be regarded as output of the "existence of some aspects of social structures" that evokes certain actions of individuals within these structures. Furthermore, it has been defined as the source of positive externalities for members of a social network that are generated through shared trust, norms, values, and their consequent effects on expectations and behavior and it broadly refers to the benefits received from social relationships (Adler/Kwon 2002, 21; Durlauf/Fafchamps 2004, 7). Bourdieu (1986, 248) defines *social capital* as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition."

Table 5 lists a considerable number of definitions of *social capital*, which have been essentially adopted from Adler/Kwon (2002, 19f).

Definition of social capital	Author(s) (Reference)
"[Social capital is understood as] the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition."	**Bourdieu** (Bourdieu 1986, 248)
"[Social capital is] the sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition."	**Bourdieu/Wacquant** (Bourdieu/Wacquant 1992, 119)
"Social capital is defined by its function. It is not a single entity, but a variety of different entities having two characteristics in common: They all consist of some aspect of social structure, and they facilitate certain actions of individuals who are within the structure."	**Coleman** (Coleman 1990, 302)
"[Social capital are] features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit."	**Putnam** (Putnam 1995, 67)
"[Social capital is] the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit. Social capital thus comprises both the network and the assets that may be mobilized through that network."	**Nahapiet/Ghoshal** (Nahapiet/Ghoshal 1998, 243)
"[Social capital can be regarded as] the information, trust, and norms of reciprocity inhering in one's social networks (…)".	**Woolcock** (Woolcock 1998, 153)
"Social capital can be defined simply as the existence of a certain set of informal rules or norms shared among members of a group that permits cooperation among them. The sharing of values and norms does not in itself produce social capital, because the values may be the wrong ones (…) The norms that produce social capital (…) must substantively include virtues like truth-telling, the meeting of obligations, and reciprocity."	**Fukuyama** (Fukuyama 1997, 378f)

Table 5: Selected definitions of the theoretical notion 'social capital'
Source: Own illustration in adoption to Adler/Kwon (2002, 19f)

Durlauf/Fafchamps (2004, 5) identified three originators for *social capital* in their study and they are:

> (1) *positive externalities* of social networks that can either be the source and/or the result of *social capital*;
>
> (2) *effects of shared trust*, *norms,* and *values* prevailing within an individual's social network or the society at large on an individual's expectations and behavior; and
>
> (3) *existence of available* and *functioning social networks* formed by established shared trust, norms, and values.

I assume that these originators of *social capital* are additionally valid for online social networks given that structural and functional characteristics are inherited and hardly differ from existing offline social networks (Koroleva et al. 2011, 7).

Putnam (2000, 22) established the concepts of *bridging* and *bonding social capital* to outline two diverse types of *social capital,* depending on the dominant structure of underlying social networks or effective social norms. Based on the established differentiation, Williams (2006, 597) concludes that the different types of *social capital* are related but not equivalent or mutually exclusive. *Bridging social capital* occurs "when individuals from different backgrounds make connections between social networks. These individuals often have only tentative relationships, but what they lack in depth they make up for in breadth" (Williams 2006, 597). On the contrary, *bonding social capital* accrues "when strongly tied individuals, such as family and close friends, provide emotional or substantive support for one another. The individuals with bonding social capital have little diversity in their backgrounds but have stronger personal connections" (Williams 2006, 597).

It is important to note that *social capital* is not exclusively achieved in offline social networks since Koroleva et al. (2011, 16f) identified benefits of achieved *social capital* and proved that these benefits – *bridging* and *bonding social capital* – can be gained as a result of frequent SNS participation and use. Furthermore, the study elaborated on patterns of SNS use that most likely result in beneficial outcomes for SNS users and showed that *structural* characteristics of an individual's social network are the most crucial determinants in the formation of *social capital* through *online social networking* (see section 5.1.1).

Similar to physical, financial, and human capital, *social capital* may facilitate productive activity and real-life benefits to individuals or groups (Coleman 1988, S98; White 2002, 255ff). Beneficial effects of *social capital* could be of social, psychological, emotional, and economical nature (Lin 1999, 28ff) and are manifested by five broad dimensions that are inherent in both offline and online social networks.

> (1) *networks-lateral relations and conjunctions* that vary in density and size, and emerge on both the individual and group level;

(2) *reciprocity-expectation* that implies that the benefit is both the network and the effect of the network, or that the generated social, psychological, emotional, and economical benefit for an individual or group will be returned by the receiving individual or group;

(3) *trust-willingness* to invest in a social context, based on an individual's assumption that other individuals or groups will respond as expected;

(4) *personal and collective efficacy* that refers to the active participation of individuals within a community or social network; and

(5) *social norms* that are based on a shared understanding and behavioral norms of a society at large, where in some cases the resulting benefits might feed back into further (social) norms and networks (Qureshi 2006).

I assume that these conditions are not only additionally predominant in online social networks, but in some cases might even have a stronger impact on individuals and their social networks since online social networks, where exchanged messages and activities are well-documented and information on relationship statuses between social peers are accessible and visible for SNS users, are more transparent when compared to offline social networks.

Following the notion of the last dimension and the above stated considerations, Newton (1997, 575ff) introduces *social capital* as an essentially cyclic concept, which is influenced by effective social norms, cultural backgrounds, and the society at large. Resnick (2001, 1) speaks of "sociotechnical capital" of these cyclic patterns emerged through the use of modern ICT and systems – such as instant messaging and SNS.

Since previous research has documented that not every type of SNS use (Burke/Marlow/Lento 2010, 1911f) and not every social network (Granovetter 1973, 1361ff) hold the same potential to create social value for an individual, parallel to other scholars (Koroleva et al. 2011, 2), I am interested in understanding *social capital* and its determinants among users of *online social networks*, in general, and focusing on age-related influences and differences among users, in specific. In particular, the thesis attempts to identify the role played by users' communication and interaction behavior in SNS and specific aspects of the communication medium itself in determining and explaining the generation of *social capital* and moreover a potentially increased subjective *well-being* for users through functional aspects of a social network namely *social connectedness* and *social support* in relation to SNS use.

A number of studies on *social capital* investigated *connectedness* within communities and social networks as an indicator of *social capital* and identified "sense of community" as an indicator and catalyst for perceived *social capital* (Perkins/Long 2002, 291). *Social connectedness* can be viewed as an estimator of the quality of an individual's social network and a precursor to *social capital* (Putnam 2000, 86), or can be directly linked to *social capital* itself (Bandiera/Barankay/Rasul 2008, 745). For the underlying thesis I consequently comprehend that *social capital* reflects the tangible or intangible benefits that can be realized as a result of being embedded within an offline or online social network. Therefore, the extent to which

network members can appropriate *social capital* from the social network will be determined by their degree of *social connectedness* achieved within the network (see section 5.2.1.4 and 5.2.2.5).

In the following, I further adopt the notion by Williams (2006, 594) in that *social capital* is considered and measured as an outcome of social interaction within networks rather than the social network itself and that an available social network functions as a causal agent or moderator of *social capital*. I therefore understand *social capital* as highly context dependent and as a variable notion depending on the quality of a social network and individual relationships. Consequently, the degree with which an individual is socially connected to its other social ties affects the type and degree of achieved *social capital*. Potential benefits of *social capital* can be engendered on an individual or community level. Parallel to approaches taken by Coleman (1988, S98) and Bourdieu (1986, 250ff), I chose a conceptualization of *social capital* on the individual level to investigate potential benefits accruing for an active SNS user as opposed to potential benefits that potentially occur at the network or community level (Williams 2006, 595).

In the following chapters, I intend to derive a review on the theoretical notions of *social connectedness*, *social support,* and subjective *well-being*. In section 5.2.2.1 and 5.4, I provide the theoretical development for each predicted causal relationship between the proposed constructs and accordingly derive a set of hypotheses.

5.1.1 Identification of potential theoretical determinants of social capital

In the following sections, I identify *social connectedness* and *social support* as notional determinants of *social capital* and provide an extensive literature review of both psychological notions. Subsequently, I present two quantitative studies conducted in order to gain a deeper theoretical understanding of *social connectedness* in the context of *online social networking.*

5.1.1.1 Review on the theoretical notion social connectedness

Connectedness can be described as the feeling of belonging to a group and implies the creation of bonding relationships. The theoretical concept of *connectedness* can be defined as "a positive emotional appraisal, which is characterized by a feeling of staying in touch within ongoing social relationships" (Romero et al. 2007, 303).

Table 6 summarizes definitions of *social connectedness*, which have been applied in building a theoretical understanding in course of the underlying thesis.

Definition of social connectedness	Author(s) (Reference)
"Social connectedness is considered an attribute of the self that reflects cognitions of enduring interpersonal closeness with the social world in to-to."	**Lee/Draper/Lee** (Lee/Draper/Lee 2001, 310)
Social connectedness "is defined as a positive emotional appraisal which is characterized by a feeling of staying in touch within ongoing social relationships (…)".	**Romero et al.** (Romero et al. 2007, 303)
"Connectedness describes in a medium-independent way the feelings of being in touch with someone, being aware of what happens in their lives, feeling they think and care about you as this results from a phone call, a mail, or any form of communication."	**Romero et al.** (Romero et al. 2007, 311)
"Social connectedness refers to an *individual's* engagement in an *interactive web* of key *relationships*, within *communities* that have particular physical and social *structures* that are affected by broad economic and political *forces*."	**Minnesota Department of Health** (Minnesota Department of Health 2010, 13)

Table 6: Selected definitions of the theoretical notion 'social connectedness'
Source: Own illustration

In contrast to the definition proposed by Romero et al. (2007, 303), Baumeister/Leary (1995, 500ff) differentiate the theoretical notion of *social connectedness* from the feeling of belongingness as defined by group membership or peer affiliation, and understand *social connectedness* as the independent self in relation to other individuals. Consequently, Lee/Draper/Lee (2001, 310) summarize on the background of *self-psychology theory* (Baker/Baker 1987, 1ff; Lee/Robbins 1995; 338ff; 1998, 232) that

> *"(...) a sense of social connectedness develops early in life and extends throughout the life span. In childhood, for example, parent-child attachments provide an initial sense of security and likeness with others. In adolescence, peer affiliations and group memberships allow individuals to identify with others who share similarities in appearance, interests, and talents. By adulthood, the aggregate of these past and present relationship experiences are gradually incorporated into one's overall sense of self, providing a relatively stable psychological sense of connectedness that is not susceptible to vacillations in relationships, such as the loss of a friend or social exclusion from a group (...)."* (Lee/Draper/Lee 2001, 310)

Therefore I assume that perceived *social connectedness* potentially is affected by age and further reason that the quality of an individual's social connections develops early in life and remains constant throughout adult life (Lee/Draper/Lee 2001, 310) since Lee and Robbins (1995, 233) conclude that

> *"(...) sense of connectedness begins to emerge during adolescence and extends throughout the adult life. The maturing self, having successfully maintained companionship and affiliation self-objects and without any threat to self-esteem, is able to feel comfortable and confident within a larger social context than family or friends."* (Lee/Robbins 1995, 233)

Based on theoretical considerations stated by Kohut (1971), Lee/Draper/Lee (2001, 310) further suggest that on the one hand, individuals who are highly socially connected tend to feel very close with other individuals, they also perceive others as friendly and approachable, can

easily identify with others and participate in social activities and groups. On the other hand, individuals with lower *social connectedness* are more likely to feel interpersonally distant from other individuals or groups. This can potentially result in a feeling of being misunderstood by other individuals and of being an outsider to a group or community as well as of being uncomfortable in social situations and in difficulties to relate to other individuals in general (Lee/Draper/Lee 2001, 310). These considerations receive importance on the background of previously discussed potential negative effects of the demographic shift for elderly individuals and occurring changes in the life of the elderly who to a greater extent are exposed to the risk of *social exclusion* based on potentially degrading social networks compared to their younger counterparts.

Kohut (1971, xiv) proposed that the individual is the organizing center of social experience and furthermore is in the fundamental need of relationships between the self and "self-objects", where self-objects are cognitive representations of other individuals and their actions towards the self. Accordingly, online and offline social networks provide the context in which individuals can interact with each other to create perceptions of being socially connected (Ashida/Heaney 2008, 887). While *social connectedness* is often objectively measured by the number of social ties that individuals maintain, in reality it has a more psychological and subjective connotation, since individuals assess their social relationships based on the extent to which they feel connected. Accordingly, the term *social connectedness* is used to represent the quality and number of connections an individual maintains with other individuals.

I argue that previously discussed derivations and descriptions of the notion of *social connectedness* from the field of psychology, namely (i) the formation, progression, and development of *social connectedness* in relation to an individual's period of life and consequently an individual's age and (ii) the egocentric view on relationship formation within an individual's social network are crucial to the overall motivation and theoretical justifications for the underlying thesis.

Continuative, *social connectedness* has been identified as one of the fundamental underlying motivating principles behind social behavior (Smith/Mackie 2000, 17). Therefore, human beings have the fundamental need to belong and feel (socially) connected (Rettie 2003, 482), and this fundamental need potentially explains the tremendous success of current SNS. Individuals can assess their social relationships through SNS based on the extent to which they feel socially connected.

Connectedness has been associated with many social and health-related benefits and is therefore a desirable property for individuals to achieve. Consequently, *social connectedness* is often viewed as a precursor to success in life as well as mental health and refers to an individual's attitude and relationship to society and her individual social network. Previous research already confirmed the positive association of *social connectedness* with "self-esteem, identity, interpersonal relationships, and general mental health (e.g., lower loneliness and depression)" (Lee/Robbins 1995, 239) and therefore is assumed to positively impact an individual's overall health and psychological *well-being*. Thus many health related benefits are associated to *social connectedness*, which makes it a very important factor for individuals to acquire (Ashida/Heaney 2008, 889). Other studies suggest that connectedness includes affective bene-

fits such as stronger group attraction, sense of sharing, belonging, and intimacy (IJsselsteijn/van Baren 2003, 927). Furthermore, Ashida/Heaney (2008, 885) found that perceived *social connectedness* has a significant positive association with an individual's health status in comparison to other theoretical notions such as perceived *social support*. Consequently, and in line with findings provided by Rook (1987, 1144f), I assume that perceived *social connectedness* potentially plays a relatively more important role to the health and psychological *well-being* (of elderly individuals) than solely the availability of *social support*.

In contrast to its potential beneficial effects on individuals, various studies showed that individuals with low *social connectedness* often experience loneliness, anxiety, jealousy, anger, depression, low self-esteem, and various other negative emotions (Baumeister/Leary 1995, 233). Kohut (1971, xivff) assumes that individuals with low connectedness are limited in the development of appropriate interpersonal behavior (e.g., being assertive and sociable). Appropriate interpersonal behavior is a premise to maintain social relationships whereas reciprocal dysfunctional interpersonal behaviors consequently might increase psychological distress, e.g., difficulty in being intimate. Lack of *social connectedness* may be experienced as feelings of loneliness and a desire for companionship (Rook 1990, 226). I further assume that this especially holds true for elderly individuals affected by the negative impact of the demographic shift (see section 2.1.1).

Furthermore, communication is often seen as means of feeling connected and being in touch. Communication can be classified as *connectedness-oriented communication* in which the focus is mainly on maintaining and enhancing social relationships, and *content-oriented communication* in which the goal is exchange of information (Kuwabara et al. 2002, 186). *Connectedness-oriented communication* allows people to be aware of each other and contribute to maintain social relationships (Rettie 2003, 477). For instance, the SNS Twitter and major functionalities implemented in the SNS Facebook and Google+ exemplify the mode of communication that primarily caters to *connectedness-oriented communication*, since a very small message size typically pre-empts the conveyance of content, e.g., functionalities around status message updates of users. In order to support this *connectedness-oriented communication* a high degree of *social awareness* and *social presence* is presupposed and necessary in offline and online social networks (see section 5.2.2.5).

Although computer-mediated communication and online social interaction is an important way of achieving connectedness, there is little research exploring the relationship between adoption and use of ICT and social systems such as SNS and the potential formation of *social connectedness* (Bradner 2001, 67-68). In this context, Rettie (2003, 479) suggests *social connectedness* not only as a theoretical concept to explain and understand communication and interaction behaviors but also to apply generated knowledge for the development and design of novel and innovative ICT and systems – a major motivational aspect of the underlying thesis research.

Another important factor of social interaction, which has been mostly ignored during the creation process of computer-mediated communication, is the way a person feels connected to its online and offline environment. Connectedness seems the result of active information sharing, modulated by the amount of information shared rather than by the type of information an in-

dividual is sharing via SNS with her social circles (Köbler et al. 2010, 7) (see sections 5.2.1.4 and 5.2.1.5). For example, the screening of status messages posted by social peers on the SNS Facebook conveys no or less *social connectedness* compared to the active sharing and commenting of posted messages. In addition, Castro/González (2008, 3f) found that the perceived (social) connectedness level of an individual can be high immediately after a communication exchange, e.g., receiving and reading a status message update or posted comment, and therefore assume that the level of perceived *social connectedness* gradually diminishes until it is refreshed with new information provided by other individuals. Similar findings are documented by van Baren et al. (2004, 15) showing that perceived *social connectedness* is a temporary state of mind which results from interpersonal communication and that the perception of connectedness is limited to the timeframe the interpersonal interaction is occurring. Many researchers who tried to understand, characterize, and measure connectedness between individuals commonly state that the sense of connectedness is a more temporary state of mind emanated from interpersonal social exchange, which is highly limited to the timeframe when these interactions occur (Castro/González 2008, 3f).

While various studies have explored the issue of connectedness only a few have empirically examined the effects of *social connectedness* on individuals. Connectedness can most efficiently be measured by analyzing the density of person's network, the frequency of use, the number of members who are in close proximity, the number of members who are kin, and the presence of family and close friends (Ashida/Heaney 2008, 873; Lee/Draper/Lee 2001, 314). To measure the proposed research model in the underlying thesis, items of the *Social Connectedness Scale* proposed by Lee/Draper/Lee (2001, 312) have been adapted to the context of *online social networking* and SNS Facebook use (see section 5.2.2.1).

Social connectedness is therefore a relevant psychological notion for all segments of the population, irrespective of age or occupation. However, it is of particular relevance for the elderly because isolation is often believed to have a strong negative influence on mental and physical health of people compared to the positive effects of being socially integrated (Cohen 1988, 271f). Aging typically results in social isolation from voluntary and involuntary diminishes in social interactions owing to health issues, retirement from active occupation, reduced role in the family, and reduced mobility (see section 2.1.1). Integration of elderly individuals through online social networks has been suggested as one potential key to successful aging (Cornwell/Laumann/Schumm 2008, 186). Research on aging has suggested many benefits of *social connectedness* among elderly people, such as moderating the rate and extent of cognitive decline (Bassuk/Glass/Berkman 1999, 169ff; Fratiglioni et al. 2000, 1316ff) as well as higher self-reported physical health (Rook 1990, 226). Accordingly, increasing research attention is being focused on identifying the different social network related factors that can be used to assess *social connectedness* among elderly and the positive effects of *social connectedness* (Ashida/Heaney 2008, 887f)[31].

[31] Textual content of paragraphs was in excerpts taken from Goswami et al. (2010, Paper 109) previously published in the Proceedings of the 31st Annual International Conference on Information Systems entitled "Using Online Social Networking to Enhance Social Connectedness and Social Support for the Elderly". The list of contributive authors comprises Suparna Goswami, Jan Marco Leimeister and Helmut Krcmar.

Therefore, to understand the notion of *social connectedness* in the context of online social networks, two pre studies were conducted in the course of the underlying thesis: (i) an explorative study that investigated how specific message types and shared information in the form of status message updates influence the feeling of connectedness between SNS users. Findings in this study document how actively revealing more information in the form of highly frequent posted status messages resulted in a stronger feeling of *social connectedness* (see section 5.2.1). Further, (ii) an empirical study provides evidence for a theoretical relationship between the notions *social awareness*, *social presence,* and *social connectedness* where *social awareness* and *social presence* are found to be preconditions to *social connectedness* as well as empirical proof on potential formation of *social connectedness* through SNS use (see section 5.2.2). The notions of *social awareness* and *social presence*, and their relationship to *social connectedness* are discussed in the context of SNS in the empirical pre study (see section 5.2.2), but excluded from the research model established in course of the underlying thesis.

For the underlying thesis, I argue that *social connectedness* and *social support* are two different psychological notions, in contrast to former studies in which *social support* and *social connectedness* are conceptualized as a single construct and are not distinguished between the two theoretical notions (Connidis/Davies 1990, S141ff; Prince et al. 1997, 325ff). Ashida/Heaney (2008, 875) provide a discussion and argumentation on the theoretical notions *social connectedness* and *social support* as independent constructs.

5.1.1.2 Review on the theoretical notion social support

Social support can be described as "information leading the subject to believe that he/she is cared for and loved, esteemed and is a member of a network of mutual obligations" (Cobb 1976, 300). Similar definitions are stated by Sarason et al. (1983, 127) who define the theoretical notion *social support* as the "existence or availability of people on whom we can rely, people who let us know that they care about, value, and love us" as well as Uchino/Uno/Holtlunstad (1999, 145) who specify *social support* as the actual or perceived availability of helpful behaviors by other individuals. An individual only perceives *social support* if it leads to certain beliefs in the prospective recipient since *social support* is intended by the provider to be helpful and therefore is distinguishable from and contrary to intentional negative social interactions (Heaney/Israel 2002, 190).

An overview on various definitions of *social support* in sociology and psychology literature is provided in Table 7.

Definition of Social Support	Author(s) (Reference)
"Both enduring and short term supports are likely to consist of three elements: the significant others help the individual mobilize his psychological resources and master his emotional burdens; they share his tasks; and they provide him with extra supplies of money, materials, tools, skills and cognitive guidance to improve his handling of his situation."	**Caplan** (Caplan 1974, 6)
"Social support is defined as information leading the subject to believe that he is cared for and loved, esteemed, and a member of a network of mutual obligation."	**Cobb** (Cobb 1976, 300)
"Social support is defined as the resources provided by other persons. By viewing social support in terms of resources – potentially useful information or things – we allow for the possibility that support may have negative as well as positive effects on health and well-being (…)"	**Cohen/Syme** (Cohen/Syme 1985, 4)
"(…) social support is an interpersonal transaction involving one or more of the following: (1) emotional concern (liking, love, empathy), (2) instrumental aid (goods or services), (3) information (about the environment), or (4) appraisal (information relevant to self evaluation)."	**House** (House 1981, 39)

Table 7: Overview on definitions of the theoretical notion 'social support'
Source: Own illustration

In the definition stated by Cobb (1976, 300), *social support* is conceived to be information directed to an individual or a group provided by other individuals, which can be classified to three distinctive types of conveyed information, namely (1) "information leading the subject to believe that he is cared for and loved", (2) "information leading the subject to believe that he is esteemed and valued", and (3) "information leading the subject to believe that he belongs to a network of communication and mutual obligation". Cobb (1976, 300f) argues that the first type of information is transmitted in intimate situations and basically conforms to the concept of *emotional support* additionally included in a typology of *social support* introduced by House (1981, 24f), which I discuss in subsequent paragraphs in detail. Contrasting the notion of *emotional support*, Cobb (1976, 301) assumes that information resulting in the feeling of being esteemed and valued is most effectively conveyed in public and consequently refers to this notion as *esteem support*. Consequently, the third type of information can be regarded as a precondition necessary for the two former types of information to be effectively conveyed. Specifically, individuals in a social network need to obtain and share this type of information to establish a general awareness and transparency of provisioned support so that all individuals within the network are potentially capable of accessing and conveying provided information.

Based on these considerations most scholars assume *social support* to occur in different forms. A widely accepted typology of *social support* was introduced by House (1981, 24f) and includes *emotional support, appraisal support, instrumental support,* and *informational support*.

Emotional support refers to expressions of empathy, love, trust and caring and presumptive is mostly transmitted in intimate situations involving a certain level of mutual trust, which has preliminarily been established between the individuals. For example, *emotional support* is essentially provided between marriage partners by showing interest in how one's partner feels by asking questions and by paying attention to the partner's natural cues, recognizing them, and caring about them. In the case of diseased or elderly individuals important sources for

emotional support are family, friends, neighbors as well as support groups, social and health care workers and individuals with similar conditions.

In contrast, *appraisal support* provides information that is useful for self-evaluation and is most effectively proclaimed in public in the form of affirmation, feedback, and social comparison. The effects of proclaimed *appraisal support* potentially increase an individual's self-esteem, reaffirm her sense of personal worth, and help individuals feel better about themselves. For example, *appraisal support* is conveyed when a chief executive spends laudatory words on achievements of employees in his annual speech at a company's staff party.

Instrumental support to a greater extent refers to aid and support in tangible forms that directly assist a person in need (House 1987, 25). Examples for *instrumental support* are helping behaviors such as loaning money and giving one's time and skill (Tardy 1985, 189) as well as support provided in the form of direct help and assistance including financial support. A more concrete example for the provision of *instrumental support* constitutes the assistance in offering a ride to the airport in early morning hours for a close friend.

Informational support aids a person by receiving advice, suggestions as well as directives that assist an individual in decision-making, and to respond to situational personal demands. For example, during patients' counseling interviews doctors potentially convey *informational support* by providing information on medication and its possible side effects, similar courses of disease, and previously achieved treatment successes to patients. Therefore it is assumed that within more exclusive communities such as self-help groups relevant information for the provision of *informational support* needs to be shared with all participating members.

A number of studies showed that *social support* has a direct positive impact on an individual's health and happiness (Sarason et al. 1983, 137f; Tardy 1985, 187; Uchino et al. 1999, 146) and subjective *well-being* (Ashida/Heaney 2008, 874). Therefore perceived availability of *social support* is believed to be a source of enhanced self-esteem, feelings of belonging, and security (Ashida/Heaney 2008, 874; Rook 1987, 1144f).

House (1987, 136) conducted comprehensive assessments on the theoretical notion *social support* and its potential positive effects on human beings and concludes that

> *"(...) social support can reduce morbidity and mortality, lessen exposure to psychosocial stress and perhaps other health hazards, and buffer the impact of stress on health is now available from diverse types of studies; laboratory experimental studies of animals as well as humans, cross-sectional and retrospective field studies of human populations, and growing numbers of longitudinal or prospective field studies as well. Although the results of individual studies are usually open to alternative interpretations, the patterns of results across the full range of studies strongly suggests that what are variously termed social relationships, social networks, and social support have important causal effects on health, exposure to stress, and the relationship between stress and health."* (House 1987, 136)

Accordingly, various studies have shown that *social support* essentially influences and is positively associated with subjective *well-being* of diseased individuals (Leimeister et al. 2008, 367; Schweizer/Leimeister/Krcmar 2006, 4476; Wright, 2002). The need for *social support* is likely to be particularly higher among elderly who suffer from aging related health problems (Ashida/Heaney 2008, 887), weakening social ties and lowered social integration in society at large as well as various potential reasons depending on situational factors (see section 2.1.1). Significant research has shown that higher levels of *social support* are associated with better health and psychological *well-being* among elderly individuals (Bowling/Farquhar/Browne 1991, 555ff). Furthermore, Thomas (2009, 351) and Krause/Herzog/Baker (1992, 300) found evidence that giving and receiving *social support* positively influences subjective *well-being* of elderly individuals and that not only received *social support*, but respectively provisioning of *social support* by elderly individuals resulted in an increased subjective *well-being*.

However, social relationships between individuals exist that do not necessarily convey *social support* that are simply maintained for pleasurable interaction (Rook/Ituarte 1999, 208). Even these ties, which do not involve the exchange of *social support,* can have a positive influence on human health and subjective *well-being* since these relationships satisfy an individual's need to be socially and emotionally connected with others (Ashida/Heaney 2008, 873).

In the scope of the underlying research model (see section 5.4), I therefore argue to introduce the notion *social connectedness* as an independent construct, which potentially can positively influence the overall *well-being* of a person in addition to *social support*. Studies found no significant association between a person's perceived availability of *social support* and her feelings of loneliness (Ashida/Heaney 2008, 875), consequently individuals can feel socially disconnected although companions and potential support providers surround them. Therefore *social support* occurs when members of a network provide aid to each other with the intention of being helpful, in contrast to the previously discussed notion of *social connectedness*, which potentially emerges without any conscious effort (Heaney/Israel 2002, 192).

The role of computer-mediated provision of *informational*, *emotional* and *appraisal support* to elderly and patient groups has been investigated in previous studies focusing on VCs (Leimeister et al. 2008, 364ff) (see section 5.1.1.2) and could show that received support emanated from online interactions is perceived to be as helpful as support provided by offline social ties (Turner/Grube/Meyers 2001, 245f). For examples, Leimeister et al. (2008, 355) document a highly positive effect of relationships of cancer patients with other patients, family members, or other social ties maintained in VCs and computer-mediated provision of *social support*. Preece/Maloney-Krichmar (2005, Article 1) summarized significant improvement of users' emotional and psychological conditions in patient-oriented VCs to result from received online *social support*. Loader et al. (2002, 64) identified the conveyance of *emotional* and *informational support* and Muncer et al. (2000, 1018f) additionally provided evidence for the provision of *appraisal support* in online environments, while both studies excluded evidence on virtually provided *instrumental support*. Findings of these studies therefore confirm previous research on the coherence and importance of social relationships and provision of *social support* for computer-mediated *social support* conveyed in virtual environments. Since SNS can be distinguished from VCs by the fact that they are primarily used for the maintenance of existing social ties rather purely online ties (Ellison/Steinfield/Lampe 2007, 1144), I assume

that active participation in SNS potentially causes comparable or even stronger positive effects for individuals.

According to various scholars House (1987, 137) and Sarason et al. (1983, 128), no common theoretical understanding and agreement on a conceptualization of *social support* exists in literature, consequently resulting in no consensus on the measurement of the item (Hupcey 1998, 1232).

> *"Social support is a multi-faceted concept that has been difficult to conceptualise, define and measure. Although this concept has been extensively studied, there is little agreement among theoreticians and researchers as to its theoretical and operational definition. As a result, the concept remains fuzzy and almost anything that infers a social interaction may be considered social support. Social support researchers have consistently ignored the complexity of the concept and have measured the variable in a simplistic manner."* (Hupcey 1998, 1232)

In the following, I attempt to provide a brief overview on established measurement scales for *social support* and subsequently argue for the application of the theoretical conceptualization and measurement scale developed by House (1987, 137f) in the context of the conducted research.

Sarason et al. (1983, 129) developed the *Social Support Questionnaire (SSQ)* in order to measure perceived *social support* of an individual whereas the questionnaire attempts to measure both an individual's perceived *social support* and an individual's degree of satisfaction with received *social support*. The measurement scale has been applied in various studies and has been proven to be a reliable scale to measure perceived *social support* and causal relationships to associated beneficial outcomes, e.g., a high level of *social support* correlates negatively to anxiety and depression and helps an individual to overcome frustrating life conditions.

Schwarzer/Knoll/Rieckmann (2004, 4ff) developed the *Berlin Social Support Scales (BSSS)* to measure *social support* in health-related contexts and its influence on stress and chronic illness. The item scale differs between (i) an individual's size of social network, which is measured in the number of potential available *social support* providers; (ii) social integration, which is measured in the number of social relationships and their structure; (iii) and the number of occurring social interactions. In the proposed scale, *social support* is measured by the quality and function of social relationships provided by the underlying social network. This determination seems to be suitable, since the actual level of *social support* provided to a person can differ drastically from her perception of received support.

Having discussed *social connectedness* and *social support* as conditional determinants for *social capital,* in the subsequent section, I consequently elaborate on the theoretical notion of subjective *well-being* as an identified and potential effect of generated and increased social capital among individuals.

5.1.2 A potential effect of social capital – subjective well-being

According to Veenhoven (1984, 22f) *happiness* or subjective *well-being* "is the degree to which an individual judges the overall quality of her or his life as a whole in a favorable way". *Well-being* is a subjective feeling, which leads to the fact that people can feel different under the same circumstances, as they value their conditions based on previous experiences, expectations, and personal values (Diener/Lucas 1999, 797).

Hence the assessment of how satisfied individuals are with their present circumstances in life is based on a comparison with a standard, which each individual defines and applies for herself. However, it is important to note that the subjectively selected standard, which serves as a highly individual benchmark, is not externally imposed by an individual's social environment or the society at large. In contrast, a number of studies have documented that social factors such as marital status, race, education, employment, and age influences an individual's subjective *well-being* (Glenn/Weaver 1979, 960f; Gove/Shin 1989, 140ff).

Diener/Lucas (1999, 799ff) propose to comprehend subjective *well-being* as a multidimensional construct that is composed of three components: positive affect, negative affect, and life satisfaction. They further assume that the components form the notion *well-being* in a two-fold manner and therefore suggest that the former two components explain affective and emotional facets and the latter cognitive-judgmental facets of the construct (Diener et al. 1985, 71).

Table 8 abstracts various definitions of the theoretical notion *well-being* prevalent in sociology and psychology literature.

Definition of (subjective) well-being	Authors (Reference)
"Subjective well-being is a broad category of phenomena that includes people's emotional responses, domain satisfactions, and global judgments of life satisfaction."	(Diener et al. 1999, 277)
"Subjective well-being is a multidimensional construct that involves a cognitive component, related to how we evaluate our life satisfaction, and an affective component, concerning our positive or negative emotional reactions."	(Albuquerque et al. 2012, 570)

Table 8: Overview on definitions of the theoretical notion subjective 'well-being'
Source: Own illustration

While philosophers have thought for decades, that subjective *well-being* can only be defined by a person itself, novel research approaches by psychologists, economists, and various other research disciplines have shown that it can be measured with validity and reliability by using self-rating questions on *satisfaction with life* and *happiness* (Diener 1984, 562ff). While *happiness* is evaluating a short-term perspective of *well-being*, *satisfaction with life* is measuring the longtime *well-being* of an individual (Helliwell/Putnam 2004, 1435). Shin/Johnson (1978, 478) define *satisfaction with life* as "a global assessment of a person's quality of life according to his chosen criteria". Diener (1984, 562-568) provides a comprehensive review of theory, measurement items, and causal as well as potential influences such as health, social contact, activity, and personality linked to the notion *well-being*. The article continuatively provides an extensive discussion on definitions of and distinctions between *well-being* and *happiness*.

Further readings and reviews on the notion of *happiness* and other related theoretical concepts can be found in sociological and psychological literature (Chekola 1975; Culberson 1977).

One of the main difficulties with self-reported measures of *well-being* is social desirability, as it may influence the validity of applied measurement items (Carstensen/Cone 1983, 713ff). In addition, Diener et al. (1991, 492) identified distortive effects of current mood on responses to *well-being* scales since studies documented that individuals reported greater *happiness* and *satisfaction with life* when in a good mood than when in a bad mood (Schwarz/Clore 1983, 522). In contrast to the previously mentioned argumentation that a subjectively selected standard for evaluation of *well-being* is not externally imposed by an individual's social environment or the society at large, Diener et al. (1991, 40f) assume a third potential influence on the measurement of *well-being* that are certain culturally affected beliefs individuals may hold regarding the importance of norms defining happiness. According to Diener et al. (1991, 41) a potential fourth source of falsification in the measurement of *well-being* is assumed to be "happy image management", which basically refers to the issue that results might report a greater or lesser happiness than subjectively perceived by the individual, because of his or her desire to appear happy to others.

Andrews/Whitney (1976) notice an over-abundance of instrumentality for measuring the theoretical notion of *well-being* and note difficulties in choosing the adequate scale and dimensions for the relevant underlying research propose. However it is now widely accepted in sociological and psychological research that subjective *well-being* and related theoretical notions such as *happiness* and *satisfaction with life* can be measured and analyzed with reliability and validity (Diener 1984, 544ff; Kammann et al. 1979, 8f), since various studies delivered substantial contributions in the research and understanding of *well-being* and *happiness* among human beings (Fordyce 1988, 355ff).

For the underlying research model, items adapted from the *WHO (Five) Well-being Index* were applied in order to measure an individual's actual *well-being*, on the background that chosen measurement items proved to be of adequate internal and external validity and easy to adopt to different underlying contexts in previous studies (Bonsignore et al. 2001, 27-31). In addition, I applied validated measurement items (Pavot/Diener 1993, 172) adapted from the *Satisfaction with Life Scale* (Diener et al. 1985, 72), in order to collect additional data to obtain a general view on an individual's *satisfaction with life.* Following Helliwell/Putnam (2004, 1435), a consolidation of items on *well-being*, *happiness,* and *satisfaction with life* in a single questionnaire could result in more accurate measurement of the actual subjective *well-being*, since self-ratings on *happiness* are assumed to reflect a relatively short-term and situational-dependent measure and self-ratings of *satisfaction with life* to produce longer-term, more stable evaluations.

For the underlying thesis, I assume that *well-being* strongly correlates with physical health, although the direction of causation of this correlation is controversially discussed in literature (Helliwell/Putnam 2004, 1438ff). Furthermore, I speculate social relationships play an important role in one's health condition and *well-being*, particularly in the case of elderly individuals (Ashida/Heaney 2008, 872). Helliwell/Putnam (2004, 1435) therefore conclude on common findings that quality of an individual's social connections appears to be better pre-

dictors for *well-being* compared to material resources. These assumptions are in line with literature indicating that social factors such as *social support* and *social capital* influence an individual's *well-being* (Berkman/Glass 2000, 150; Helliwell/Putnam 2004, 1435) and build fundamental argumentation to utilize *social capital* as a predictor for subjective *well-being* in the proposed research model (Ashida/Heaney 2008, 889; Plagnol 2010, 761).

In the following section, I conclude on the executed literature review of essential theoretical concepts and in doing so I substantiate the focus of conducted pre studies on the formation of *social connectedness* through *online social networking*.

5.1.3 Conclusion on theoretical development in the context of the thesis

In the previous sections, I identified and discussed *social connectedness* as a relevant notion for all individuals and segments of the population, irrespective of age or occupation. However, on the background of the introductory described implications of the occurring demographic shift in most societies, I assume it is of particular relevance for the elderly since social isolation is often believed to have a strong negative influence on mental and physical health of people compared to the positive effects of being socially integrated (Cohen 1988, 271ff). Older adults' ongoing integration through social networks has been suggested as the key to successful aging (Cornwell/Laumann/Schumm 2008, 187f). Research on aging has suggested many benefits of *social connectedness* among elderly people, such as moderating the rate and extent of cognitive decline and higher self-reported physical health. Accordingly, increasing research attention is being focused on identifying the different social network related factors that can be used to assess *social connectedness* among elderly and the positive effects of *social connectedness* (Ashida/Heaney 2008, 880ff; Cornwell/Laumann/Schumm 2008, 185ff). However, when compared to research efforts on the notion of *social support* – especially in the context of computer-mediated communication and social interaction and more particular *online social networking* – the notion of *social connectedness* is rather unexplored, until now.

In comparison, literature provides an extensive collection of widely accepted typologies of *social support.* The notion has been well defined, e.g., through a typology aggregating *emotional*, *instrumental*, *informational,* and *appraisal support* introduced by House (1981, 24ff). Furthermore, significant research has shown that higher levels of *social support* are associated with better health and *well-being* among the elderly (Bowling/Farquhar/Browne 1991, 555ff) and that higher levels of *social support* potentially arise through active use of VCs in the context of computer-mediated communication and social interaction (Leimeister et al. 2008, 364ff). I additionally provided a literature review and discussion on the notion of subjective *well-being* that I identified as a potential beneficial outcome of established *social connectedness, social support,* and *social capital*. In sections 5.2.2.1 and 5.4, I process gained understanding in the course of the literature review and consequently attempt to derive and delineate the theoretical coherences between addressed theoretical constructs in the course of the development and formulation of hypotheses along the proposed research model (see section 5.4). I further introduced the notion of *social capital*, which I attempt to apply as the overarching theoretical concept in subsequent derivation of the proposed research model.

Hence, the following sections cover two studies conducted in course of the thesis, which primarily focus on the theoretical notion of *social connectedness* in the context of computer-mediated communication and online social interaction – in the specific case of *online social networking*.

5.2 Empirical studies on formation of social connectedness on SNS

Two quantitative studies on the notion of *social connectedness* and SNS use have been conducted to ground its theoretical understanding for the underlying thesis: (1) the initial study empirically explored the concept of *social connectedness* in relationship to status message functionality use on the SNS Facebook (Köbler et al. 2010)[32], whereas (2) the subsequent study investigated a theoretical causal-effect model of communication behavior such that *social presence* and *social awareness* predict *social connectedness* in the context of *online social networking* and identified *social connectedness* as a determinant for *social capital*. In particular, the study focused on moderating effects of (i) (actual) size of a user's online social network and (ii) (actual) use of the online social network on *social connectedness* and *social capital.*

Both studies contributed to (1) the theoretical development and understanding of the construct and notion of *social connectedness* in the context of *online social networking* as well as (2) the development of the vital research model and hypotheses presented in the context of the underlying thesis research (see section 5.4).

5.2.1 Explorative study on formation of social connectedness on SNS

As previously mentioned, social psychology recognizes the need for connectedness of human beings (Adler/Kwon 2002, 17f) where the pursuit of connectedness represents one of the basic motivational principles that underlie social behavior (Smith/Mackie 2000, 17). For the underlying study *social connectedness* has been defined as the feeling of belonging to a social group and it was assumed that it implies the creation of bonding relationships. The concept of *social connectedness* can be described as "a positive emotional appraisal which is characterized by a feeling of staying in touch within ongoing social relationships" (Romero et al. 2007, 303). I previously provided a detailed discussion on the notion of *social connectedness* in section 5.1.1.1. The study empirically explored the theoretical notion of *social connectedness* in the general context of online social networking and further in relationship to status message use on the SNS Facebook in specific – motivated by evidence and results documented in previously addressed explorative studies (see section 4).

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[32] The study has been published prior to the underlying thesis under the title "Social Connectedness on Facebook – An explorative study on status message usage" in the Proceedings of the 16th Americas Conference on Information Systems, Paper 247. The list of contributive authors comprises Christoph Riedl, Céline Vetter, Jan Marco Leimeister and Helmut Krcmar. A full reference of the publication can be found in the reference section of this document. The following sections contain textual and graphical material taken and adapted from Köbler et al. (2010).

5.2.1.1 Methodology

A questionnaire was developed in order to gain first explorative insights on *social connectedness* in the context of *online social networking*. Two researchers at the Chair for Information Systems at Technische Universität München independently assessed the questionnaire in regards to comprehensibility of phrased items. The feedback was used to refine the items. Table 9 summarizes applied items and their corresponding operationalization.

Questionnaire item	Variable	Item Scale	Reference
How often do you update your status on Facebook?	Usage (status functionality)	Never, rarely (once a month), daily, several times a day	–
What type of status updates do you post?	Amount of information	None, links, location-based information, feelings, current activity	(Nardi/Whittaker/Bradner 2000) (Java et al. 2007) (Gross/Acquisti 2005, 76)
Do you read status updates by others/your friends?	Follow Passive	5-point Likert	(IJsselsteijn/van Baren 2003)
Do you screen the status messages on the "status updates" site?	Follow Active	5-point Likert	(IJsselsteijn/van Baren 2003)
I feel better connected to my friends through the use of status updates.	Feel Connected	5-point Likert	(Smith/Mackie 2000) (Helliwell/Putnam 2004, 1435-1446)
Do you comment/write a message on status updates?	Comments on updates	Never, rarely (once a month), daily, several times a day	-
How often did you meet/schedule a meeting based on status update information in the last 6 months?	Meetings due to updates	Never, once, 2-5, 6-10, more than 11	(Helliwell/Putnam 2004, 1435-1446)
Status messages are useful to me because…	-	Open	-

Table 9: Overview on questionnaire items and their corresponding variables
Source: Own illustration adapted from Köbler et al. (2010, 4)

Results presented in the following sections are based on descriptive analysis and non-parametric statistics (e.g., *one-sample Kolmogorov-Smirnov test* and *two-sample Mann-Whitney-U tests*).

5.2.1.2 Sampling and data collection

Snowball sampling (or *chain-referral sampling*) was used to retrieve the data set – a common sampling method in sociological and statistical explorative research with a focus on groups, community, and social networks composed of humans. A description and a discussion on advantages and disadvantages of the sampling method in research on (online) social networks can be found in section 4.1.1.

The questionnaire was distributed in the form of an online survey, through two Facebook user profiles using the status message function by posting a short description and hyperlink information about the questionnaire. In some cases, individuals were directly messaged and asked to forward the description text and hyperlink information. The survey was active for eight

days (in May 2010) and resulted in a sample size of 109 data sets (N = 109). After a data cleaning process one data entry has been discarded due to obviously incorrect information.

5.2.1.3 Demographics

The developed online survey focused on simplicity and therefore excluded demographic data to boost participation and to return completed questionnaire data samples. According to the sampling and distribution of the survey, estimations on the demographic characteristics of the data set can be deduced. It is assumed that (1) most participants are between 25 and 45 years of age, (2) collected data is equated on the means of gender, (3) participants dominantly originate from a Western cultural background, and (4) individuals are mostly well-educated with university-entrance and/or university diploma participated in the questionnaire.

5.2.1.4 Findings

Descriptive statistics

Through the self-selection of participants and applied *snowball sampling*, the general use of the SNS Facebook status message functionality is high (see Figure 25) and consequently all participants actively used the SNS. Only 12% of the participants reported they have never used the status message functionality on the SNS Facebook. The majority of users update their status around once a week. However, a large quantity of users in the sample reported to update their status at least daily (31%).

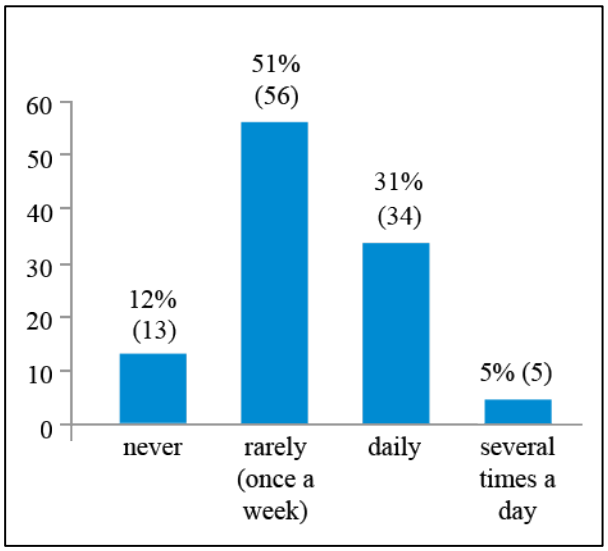

Figure 25: Frequency of status message updates and functionality use (N = 108)
Source: Own illustration adapted from Köbler et al. (2010, 5)

Table 10 shows the descriptive statistics of variables of interest. Köbler et al. (2010, 5) provide a detailed description on how the type of information was specified following considerations by Java et al. (2007, 57-62) and an overview on answers regarding the type of information specified in posted status messages.

Variable	N	Mean (Range)	σ*
Usage status functionality	108	1.28 (0-3)	0.73
Amount of information	109	2.14 (0-4)	1.25
Follow Passive	108	4.01 (1-5)	1.05
Follow Active	109	2.80 (1-5)	1.45
Feel Connected	109	3.38 (1-5)	1.21
Comments on updates	109	1.44 (0-3)	0.74
Meetings due to updates	109	0.81 (0-3)	1.00
* Standard deviation			

Table 10: Overview on descriptive statistics of variables of interest
Source: Own illustration adapted from Köbler et al. (2010, 5)

Following the active posting of status messages the survey investigated the reading pattern of status messages indicating that (1) the majority of survey participants (mean=4.01) often follow status messages displayed on their profile page, whereas (2) fewer users (mean=2.80) actively visit the *Facebook status updates page* exclusively dedicated to displaying status message information[33].

Items*	Mean	Std. Dev.
Read status updates by friends (*follow passive*)	4.01	1.04
Read on the *Facebook status updates page* (*follow active*)	2.80	1.45
* The frequency of reading/following status messages was assessed with a 5-point Likert scale ranging from 'never' to 'often'.		

Table 11: Frequency of reading vs. following patterns of status messages
Source: Own illustration adapted from Köbler et al. (2010, 6)

Additionally, the survey contained two items inquiring about users' reactions to status messages in online and real-life environments. The first item asked if users would comment on status messages or write messages related to other status messages. The results indicated that most users not only passively follow status messages of their social ties on the SNS Facebook, but also react to messages by responding with comments (see Table 12).

Reactions on status updates	Relative frequency
Never	7%
Rarely (once a month)	49%
Daily	37%
Several times a day	7%

Table 12: Reaction behavior towards published status messages
Source: Own illustration adapted from Köbler et al. (2010, 6)

The second item asked how often users would meet with others based on status message information in the last six months. Substantially fewer users follow up on status messages with

[33] Facebook changed the design of user profiles by adopting a status update page as a start page so that it is identical to the old *Facebook status update page*. This page only comprised status messages posted by social ties of a user on Facebook before and during the execution of the study. Additionally, the status message functionality was more prominently placed on user profiles. Thus, the distinction between active and passive following could not been made with the resulting configuration of Facebook user profiles.

external actions by setting up real-life interactions and activities. However, approximately 45% of the individuals within the sample have met at least once based on the SNS Facebook status message information in the last six months (see Table 13).

Real-life interaction based on status updates	Relative frequency
Never	55%
Once	16%
2-5 times	23%
6-10	6%

Table 13: Real-life social interaction triggered by activities around status messages
Source: Own illustration adapted from Köbler et al. (2010, 6)

Finally, the last item of the questionnaire was phrased as an open question. There were 36 answers submitted for this optional questionnaire item. After the retrieved answers were independently coded and analyzed by two researchers, 20 of the 36 comments contained the word "friend" or synonyms. Additionally, 19 comments seem to support the assumption that creating and following of status messages on the SNS Facebook generates a feeling of connectedness.

In a next step, non-parametric statistics were applied to strengthen and deepen the first insights, which were also used in the design of the follow-up study and overall development of the underlying research model and hypotheses presented in the scope of the underlying thesis (see section 5.4).

Non-parametric statistics

First, all variables were subjected to a one-sample *Kolmogorov-Smirnov test* to control normality of their distribution. For all variables, the test was highly significant given that all p-values are below 0.01 (see Table 14). Hence, non-parametric statistics were employed.

Variable	Z-score	Significance (2-tailed)
Usage Status Bar	3.072	$p < .000$
Amount of information	1.654	$p < .01$
Follow Passive	2.564	$p < .000$
Follow Active	1.749	$p < .01$
Feel Connected	2.203	$p < .000$

Table 14: One-sample Kolmogorov-Smirnov tests for all variables
Source: Own illustration adapted from Köbler et al. (2010, 7)

The analyses were primarily motivated by the question what makes people feel connected. One way to answer this question was to use the variable 'feel connected' to build two subgroups in the population: (i) participants that felt less connected (*low-connected group*, scores 1-3, n = 53) and (ii) more connected (*high-connected group*, scores 4 and 5, n = 56) by using the SNS Facebook status message functionality. Thus, first inferences about the differences between users who feel more or less connected could be done.

Variable	Z-score	Significance (2-tailed)
Usage Status Bar	-2.334	p< .05
Amount of information	-2.41	p< .05
Follow Passive	-3.438	p< .01
Follow Active	-2.33	p< .05
Feel Connected	-9.274	p< .000

Table 15: Mann-Whitney test for two independent samples (low-connected and high-connected) for all variables
Source: Own illustration adapted from Köbler et al. (2010, 7)

Seven *two-sample Mann-Whitney-U tests* for independent samples with the sub variables ('low_connected' and 'high_connected') were applied to all variables and showed significant differences between the two groups. Significance levels are shown in Table 15 and differences between the groups in Figure 26.

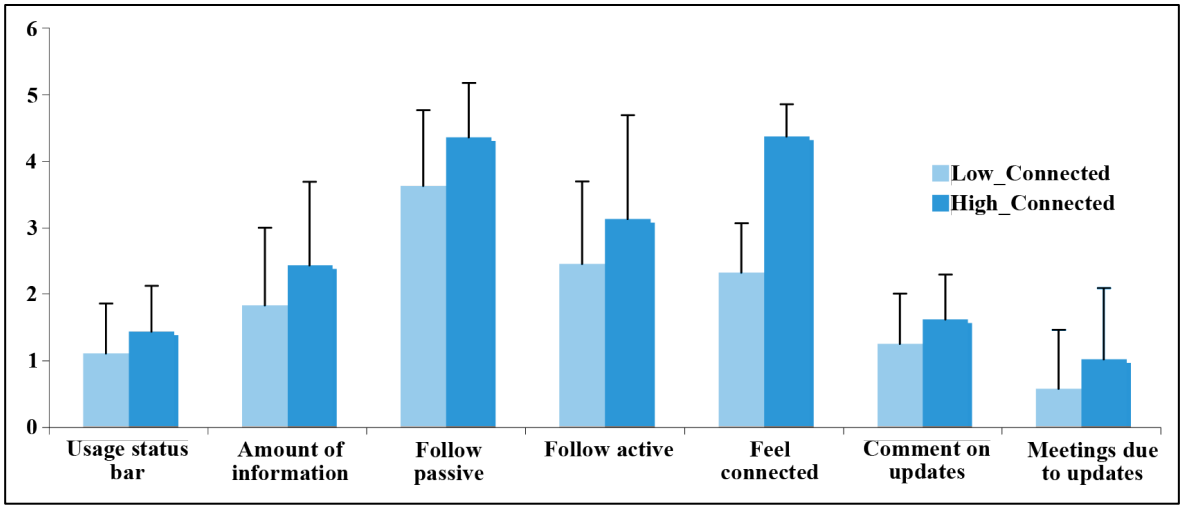

Figure 26: Differences between respective group means (± standard deviation) are depicted as a function of group affiliation (low_connected or high_connected)
Source: Own illustration adapted from Köbler et al. (2010, 7)

To test whether active use itself influences the subjective feeling of connectedness, the variables 'usage status bar' and 'feel connected' were correlated (*two-tailed Kendall's Tau*). The analysis showed that a high level in status message functionality use is concomitant with a high subjective experience of feeling connected ($\tau = 0.246$, $p = 0.001$, $n = 108$). In a second analysis, the question whether the type or the amount of information revealed by a user played a role in the feeling of being connected was addressed. Both groups – the *low-* and *high-connected group* – post locations, feelings, and current activities (20.8% and 17.9% respectively). However, the largest group in the *high-connected group* posted all types of information, i.e., links, locations, feelings, and activities. This was not the case for the *low-connected* group. Furthermore, 17% of the *low-connected users* do not post any of these types of information, in contrast to 7% of the *high-connected users*. A statistical analysis was not possible due to small sample sizes in the distinct categories. Further analyses and discussion on shared information through use of the SNS Facebook status message functionality is provided in Köbler et al. (2010, 7f).

In conclusion, the patterns of (type of) information shared via the SNS Facebook status message functionality points to a quantitative relationship between the feeling of being connected to other social ties on the SNS and the extensiveness of information shared. Kendall´s correlation analysis confirms this assumption ($\tau = 0.173$, $p = 0.027$, $n = 109$). Further correlation analysis demonstrated a significant relationship between the *active* and *passive following* of status message updates and the degree of feeling connected (*passive*: $\tau = 0.400$, $p = 0.000$, $n = 108$; *active*: $\tau = 0.312$, $p = 0.000$, $n = 109$). In the same way, independent of an *active* or *passive* use pattern, reactions (e.g., comments on posted status messages) to updates of social ties are linked to the feeling of being connected (*passive*: $\tau = 0.419$, $p = 0.000$; $n = 108$ and *active*: $\tau = 0.211$, $p = 0.01$, $n = 109$).

Reactions to comments of other users and whether users meet in real-life social interactions additionally influence the extent of feeling connected ($\tau = 0.326$ and $\tau = 0.169$, $p < 0.05$, respectively). In turn, the occurrence of real-life social interaction based on information provided in status messages is not related to the frequency of following status messages, neither for passive screening ($\tau = 0.069$, $p = 0.414$, $n = 108$), nor the active screening ($\tau = 0.077$, $p = 0.342$, $n = 109$).

The following section discusses the findings in the context of the underlying thesis research.

5.2.1.5 Discussion in the context of the thesis

As I previously mentioned, a more detailed discussion on general findings of the research can be found in Köbler et al. (2010, 7f). I will briefly discuss findings that are important in the scope of the thesis.

Based on evidence and results discussed in the previously presented explorative studies, I assume that elderly SNS users mimic use behavior of younger users and accordingly demonstrate equal SNS use patterns. Therefore by reverse-conclusion, findings documented in the previously presented study – that mostly comprised younger subjects – could be applied to elderly users and further utilized to propose and influence social design principles of SNS functionalitiesto generate social benefits such as *social connectedness* for elderly individuals through *online social networking*. The underlying study particularly focused on status message functionality use and its potential effects on the generation of *social connectedness*. I further assume that users' motivation on why they used the SNS Facebook status message functionality is to primarily keep contact with close social ties, to be up-to-date and to share "routine things" – since it represents a casual and non-intrusive form of computer-mediated communication and online social interaction – and to additionally hold true for elderly SNS users.

This information seems to be particularly valuable when shared within a network of social peers especially if individuals do not have the opportunity for personal (face-to-face) interaction. Furthermore, it can be assumed that Facebook status message functionality use can be a viable means of communication that has its strengths in conveying highly personal information allowing users to share emotions and current activities, and to support their psychological need for connectedness. Evidence found in the explorative studies suggests that elderly

users appear to passively use SNS by consuming user-generated information of younger SNS users instead of actively sharing information. Results of the underlying study however indicate that younger users not only passively follow status messages of their social ties within the SNS Facebook, but also actually react on messages by responding with comments. In particular, results documented in the *explorative quantitative study* revealed that elderly users – despite their expressed concerns towards data privacy regarding use of the Facebook status message functionality and commenting functionalities – indicated frequent use and convenience with assessed functionalities. Therefore I assume prospectively increased use of the status message functionality among elderly SNS user segments. Yet, the study revealed that not only the active sharing of information potential results in an increased feeling of connectedness, but also the passive consumption of status messages information shared by social ties within an individual's (online) social network. Furthermore, the analysis showed that a high level in status message functionality use is concomitant with a high subjective experience of feeling connected to other social peers – and therefore suggests quantitative relationship between the feeling of being connected to other social ties in the SNS Facebook and the extensiveness of information shared. Hence, discussed findings suggest devising means to increase passive and active use of status message and related functionalities enabling, e.g., commenting of user-generated information among elderly users, since correlation analyses demonstrated a significant relationship between the (*active* and *passive*) following of status message updates and the degree of feeling connected. In the same way, independent of an *active* or *passive* use pattern, reactions to updates of social ties (e.g., comments on posted status messages of other social ties) seem strongly linked to the feeling of being connected.

The sharing of information is not only passively consumed but, more importantly, is able to invoke user reactions by replying on posted status update messages (i.e., 44% of respondents comment at least once a day on their social ties' status messages) and by provoking real-life meetings or activities. Yet, substantially fewer users follow up on status messages with external actions by setting up real-life interactions and activities. However, approximately 45% of the individuals within the sample have met at least once based on Facebook status message information in the last six months whereas these real-life social interactions additionally influence the extent of feeling connected.

On the background of introductory illustrated repercussions of the demographic shift such as social isolation – especially among elderly individuals – research in the course of the underlying thesis therefore primarily focused on status message functionality use in *online social networking* and its adequate design for elderly users.

5.2.1.6 Limitations

Various limitations need to be considered in relation to the study design, which at the same time can serve as directions and starting points for future research within the IS and HCI disciplines. Due to the style of distribution of the survey and data collection procedure within the SNS Facebook results cannot necessarily be regarded as representative for the total population of *online social networking* users, users of different asynchronous messaging technologies, or the total Internet user population in general. The questionnaire also did not collect detailed demographic data. Therefore, the impact of demographical effects, i.e., gender, age, and cul-

tural factors, could not be considered during the data analysis. The primary goal during the data collection phase was to distribute a short questionnaire to boost the response rate. Additionally, it was assumed to achieve a higher response rate by not asking for demographic data while also considering potential privacy issues of individuals. Subsequently, this resulted in sample data that included mostly younger users, mostly due to the sampling method.

The above stated findings and limitations were considered in the design and theoretical development applied in the subsequent studies in order to strengthen theoretical understanding of the construct and notion of *social connectedness* in *online social networking* (see section 5.2.1) and applied in the theoretical development and refinement of the proposed research model presented in scope of the underlying thesis (see section 5.4).

Further conclusions of the study are summarized in section 6.2.4. The following section describes the empirical study on the formation of *social connectedness* with the SNS Twitter subsequently conducted in course of the underlying research.

5.2.2 Empirical study on formation of social connectedness on SNS

The study aimed to generate an (i) understanding of the theoretical relationship between *social presence, social awareness,* and *social connectedness* in online social network use and (ii) further focused on if and how *social connectedness* is generated through use of SNS[34]. It shall be noted that the produced sample included a minor proportion of elderly Twitter users due to the fact that the specific SNS user base is composed of primarily younger users in general and that the applied *snowball sampling* (see section 4.2.1) consequently resulted in a higher proportion of younger users. The study did not explicitly focus on elderly users. Yet, documented findings can be transferred and applied to elderly users based on previously stated argumentation.

In the stream of research of the underlying thesis the study delivers (i) empirical insights on the formation of *social connectedness* through SNS use, (ii) an initial testing and validation of the theoretically developed construct *social connectedness,* which subsequently serves as an independent variable in the proposed research model developed and measured in the subsequent presented research, and (iii) primary insights and understanding of the notion *social capital,* which is applied as a mediator variable for subjective *well-being* in the proposed research model (see section 5.4).

Therefore the notion of *social capital* is used as an overarching theoretical framework to examine the various factors that engender feelings of connectedness among SNS Twitter users. Twitter allows its users to manage social relationships among each other and thus provide

[34] As previously mentioned, section 5.2.2 contains textual and graphical material that has been published as a research article entitled "Tweeting to Feel Connected: A Model for Social Connectedness in Online Social Networks" in the International Journal of Human-Computer Interaction (Riedl et al. 2013, 670-687). The list of contributive authors comprises Christoph Riedl, Suparna Goswami and Helmut Krcmar. Textual and graphical material has been taken and adapted for the underlying thesis.

functionalities to establish an online social network and is consistently classified as a SNS (see sections 2.2.2 and 2.2.4).

Drawing from literature on social psychology, the developed model relates key constructs influencing *social capital* in the offline world to the realm of computer-mediated communication and online social interaction on SNS. The study focused on examining both *structural* and *functional* characteristics of individual Twitter users' network and their online social interaction behavior within the network. Therefore the conducted study also investigated direct and moderating effects of *network size* and *frequency of use* to develop initial insights on both hypothesized moderating variables. 'Network size' and 'use frequency' additionally serve as moderating variables in the proposed research model presented in the subsequent research (see section 5.4).

Social connectedness is strongly related to the theoretical concepts *social presence* and *social awareness* studied in previous research (Rettie 2003, 476ff). Discussing the concepts of *social connectedness*, Rettie (2003, 479) constitutes that "connectedness is a more fundamental concept than the other two and embodies a key concept in the analysis of communication and the development of communication technology". The difference between *social connectedness* and *social presence* can best be illustrated referring to instant messaging, since the awareness that peer users are online in an instant messaging network conveys connectedness even when there is no message exchanged. I would like to point to section 5.1.1.1 for a detailed discussion on the theoretical notion of *social connectedness*.

To summarize, the study investigated the interplay between the three fundamental constructs of social interactions: *social presence*, *social awareness*, and *social connectedness* – and fundamental structural constructs characterizing an individual's (i) social network (*network size*) (Scott 2000, 69ff), and (ii) communication behavior within the network (*frequency of use*), in particular. While prior research has examined and highlighted the importance of *social presence*, *social awareness*, and *social connectedness*, there is little empirical evidence on how they influence each other in computer-mediated communication and online social interaction (Rettie 2003, 478).

Therefore, in the following study two fundamental research questions related to the use of SNS were addressed. First, the study consequently investigated the relationship between three fundamental constructs of social interactions: *social presence*, *social awareness*, and *social connectedness*. Second, the study focused on the moderating effect of (1) (actual) size of a user's online social network and (2) (actual) frequency of use of the online social network on the three main constructs.

5.2.2.1 Research model and hypothesis development

The established research model outlines the relationship between various *structural* and *functional* characteristics of (online) social networks and communication on the SNS Twitter. It is proposed that *social awareness*, *social presence*, the size of an online social network, and use of the corresponding SNS influence *social connectedness* (see Figure 27). Theoretical justification for each of the hypotheses is provided below, particularly concerning the notions of

social awareness and *social presence*. In the subsequent research model, *social connectedness* is introduced as the fundamental independent variable besides *social support* and additionally discussed in successive sections of the thesis (see section 5.1.1.2).

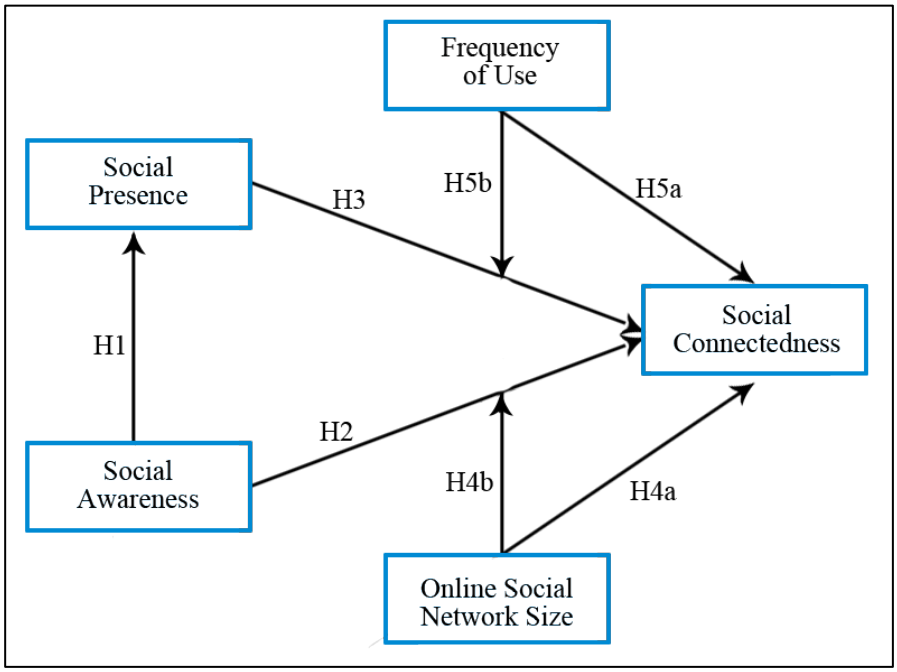

Figure 27: Research model with social connectedness as dependent variable
Source: Own illustration

Awareness is defined as an understanding of the activities of other individuals, which defines one's own activities (Dourish/Bellotti 1992, 107). *Social awareness* relies on knowing the (social) context of an individual; such that individual A perceives social awareness of individual B, if A has access to the (social) context of individual B (Bardram/Hansen 2004, 192). *Social awareness* in online social networks consequently refers to individuals being conscious about the activities of others SNS users. This consciousness or awareness can be facilitated by certain functionalities provided by SNS or by the way individuals choose to use SNS and communicate via them. When people are not co-located, they can create a sense of awareness by mediating information regarding their (social) contexts through the use of ICT such as email, instant messaging, or SNS. For instance, studies have documented that online and status information in instant messaging applications raises awareness regarding availability of individuals in the network (Nardi/Whittaker/Bradner 2000, 84).

In contrast to awareness, *social presence* is defined as "degree of salience of the other person in a mediated communication and the consequent salience of their interpersonal interactions" (Short/Williams/Christie 1976, 65). *Social presence* is usually considered as a prerequisite for effective communication. *Social presence* within a computer-mediated environment is defined as an individual's subjective sensation of "being there" (Heeter 1992, 262), which is also referred to as "telepresence" (Biocca/Levy 1995, 461) or "being together" (de Greef/Ijsselsteijn 2001, 308). Others have linked the notion of *social presence* to concepts of "immediacy" (Weiner/Mehrabian 1968, 4) and "intimacy" (Argyle/Dean 1965, 293), where actions within a medium that facilitate immediacy are used to create and maintain intimacy, and these actions

also enhance the feeling of *social presence* within a medium (Short/Williams/Christie 1976, 129).

Literature reflects the interconnection between *social presence* and *social awareness* by introducing definitions and terms such as "to be aware [of one's] presence" (Tollmar/Sandor/Shomer 1996, 306), which can be regarded as the awareness of the presence of social ties, and "affective awareness", which can be defined as a general sense of being connected (Liechti/Ichikawa 1999, 457). While *social presence* implies awareness of the other individual, it has been proposed that "awareness can occur without either social presence or connectedness" (Rettie 2003, 478). *Social presence* has also been described as the state in which two individuals are aware of each other in a computer-mediated environment, and consequently their "mutual awareness is the essence of social presence" (Biocca et al. 2003, 463).

In computer-mediated communication and online social interactions, it is the medium that allows a sense of *social presence* (Short/Williams/Christie 1976, 65). In particular, media might differ in the extent to which they allow users to experience others as being present (Cyr et al. 2009, 541). This might play a particularly important role in the SNS Twitter given that message length and similar SNS functionalities are severely restricted. Therefore, *social presence* can be facilitated or limited by certain functionalities of SNS Twitter. Further, individuals' perception regarding awareness will also increase the perception of *social presence* among Twitter users. Therefore, the hypothesis writes out to:

H1: *In SNS, social awareness will lead to social presence.*

Furthermore, awareness can be thought of both as a perception of other users active in the system, and an aspect of the system itself that facilitates that perception (Rettie 2003, 476). Accordingly, *social awareness* in the context of the SNS refers to people being conscious about other users in the (online) social network. It has been proposed that raised awareness regarding availability of other individuals in the (online) social network and functionalities, which help in monitoring this information, create and maintain a sense of *social connectedness* (Nardi/Whittaker/Bradner 2000, 84). Therefore, Twitter and respectively SNS in general are assumed to facilitate *social connectedness* by allowing for enhanced awareness among its users. Therefore, the hypothesis writes out to:

H2: *In SNS, social awareness will lead to social connectedness.*

Social presence has been referred to as a psychological connection that users feel among each other after an interaction, and can be described as a temporary judgment of an interaction as augmented or limited by the medium (Biocca et al. 2003, 481). Therefore, increased perceptions regarding *social presence* among SNS users will enhance the connection that users will feel with each other and this in turn results in increased feelings of *social connectedness*. Moreover, *social connectedness* is also described as the emotional experience, which is generated by the perceived *social presence* of other individuals in a medium (Rettie 2003, 477). Consequently, it can be hypothesized that

H3: *In SNS, social presence will lead to social connectedness.*

Social connectedness has been characterized by the size of a social network (Cornwell/Laumann/Schumm 2008, 187). Accordingly, in SNS, *network size* will play a role in the extent to which users feel socially connected. A user who has many social connections will be more ensconced within the (online) social network, and therefore, feel more socially connected. Further, having more members in one's (online) social network means that at any point in time the user will have a heightened awareness regarding other members of the network, and this in turn will result in increased feelings of being connected. Therefore, *network size* will also moderate the relationship between *social awareness* and *social connectedness*. Accordingly, it is hypothesized that

> ***H4a:*** *In SNS, network size is positively associated with social connectedness.*
>
> ***H4b:*** *In SNS, network size positively moderates the relationship between social awareness and social connectedness.*

Frequency and amount of communication play an important role in maintaining social relationships (Rettie 2003, 477). The previous study has also suggested that *social connectedness* is enhanced by frequent active information sharing among network members (Köbler et al. 2010, 1, 7) (see section 5.2.1.4). Therefore, in SNS, more frequent use would result in users experiencing higher levels of *social connectedness*. Further, the more people interact with each other, the more it is likely that they will experience psychological and emotional connection with other members of the network. Since *social presence* also refers to the psychological connection that users feel after an interaction, a higher frequency of SNS use will result in a stronger relationship between *social presence* and *social connectedness*. Accordingly, derived hypotheses write out to:

> ***H5a:*** *In SNS, frequency of use is positively associated with social connectedness.*
>
> ***H5b:*** *In SNS, frequency of use positively moderates the relationship between social presence and social connectedness*

The following section describes the chosen methodological approach including applied sampling and data collection as well as a description of the data analysis method and conducted validity tests.

5.2.2.2 Methodology

The research model was tested using survey data as well as actual use data collected from the SNS Twitter. An online survey was developed to measure *social awareness*, *social presence*, and *social connectedness*. The link to the survey was distributed through student mailing lists of undergraduate and graduate students enrolled at Technische Universität München, and by posting the survey link in various SNS (i.e., Facebook), and sending out *tweets* on various lists of Twitter users. A similar sampling approach can be found in Ledbetter et al. (2010, 36) and previous studies presented in the context of the thesis – primarily following a *snowball sampling* approach (see section 4.2.1).

The survey research methodology is particularly suitable for testing relationships between multiple constructs simultaneously and enhances the generalizability of results (Dooley, 2000). In the survey, respondents were asked to provide their SNS Twitter user names. This information was then used to gather *network size* and actual *frequency of use* data directly from respondents' Twitter accounts by employing the Twitter API. The survey consent form clearly explained this data collection procedure to respondents. After combining survey data with data collected directly from Twitter profiles, Twitter user names were deleted from collected records in order to arrange an anonymized data sample. Details on data directly collected from Twitter are provided below in the discussion on operationalization of variables. Most of the variables were operationalized using multi-item survey scales, while others (such as *tenure*, *usage*, and *network size*) were actual use data obtained from Twitter retrieved by Twitter API calls. In order to enhance validity of the survey instrument, tested and validated scales from previous studies were implemented to measure variables (Stone 1978, 39ff).

In an initial step*, content validity* of the measurement items were assessed by researchers and faculty members at the Chair for Information Systems at Technische Universität München (see section 5.2.2.4 for all conducted validity tests). The generated feedback was used to refine the items. Following this, two rounds of questionnaire sorting exercise (*labeled* and *unlabeled car sorting*) were carried out based on Moore/Benbasat (1991, 200f). Four graduate students participated in each sorting exercise. For the *unlabeled sorting* exercise, the labels or descriptions that the sorters came up with closely corresponded with the actual construct names and on the average more than 71% of the items were correctly sorted into their intended constructs. The results of the *unlabeled sorting* exercise were then used to drop some of the measurement items (those that were wrongly sorted or found to be ambiguous) and to refine the scale. The *labeled sorting* exercise – in which the sorters were provided with the name and definition of each construct – resulted in an even higher percentage of the items getting correctly sorted into their intended constructs, thus indicating a high level of face and content validity (see Appendix C).

The following paragraphs provide a brief definition of applied constructs (i) *social connectedness*, (ii) *social presence,* and (iii) *social awareness,* which were consequently applied in the previously described *card sorting* exercises:

> ***Social connectedness*** refers to being connected by having social, professional, or commercial relationships. People having high levels of *social connectedness* tend to feel close to others, identify with others, and participate in social groups and activities (Lee/Draper/Lee 2001, 310). *Social connectedness* in the context of the underlying study is defined as the connectedness that is achieved by using SNS in order to foster and maintain social interaction. The operationalization of *social connectedness* makes use of previous research measuring online communication attitude (Ledbetter 2009, 471). A definition and more detailed description of the theoretical notion *social connectedness* can be found in section 5.1.1.1.
>
> ***Social presence*** was defined as users' subjective sensation of "being there" in a scene, i.e., the illusion of having a non-mediated communication when in reality the communication is mediated. The theoretical notion *social presence* was operationalized based

on measurement items proposed (Biocca et al. 2003, 59f) and applied in comparable previous studies (Shen/Khalifa 2009, 50) (see Table 16).

For the underlying study ***social awareness*** was defined as the extent to which users are aware of the presence of others and react to their presence. Therefore, *social awareness* can be thought of as perception of other users and is facilitated by certain aspects of the system (Rettie 2003, 478). For example, in computer-mediated communication and social interaction such as in VCs or SNS, *social awareness* is dependent on factors such as use of status message functionality and similar functionalities.

In summary, Table 16 reports the items that were used to measure the various constructs, including the references from which they were derived and adopted.

Variable	Items	Reference
Social Connectedness	*I feel distant from people in my Twitter network.* *I do not feel related to most people in my Twitter network.* *I feel like an outsider in my Twitter network.* *I feel disconnected from the Twitter world around me.* *I do not feel I participate with anyone or any group in Twitter.* I feel close to people on Twitter. I am able to relate to my peers on Twitter. I am able to connect with other people on Twitter. *I have little sense of togetherness with my peers on Twitter.* My Twitter friends feel like family. I find myself actively involved in my Twitter friends' lives.	(Lee/Draper/Lee 2001, 312)
Social Presence	People on Twitter understand each other. I understand the other Twitter users' opinions. The other Twitter users understand what I mean. My thoughts are clear to the others on Twitter. The other individuals' thoughts are clear to me.	(Shen/Khalifa 2009, 50)
Social Awareness	*I hardly notice other users on Twitter.* I feel that other Twitter users are aware of my presence. *The other individuals do not notice me on Twitter.* I am often aware of other users in Twitter. Others of often aware of me on Twitter.	(Shen/Khalifa 2009, 50) (Biocca et al. 2003, 55f)
Items formatted in italic notation are reverse coded measures. All constructs were measured on a 7-point Likert scale ranging from 'strongly disagree' to 'strongly agree'.		

Table 16: Operationalization of the variables 'social connectedness', 'social presence' and 'social awareness'
Source: Own illustration

Following established practices in graph theory, *network size* was measured through a node's in-degree and out-degree. In the context of the SNS Twitter, the measure was operationalized as a sum of the number of followers and following. The number of followers and the number of following was obtained directly from the SNS Twitter through calls to the Twitter API. Since this variable ranged from 0 to 152,813 and significantly deviated from a *normal distribution*, *natural log transformation* was applied to obtain a relatively *normal distribution* of 'network size'.

Following: The number of other Twitter users that the focal user is following (i.e., has subscribed to their tweets). The variable 'following' represents the number of other Twitter users in whom the focal user is interested, and represents the node's out-degree. The variable was measured as a count obtained directly from respondents' Twitter profiles and ranged from 0 to 73,959 in the sample.

Followers: The number of users who follow a focal user (variable 'follower'). This is a direct measure of the focal user's online social network size regarding incoming connections and represents the node's in-degree. The number of followers cannot be controlled by the focal user but are unsolicited expressions of interest of those who follow. In the sample, the variable 'followers' ranged from 0 to 78,854.

Different measures have been employed in the field of IS research to measure *use* of a system or application. In the context of the underlying study, use was operationalized as the frequency with which individuals use the SNS Twitter. *Frequency of use* was therefore calculated by dividing the total number of tweets a user has posted by the user's *tenure* with the SNS Twitter. Both measures have been obtained directly from Twitter through calls to the Twitter API. Similar to 'network size', 'frequency of use' was transformed using a *natural log transformation*.

Tenure (data collected via Twitter API)**:** The Twitter API allows reading the sign-up date when a Twitter user account has been created. The obtained data was operationalized as '(June 26, 2011 – sign-up Date) in days'. In the sample, the earliest sign-up date was November 03 2006 15:01:14 Eastern Standard Time and the most recent sign-up date was April 12 2011 01:23:13 Eastern Daylight Time.

Tweets (data collected via Twitter API)**:** The number of all tweets ever posted by the respondent as a natural number (min 0; max 62,173).

As the number of consecutive calls to the Twitter API is limited to 500 per hour, the data collection and extraction had to be performed over multiple days. In a first step, the measurement model was examined followed by analysis of the structural model.

5.2.2.3 Sampling and data collection

As has been noted, *snowball sampling* was chosen as the primary sampling method and distribution followed a procedure applied by Ledbetter et al. (2010, 36). In addition, the questionnaire was distributed using various mechanisms such as through student mailing lists at Technische Universität München, various lists of Twitter users, and postings on Facebook profiles. The survey was carried out over a period of two months in 2011.

5.2.2.4 Validity tests and data analysis

All respondents were users of the SNS Twitter and the sample was equally distributed between male and female users. The survey collected 141 responses out of which 121 provided

a valid user name and public profile, which were included in analyses. Table 17 presents the demographic variables of the sample.

Variable	Categories	Frequencies
Gender	Male	60
	Female	58
	Not specified	3
Age	Under 17	2
	18 - 24	46
	25 - 34	41
	35 - 44	21
	45 - 54	8
	55 or older	1
	Not specified	2
Education	High School	20
	Bachelor	44
	Master / Diploma	42
	PhD	7
	Not specified	8

Table 17: Demographic data of collected sample (N = 121)
Source: Own illustration

Partial least squares (PLS) analysis was used to perform the data analysis and has enjoyed increasing popularity in recent years because of its ability to model latent constructs under conditions of non-normality and in small to medium-sized samples in research disciplines such as IS and HCI (Chin 1998, 316ff). It allows researchers to specify the relationships among the conceptual factors of interest and the measures underlying each construct, resulting in a simultaneous analysis of the *measurement model* (i.e., how well the measures relate to each construct) and the *structural model*, i.e., whether the hypothesized relationships at the theoretical level are empirically true). The PLS analysis was conducted using the software SmartPLS Version 2.0 (Ringle/Wende/Will 2005).

Internal consistency, *convergent validity*, and *discriminant validity* were assessed to validate the instruments (Gefen/Straub 2005, 93ff). *Internal consistency* was examined using composite reliability, which in PLS relies on the actual loading to calculate the factor scores and is a better indicator of *internal consistency* than Cronbach's alpha (Ranganathan/Dhaliwal/Teo 2004, 145f). As shown in Table 18, the *composite reliability* values for the constructs in the model were all above the suggested threshold of 0.7 (Straub 1989, 160), thus supporting the reliability of the measures.

Convergent validity indicates the extent to which the items of a scale that are theoretically related are also related in reality. It measures the correlation among measurement items of in a given construct using different methods of measurement. Table 18 presents information about the factor loadings of the measures of the research model. All items have significant path loadings at the 0.001 level. The average variance extracted (AVE) values are all above the recommended value of 0.5 (Fornell/Larcker 1981, 46). Therefore, the *convergent validity* of the scales is acceptable.

Construct	Item	Factor Loadings	Composite Reliability	AVE
Social Connectedness (SC)*	SC1	0.7298	0.9378	0.6277
	SC2	0.7957		
	SC3	0.7132		
	SC4	0.8613		
	SC5	0.8670		
	SC6	0.8709		
	SC7	0.7549		
	SC8	0.8014		
	SC9	0.7147		
Social Presence (SP)	SP1	0.8041	0.8974	0.6365
	SP2	0.8107		
	SP3	0.8284		
	SP4	0.7798		
	SP5	0.7644		
Social Awareness (SA)	SA1	0.7254	0.8793	0.5961
	SA2	0.8454		
	SA3	0.7702		
	SA4	0.6289		
	SA5	0.8665		
* Some items were excluded from further analyses since factor loadings and cross loadings showed insufficient or improper values.				

Table 18: Factor loadings of applied measurement items
Source: Own illustration

Table 19 shows the correlation between constructs, with the diagonal elements being the square roots of AVE. This indicates that the variance shared by the items of a particular construct is higher than the variance shared by the construct with another construct, which is used as an indicator of discriminant validity in PLS.

	Frequency of Use	Network Size	Social Awareness	Social Presence	Social Connected-ness
Frequency of Use	**1.000**				
Network Size	0.6788	**1.000**			
Social Awareness	0.4883	0.5821	**0.7720**		
Social Presence	0.3228	0.3013	0.4828	**0.7978**	
Social Connectedness	0.5387	0.4595	0.6861	0.5549	**0.7923**
Diagonal elements are the square roots of AVE (for latent constructs).					

Table 19: Correlations between constructs
Source: Own illustration

Another method of assessing *discriminant validity* is by checking the factor loadings and cross loadings of the measurement items (see Table 20). Scanning down the columns indicates that the item loadings in their corresponding columns are all higher than the loadings of items used to measure the other constructs. Scanning across rows indicate that item loadings are higher for their corresponding constructs than for other constructs. Thus, the measurement items of this model satisfy criteria for *discriminant validity* suggested by Chin (1998, 311,

316ff). Overall, the data provides empirical support for reliability, as well as *convergent* and *discriminant validity* of the scales of the *measurement model*.

	Social Presence	Social Awareness	Social Connectedness
SP1	**0.8041**	0.3666	0.4933
SP2	**0.8107**	0.4093	0.4512
SP3	**0.8284**	0.4318	0.4556
SP4	**0.7798**	0.3534	0.3523
SP5	**0.7644**	0.3589	0.4561
SA1	0.4038	**0.7254**	0.5463
SA2	0.4407	**0.8454**	0.6014
SA3	0.2620	**0.7702**	0.4827
SA4	0.3361	**0.6289**	0.4007
SA5	0.3937	**0.8665**	0.5822
SC1	0.2746	0.5008	**0.7298**
SC2	0.3959	0.5934	**0.7957**
SC3	0.3754	0.5135	**0.7132**
SC4	0.4938	0.5992	**0.8613**
SC5	0.4271	0.5995	**0.8670**
SC6	0.5439	0.5479	**0.8709**
SC7	0.4899	0.5074	**0.7549**
SC8	0.5720	0.5369	**0.8014**
SC9	0.3470	0.4795	**0.7147**

Table 20: Factor loadings and cross loadings of applied measurement items
Source: Own illustration

After the assessment of the *measurement model* in regard to *internal consistency, convergent validity* and *discriminant validity,* the following section provides a description and discussion of findings.

5.2.2.5 Findings and discussion

Results of model testing through PLS analysis

Table 21 presents the result of the model testing. At first a model was tested incorporating only the main effects (*Model 1*) and then introduced the moderating effects in a second model (*Model 2*).

	Path Coefficients		
Variable	**Model 1**	**Model 2**	**Implications**
Control Variables			
Age	0.037	0.059	
Gender	-0.049	-0.029	
Independent Variables			
Social Awareness → Social Presence	0.483***	0.483***	**H1 Supported**
Social Awareness	0.462***	0.476***	**H2 Supported**
Social Presence	0.267***	0.335***	**H3 Supported**
Network Size	-0.100	-0.115	**H4a Not Supported**
Frequency of Use	0.284***	0.250**	**H5a Supported**
Moderating effect of Network Size			
Network Size * Social Awareness	-	0.199**	**H4b Supported**
Moderating effect of Frequency of Use			
Frequency of Use * Social Presence	-	0.075	**H5b Not Supported**
R^2	**0.585**	**0.630**	
*p<0.05; **p<0.01; ***p<0.001			

Table 21: Hypotheses testing (dependent variable 'social connectedness')
Source: Own illustration

Overall, the models explained 59% and 63% of the variance in *social connectedness* on the SNS Twitter (see Figure 28).

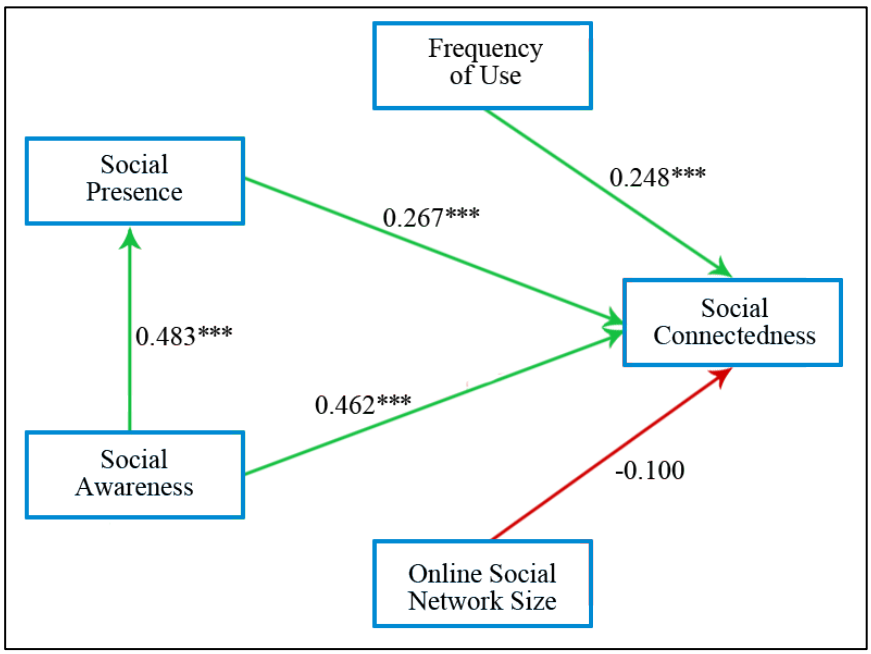

Figure 28: Measured research model (Model 1) with path coefficients
Source: Own illustration

While users' Twitter *network size* does not have a significant direct relationship on *social connectedness*, it positively moderates the relationship between *social awareness* and *social connectedness*. 'Frequency of use' has a significant direct effect. However, the moderating effect on the relationship between *social presence* and *social connectedness* was not significant (see Figure 29).

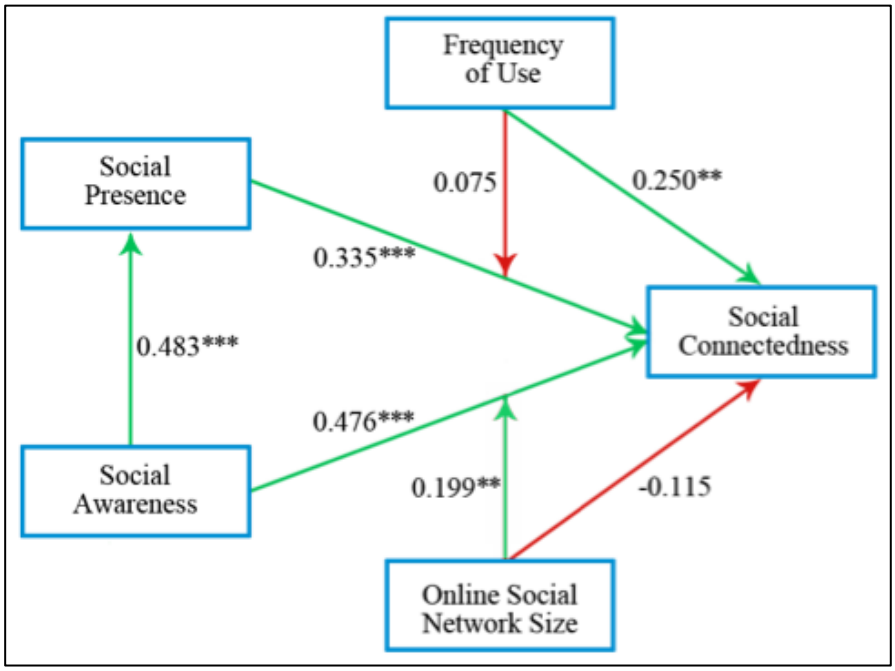

Figure 29: Measured research model (Model 2) with path coefficients
Source: Own illustration

The conducted study aimed to develop and test a model theorizing relationships between *social presence*, *social awareness*, and *social connectedness* in the context of the online social network Twitter. Additionally, the study tested for direct and moderating influences of users' *network size* and *frequency of use*, which were measured directly by making calls to the Twitter API. Within the field of social psychology, it is recognized that *social presence* and *social awareness* relate to *social connectedness*; but it is less clear how this translates to computer-mediated communication and online social interactions. Consequently, the study investigated if this still holds true in computer-mediated environments and *online social networking*. Further, previous research has often focused on *social presence* and *social awareness*, although *social connectedness* is a more basic human need and therefore can be considered more fundamental.

The sampled data shows a positive and significant effect of *social awareness* on *social presence*, thus supporting ***H1***. Furthermore, the empirical results show both *social awareness* and *social presence* have a significant positive effect on *social connectedness*, thus supporting ***H2*** and ***H3***. Therefore it can be assumed that *social connectedness* is the higher-level construct, which is influenced by both the *functional* and *structural* characteristics of the online social network among individuals within their individual networks.

In the context of computer-mediated communication and online social interaction, the *social presence* theory advocates that the medium should be as proximate to face-to-face communication as possible. However, previous research on *social presence* in computer-mediated communication has often been criticized for taking a too media-centric view on the occurrence of *social presence* (Shen/Khalifa 2009, 34), with *social presence* often being considered an inherent property of the medium itself (the richer the medium, the more *social presence* it is believed to generate). The conducted study overcomes this criticism by considering the mechanism through which *social presence* can be enhanced in a not so rich medium such as

SNS. By facilitating the exchange of very short *connectedness-oriented* messages and status updates, the SNS Twitter enhances feelings of awareness regarding other users in the medium, and this in turn enhances the perceived *social presence*. Further, both *social presence* and *social awareness* significantly influence *social connectedness*, an excellent indicator of the potential to appropriate *social capital* from the network.

To provide a more complete picture on how users' communication behavior and online social interaction is related to users' feeling of *social connectedness*, the study additionally considered direct and moderating effects of *network size* and *frequency of use* by directly collecting actual data from users' Twitter accounts. Regarding *network size* the results show no significant direct effect but a significant moderating effect on the relationship between *social awareness* and *social connectedness.* Therefore, ***H4a*** is not supported, while ***H4b*** is supported. This indicates that in the context of *online social networking*, having a large network is not necessarily a pre-condition to feeling socially connected, however, the larger the *network size*, the stronger the relationship between *social awareness* and *social connectedness*. In the SNS Twitter, the relationship between *social awareness* and *social connectedness* can be summarized as a feeling of being connected in the network because of a better understanding regarding the activities of others. A larger network results in increased understanding regarding the activities of others and therefore increased feeling of connectedness.

Frequency of use has a significant direct effect but the moderating effect on the relationship between *social presence* and *social connectedness* is not significant, thus hypothesis ***H5a*** is supported while ***H5b*** is not supported. It can be speculated that not every type of use and not every type of social network results in having higher levels of psychological connection as a result of interactions within the network (Burke/Marlow/Lento 2010, 1910ff; Granovetter 1973, 1361ff). In Twitter, for instance, not just the amount or *frequency of use*, but rather the fundamental motivation behind use of the medium, may have a better explanatory power of the relationship between *social presence* and *social connectedness*.

Overall, the use of two distinct but complementary data sources provides a richer picture of the studied phenomenon and follows suggested practice in IS research (Sharma/Yetton/ Crawford 2009, 485). This study is one of the few examples of research that combines measures of psychological perceptions with actual measures of *use* and *network size* from SNS to investigate the link between subjective and objective variables. The results show that active participation on SNS can indeed result in tangible outcomes by increasing users' *social capital*. Hence, the study provides empirical evidence to the discussion on whether *online social networking* translates into real-world social benefits.

Results based on analysis on subjects' actual use data

The above analysis relies on PLS analysis to test a theoretic model linking SNS Twitter use to perceived benefits such as *social connectedness*. To better understand the sample population's use behavior on the SNS, several additional analyses were performed based on actual data collected via Twitter API calls as well as responses elicited through the online survey. In an initial step, analysis focused on different types and means of computer-mediated communication additionally used to the SNS Twitter as well as on their particular *frequency of use*.

Figure 30 displays communication media use. Face-to-face, online social networking, and cell phone text messages are the dominant communication media with around 50% of the respondent reporting "very frequently". Given the sample population of the SNS Twitter users, the *frequency of use* of other computer-mediated communication means such as email, cellular phone text messages are, not surprisingly, very high (around 45% responding "very frequently").

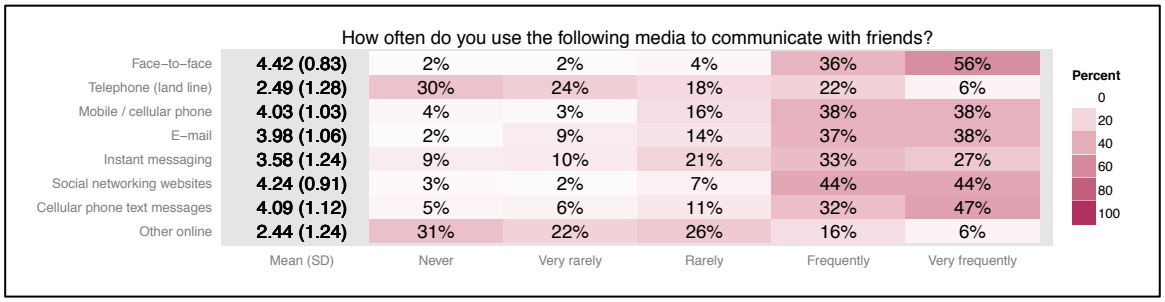

Figure 30: Non computer-mediated and computer-mediated use of survey subjects
Source: Own illustration

To better understand whether the survey respondents were exclusive users of the SNS Twitter, subjects were additionally asked on their membership status and use behavior on other SNS (see Figure 31). Almost all respondents were also users of the SNS Facebook (93%). The only other widely used SNS was LinkedIn (54%). Other SNS had only limited reported use of below 25%.

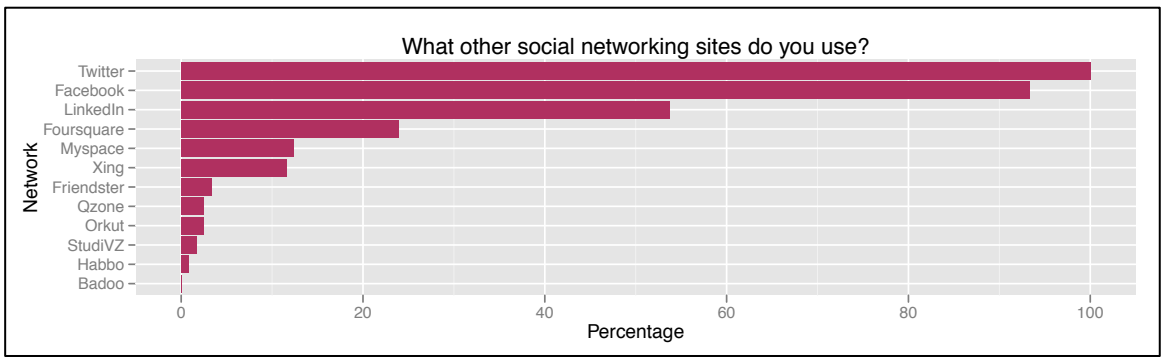

Figure 31: Reported use of online social networking means other than SNS Twitter
Source: Own illustration

In order to get a better understanding of users' feeling of connectedness, the study further analyzed self-reported details regarding the nature of connections users have on Twitter. Figure 32 shows the composition of connections regarding the different connection types. Most connections are with celebrities and prolific people (22%), friends (21%), and acquaintances and casual contacts (21%). Very few connections are with family members or romantic relationships (2% and 0.3% respectively), which could be explained by the composition of the collected data sample rather consisting of younger individuals. Based on evidence of the explorative studies, I assume that elderly users – if registered with the SNS Twitter – will maintain online social networks composed of close social ties such as family members based on their use behavior and social network compositions observable in Facebook. Work-based rela-

tionships account for 13%, which additionally could be higher in elderly Twitter user populations.

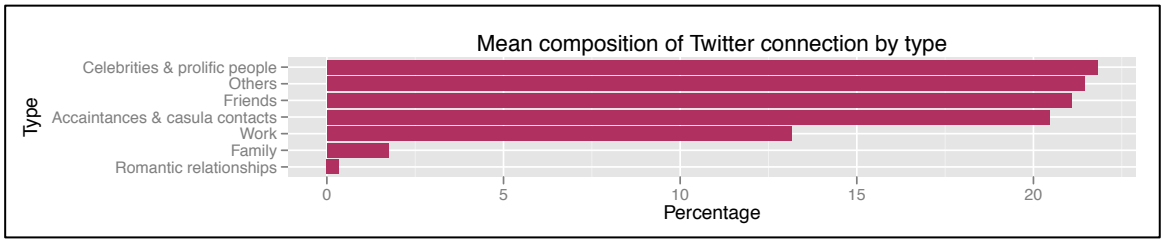

Figure 32: Composition of Twitter connections by type (percentages denote distribution excluding neutral rating)
Source: Own illustration

Figure 33 displays the classification of connections regarding their physical distance. Twitter connections are mostly between local friends (34% reported "almost all" or "all"). The classification of long-distance social ties is largely consistent (42% reporting "none" or "very few" long-distance connections) which increases the reliability of the finding. This indicates that most SNS Twitter users rely on Twitter as a medium for remaining connected to friends, casual acquaintances, and other prominent Twitter users rather than using it for keeping in touch with family. Therefore, the SNS Twitter can be considered as a tool for establishing and maintaining weak network ties, rather than for strong network ties, which I assume is different to use behavior and patterns documented in the explorative studies based on the SNS Facebook.

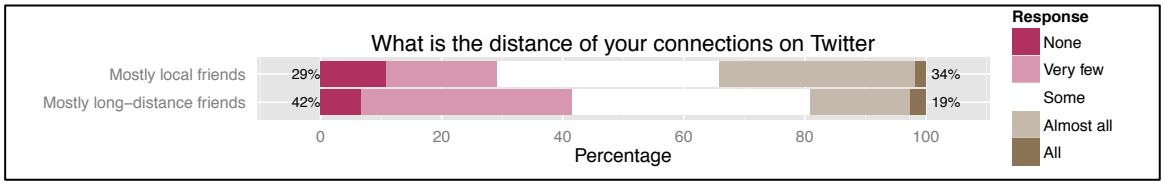

Figure 33: Composition of Twitter connections by physical distance between user and Twitter connections (percentages denote distribution excluding neutral rating)
Source: Own illustration

Finally, the study additionally investigated individual use behavior by analyzing each subject's last 200 tweets. Figure 34 depicts a random sample of 50 respondents from the collected data sample (N = 121). To illustrate *frequency of use*, the *tweets* were plotted as a time series: The shorter the time series, the higher an individual's frequency of use (the elapsed time between the last 200 tweets is shorter). For a *high-frequency* user such as 'User 1', the last 200 tweets span only a period of 3.6 days resulting in an average of 55 tweets per day. For a *low-frequency* user, such as 'User 50', the last 200 tweets span almost one and a half years resulting in an average of 0.3 tweets per day.

The majority of tweets are *connectedness-oriented* communication including mentions of other users accounting for 45% of all tweets. Another category of *connectedness-oriented* tweets is re-tweets with additional mention of another Twitter user (mostly the source of the re-tweet), which account for another 20% of tweets. *Re-tweets* without mentioning of another user are very rare accounting for below 1% of *tweets*.

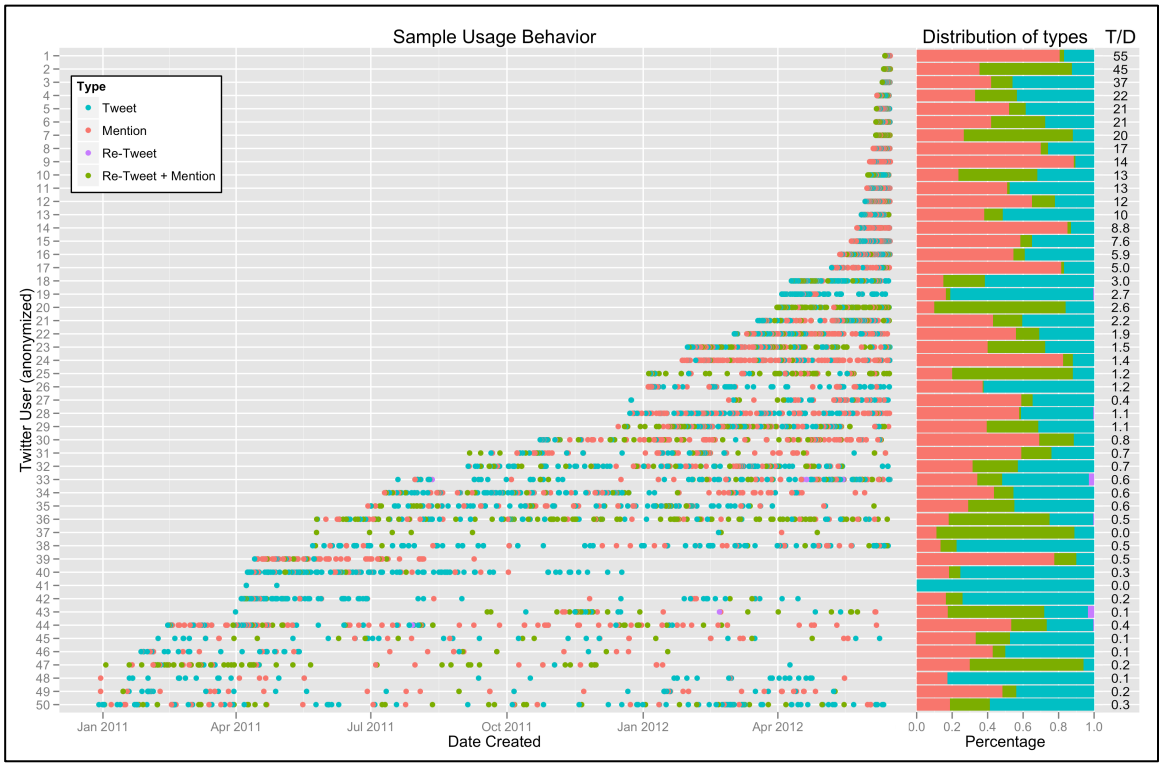

Figure 34: Frequency of use within a random subset of 50 Twitter users of the total sample (N = 121)[35]
Source: Own illustration

Finally, plain *tweets* account for 35% of the messages exchanged on the SNS Twitter. This supports the argument that the SNS Twitter is a *connectedness-oriented* online social network and provides additional credibility to findings documenting the ability to meaningfully fostering social interaction through an online social network.

5.2.2.6 Limitations

The described study of *social connectedness* formation on the SNS Twitter relied on two very basic measures of use behavior – *frequency of use* and *network size*. The study excludes to investigate additional structural properties of the online social network such as the networks density or the centrality of the focal user within the social graph, in particular. As relationships on the SNS Twitter are directed rather than undirected (as it would be the case, for example, in the SNS Facebook) this might provide additional insights which could be explored in future research. Furthermore, the use measure did not take the nature or the content of the communicated information into consideration. Consequently, future research could be extended in this direction. Researchers have already started analyzing the content of communication in online social networks, and these could provide a richer understanding of different types of use behaviors.

[35] The figure displays each subject's last 200 *tweets*, classified by *tweet* type (plain tweet, mention, re-tweet, or mention within a re-tweet). The distribution of *tweet* types is shown in the bar plot next to it. Numbers to the far right show *tweets per day* (T/D). For 'User 1', a high-frequency user, the last 200 tweets span only a period of 3.6 days while for 'User 50', a low-frequency user, the last 200 tweets span almost one and a half years.

Furthermore, in the light of the underlying thesis research, the produced sample only included a minor proportion of elderly Twitter users due to the fact that the specific SNS user base is composed of primarily younger users in general and that the applied *snowball sampling* (see section 4.2.1) consequently resulted in a higher proportion of younger users.

In parallel to the previously discussed study, I argue that findings not only specifically apply to younger SNS users, but also to elderly SNS user segments. Furthermore, findings of the conducted study provide novel insights on the theoretical development of *social connectedness* in the context of *online social networking* since to this day systematic empirical research has not been sufficiently documenting the underlying phenomenon in IS and HCI research.

Identified and described limitations of the previously presented study were used in the development of the research model and supported me in the execution of the subsequently presented study on the formation of *social capital* in *online social networking*.

The following sections summarize the contributions extracted from the two studies on formation of *social connectedness* in SNS.

5.3 Theoretical and practical contributions of both empirical studies

In the following, I attempt to illustrate the theoretical contributions to the stream of research on beneficial effects of *online social networking* use within the IS and HCI disciplines as well as practical implications for the design of SNS functionalities and subsequently proposed social design principles in the course of the underlying thesis research (see section 6.1).

5.3.1 Contributions to theoretical understanding of social connectedness formation in online social networking

Both studies and their findings contribute to the stream of literature on the general beneficial effects of *online social networking* (Ellison/Steinfield/Lampe 2007, 1145ff) (Burke/Marlow/Lento 2010, 1909ff) and, in particular, on the formation of *social connectedness* and *social capital* through active participation on SNS (Ganley/Lampe 2009, 267ff; Koroleva et al. 2011, 3f; Ledbetter et al. 2010, 33ff).

Results indicate that the more individuals use functionalities equivalent to the status message functionality provided in the majority of dominant SNS, the more connected they feel. Analyses considering patterns of shared information (type and amount of information) on SNS point towards a quantitative relationship between an individual's degree of perceived *social connectedness* and the extensiveness of information shared. The feeling of being connected seems to be related to the amount of messages and not the type of information an individual is sharing among her online social network. This is consistent with earlier findings reporting that the exchange of "goodnight" text messages creates a feeling of *social connectedness* although no specific and explicit content information is shared (Rettie 2003, 477). Additionally, the research documented that frequency of *passively* or *actively* followed status messages of social peers on the SNS is related to reactions on other users' status message information. Ac-

cordingly the findings document and justify the declaratory influence of *frequency of use* on the theoretical construct and notion of *social connectedness*. Köbler et al. (2010, 7f) provide a more detailed description of findings and their implications.

In line with prior research, the primary motivation for the empirical study was to deliver an initial understanding on the formation of *social connectedness* and *social capital* evolving from SNS use. As recent research on the formation of beneficial social aspects through *online social networking* lacks validated measurement instruments that are specifically developed to capture outcomes related to *social capital* (Koroleva et al. 2011, 8f), the research model applied existing and established psychological concepts such as *social presence*, *social awareness,* and *social connectedness* as potential predictors of *social capital* among SNS users. The results supported the proposed model and applied measurement items. The study also investigated direct and moderating effects of *network size* and *frequency of use*, finding a direct effect of *frequency of use* on *social connectedness* and a moderating effect of *network size* on the relationship between *social awareness* and *social connectedness*. I therefore argue to include these variables in building the subsequent presented fundamental research model in the scope of the thesis.

Furthermore, it can be argued that by increasing users' feelings of *social connectedness* the use of the SNS Twitter makes a valuable contribution to facilitated *social capital* and indirectly to a users' *well being*. Thus, findings provide insights about how the use of computer-mediated communication and online social interaction in the form of online social networks generate real-world benefits by growing users' *social capital* through an increased feeling of *social connectedness*. The conducted literature review indicated that prior empirical research missed an opportunity to generate a clear understanding of the potential relationships between these constructs. Therefore, the study intended to contribute to a better understanding of the relationships between the three constructs by disentangling the empirical effect of *social presence* and *social awareness* on *social connectedness*. In addition, evidence suggests that – in the context of *online social networking* – a larger (online social) network results in increased understanding regarding the activities of other social ties within the network and consequently leads to an increased feeling of connectedness.

Thus, findings contribute to and extend social psychology and IS research, which has investigated these constructs (Biocca et al. 2003, 38ff; Koroleva et al. 2011, 8ff; Rettie 2003, 476f; Shen/Khalifa 2009, 36ff). The later study additionally contributes to the important research stream investigating if and how online behavior translates to the offline world (Ellison/Steinfield/Lampe 2007, 1153; Ledbetter et al. 2010, 39ff).

5.3.2 Implications on design considerations for developers of SNS

From a practical perspective, findings could have major implications in the field of HCI where researchers consistently attempt to develop systems to improve various aspects of social benefits of applications. Building on the concept of *theory-driven design* and *evidence-based social design* previously mentioned in section 1.4, which aim at translating the findings resulting from the test of the theoretical model into concrete design implications (Kraut/Resnick 2012, 12). The goal of these approaches is to help designers incorporate these

social science research and theoretical findings into informed design choices for systems and applications. Table 22 provides a summary of social design implications that can be drawn from both conducted empirical studies on the formation of *social connectedness* in *online social networking* for both younger and elderly SNS user populations and consequently have influence on proposed and evaluated design principles in later sections of the underlying thesis.

Design implication	Rationale
Social benefits of SNS	Documented results in both empirical studies indicate that SNS have indeed social benefits by enabling users to generate *social connectedness* and build *social capital*. Users can successfully build *social capital* and feelings of *social connectedness* through novel means of *online social networking* thus indicating that socially beneficial effects of personal interaction can be transferred from an offline to an online context. Designers of HCI should therefore consider adding social networking functionalities in other applications (e.g., mobile applications) to support the creation of *social capital*. This design implication is particularly important for designers of SNS that are targeted at users' social benefits such as those providing companionship and *social support*.
Social benefits despite limited media richness	Evidence documented in both empirical studies indicate that the social benefits of SNS use can be achieved even with very limited media such as the SNS Twitter, which only allows the exchange of very short messages. Therefore, designers should exploit even very simple means of communication, given that even *tweets* are able to successfully convey *social awareness*, *social presence*, and *social connectedness*. SNS functionalities should especially focus on the exchange of *connectedness-oriented* messages. SNS functionalities should specifically allow directing messages at others and providing personal and location information to place messages into a social and geographical context. Based on the evidence documented in the explorative studies, consequence of status message or similar functionalities related to the sharing of user-generated content need to be evidently constituted to SNS users and in specific to elderly SNS users. Furthermore, findings call for clear and limited initial privacy settings of such functionalities since especially elderly users seem to have a negative bias against current implementations of such functionalities and their corresponding privacy settings.
Social awareness as a fundamental system feature	*Social awareness* functions as a fundamental building block for higher-level constructs of *social presence* and *social connectedness*. Designs should be directed towards incorporating and enhancing awareness creating functionalities within SNS, as awareness not only has a direct effect on *social connectedness*, but also enhances *social connectedness* indirectly through increased feelings of *social presence*. Possible functionalities to consider are status indicators, status messages, and other forms of awareness displays to provide contextual information about the activities of social ties within an individual's social network (Dabbish/Kraut 2008, 226ff). These findings and potential impact on the design of SNS functionality are noteworthy in the context of elderly individuals as well as in the light of earlier discussed negative effects of the demographic shift such as social isolation especially within elderly demographic segments.
Social presence as building block for social connectedness	Evidence from the later empirical study suggests that *social presence* functions as an important building block for *social connectedness* and can be generated on SNS. Consequently, designers should aim at integrating functionalities to enhance *social presence* in order to enhance users' feeling of *social connectedness*. Possible SNS functionalities to convey the presence of other people are images of members (Resnick et al. 2012, 268). To support *social presence,* the SNS Twitter includes profile pictures next to each tweet and a display of a relative time indicator such as "posted 8 minutes ago" to evoke *immediacy*. Similar

	indicators can also be found in the SNS Facebook. Yet, implications assume an increased fraction of non-automatically or automatically shared information of SNS users whereas the findings documented in the explorative studies revealed a tendency to highly limited information sharing behavior of elderly SNS users. Therefore elderly SNS users need to be convinced through adjusted evident privacy settings of proposed functionalities.
Direct effect of frequency of use	Evidence in both empirical studies further suggests that frequency of use has a strong direct effect on an individual's feeling of *social connectedness*. To enhance *social connectedness*, designers of human computer interactions should integrate functionalities that motivate users to contribute more. A wide variety of functionalities can be employed such as low threshold interfaces for easily making small contributions, identifying user contributions by name, leader boards, and conveying to users that they are unique and others in the group cannot make the contributions they are making (Kraut/Resnick 2012, 15). I assume that mentioned design implications are highly important in the context of SNS use behaviors expressed by elderly individuals documented in the explorative studies of the underlying thesis research. In the case of the SNS Twitter, the online social network encourages use frequency through their *Trends* functionality that shows major global trends in current Twitter content and thus invites the user to explore contributions made by other Twitter users who are not in an individual's immediate online social network. *Frequency of use* could be potentially increased among elderly individuals if the individual is notified of actions or newly shared user-generated content of other social ties within her online social network through different online communication means such as email, mobile phone text messages to increase the frequency of return rates.
Moderating effect of network size	While *network size* has no direct effect on *social connectedness*, it is an important moderating factor for the effect of *social awareness* on *social connectedness*. To increase the positive effect of users' *network size*, designers should implement functionalities that help users to grow their online social network. Possible implementations could be functionalities that are automatically suggest other members as possible friends or import functions that allow importing an address book to grow the online social network. Twitter supports users in building a larger network through the "Who to follow" panel that suggests other Twitter users. Similar functionalities are currently implemented in the SNS Facebook. In addition to the immediate suggests, the panel also offers a "refresh" button, which will generate a new set of suggested users. Since evidence of the explorative studies suggest that elderly SNS users maintain smaller online social networks as well as rather built online social ties to more intimate individuals such as family members, proposed functionalities might not impact elderly SNS users or need to be specially adjusted to elderly individuals' needs and concerns towards *online social networking*.

Table 22: Implications of findings on the design of SNS functionalities
Source: Own illustration

Contributions of the conducted empirical studies were not only applied in the deduction of social design principles for SNS functionalities to foster (social) benefits for especially elderly SNS users (see section 6), but also in the theoretical development of the pivotal research model in the course of the underlying thesis research that I will present in detail in the following sections.

5.4 Research model and hypotheses

On the background of previously described theoretical reviews on the notions *social connectedness*, *social support* and subjective *well-being* as well as a deepened theoretical understanding of the notion *social connectedness* in light of *online social networking* based on findings provided by both conducted empirical studies (see sections 5.2.2 and 5.4), I propose that active participation in SNS will have positive implications for prospective achieved *social capital* of an individual through online social interaction on SNS.

Furthermore, I advocate in utilizing the theoretical construct *social capital* as a mediating variable for an individual's *well-being* and indirectly as the overarching theoretical concept in the proposed research model since direct effect of both *social support* and *social connectedness* on an individual's *well-being* or *health* are more difficult to measure (Bowling/Farquhar/Browne 1991, 563f) (see section 5.1.1).

Following the above discussion, I propose that participation in SNS will have positive implications on the overall *well-being* of active SNS users. Although there are some indications that elderly individuals are increasingly joining some popular online social networks, penetration of SNS is still quite low among elderly individuals. Existing online social networks primarily target younger individuals since these age segments currently form the largest user group (see section 2.2.2). Accordingly, there is little understanding regarding the factors that can facilitate SNS use among elderly SNS users and therefore the established research model will be measured using data from younger and respectively elderly SNS users to derive comparative results and findings to be utilized in the theoretically-driven deduction of social design principles (see section 6.1).

Previous research on ICT use by elderly has highlighted the key motivations for using systems for computer-mediated communication – they are socialization, networking and mutual support, entertainment, intellectual stimulation and challenge, companionship, and safety (Kanayama 2003, 271). These motivations broadly highlight the need for *social connectedness* and *social support* that ICT and system use is expected to satisfy. SNS that effectively support these needs among the elderly are likely to be adopted and further actively used by its members.

I propose that perceived *social connectedness* and perceived *social support* will be positively associated with the use of SNS among the elderly. Feelings of *social connectedness* and *social support* are positively associated with mental and physical health of individuals. While direct effects of these two variables on an individual's health are more difficult to measure, researchers have often relied on self-reported measures of health and *satisfaction with life* as an outcome of social integration and as an indication of overall subjective *well-being* (see section 5.1.2). Therefore, in the underlying thesis I propose that perceived *social connectedness* and perceived *social support* will be positively associated with *social capital* and in turn *social capital* will be positively associated with the overall *satisfaction with life* among SNS users.

Users will perceive high *social connectedness* and high *social support* provided that SNS caters to the above dimensions of connectedness and support. Therefore, the previously described dimensions will be used to assess perceived *social connectedness* and perceived *social support* (see section 5.1.1), which will then be used as predictors for perceived *social capital* gained through SNS use and, in turn, for potentially increased subjective *well-being*. Figure 35 represents the overall research model.

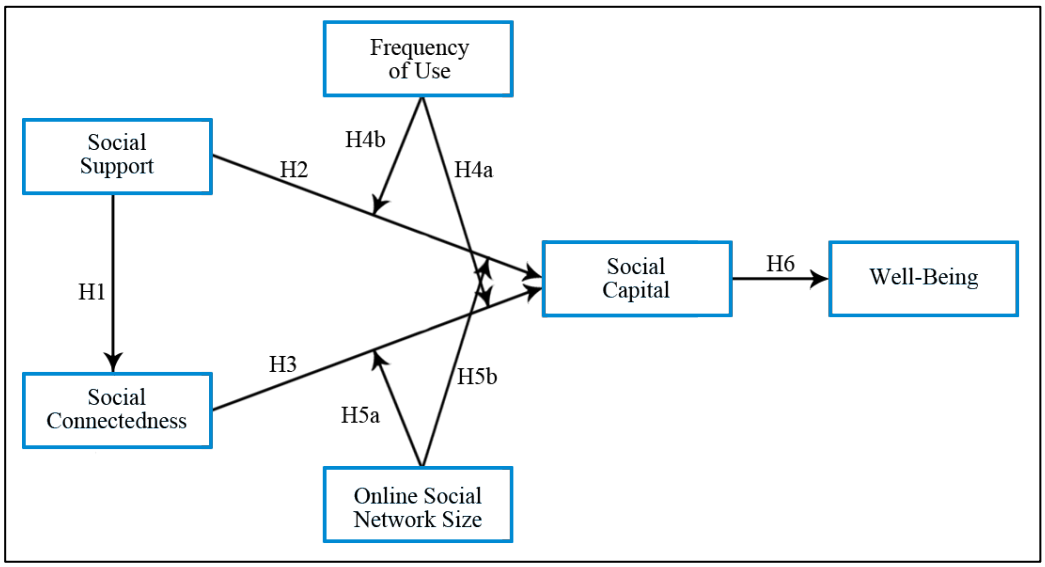

Figure 35: Research model with 'well-being' as the dependent variable
Source: Own illustration

Following considerations of Ashida/Heaney (2008, 889), I assume that the constructs of *social support* and *social connectedness* are positively associated with each other but have differential effects on an individual's perception since not all online social interactions involve the exchange of support but receiving *social support* may facilitate an individual`s sense of *social connectedness* (Ashida/Heaney 2008, 876). Further, based on the previous discussion on the theoretical notion of *social connectedness*, I assume that the feeling of *social connectedness* can solely occur by exchanging *connectedness-orientated* communication with other individuals in the online social network where the exchanged messages does not necessarily convey any form of *social support* (see section 5.1.1). Considering previous discussions on the theoretical notions *social support* and *social connectedness* I therefore hypothesize:

> ***H1:*** *In SNS, perception of social support is positively associated with social connectedness.*

According to the previously conducted theoretical review, *social capital* can be regarded as an outcome of network membership and refers to the value of social relations within and between social networks and the ability to produce collective or individual (economic) benefits from network members. It refers to the ability of social nodes to produce collective or individual economic, psychological, or emotional benefits. Therefore, as stated above, I comprehend that *social capital* reflects the tangible or intangible benefits that can be realized as a result of being embedded within a social network. Therefore, the extent to which network members can appropriate *social capital* from the social network will be determined by either

their achieved *social connectedness* or *social support* within the network (see sections 5.1.1 and 5.2.2.5). Ashida/Heaney (2008, 874) assume a positive effect between the extent of an individual's *social support* and perceived *social capital*. Therefore I hypothesize that:

H2: *In SNS, perception of social support is positively associated with social capital.*

Since *social support* is suggested to be positively related to *social capital* and furthermore positively related to *social connectedness,* I reason that *social connectedness* is also positively associated with *social capital*. As previously stated, various studies suggest (social) connectedness evolving from communities and social networks as an indicator and catalyst for *social capital* (Stone 2001, 18). Therefore *social connectedness* can be viewed as an estimator of the quality of an individual's social network and a precursor to *social capital* (Putnam 2000, 108) or directly linked to *social capital* itself (Harpham/Grant/Thomas 2002, 106) (Bandiera/Barankay/Rasul 2008, 736ff). However a valid and sound argument for reasoning a relationship between *social connectedness* and *social capital* can be found in findings of the previously described empirical study (see section 5.2.2.5). Accordingly I hypothesize that:

H3: *In SNS, social connectedness is positively associated with social capital.*

Following considerations on social integration, social isolation, and *social support* documented by House (1987, 137), I assume *network size* and *frequency of use* with an underlying (online) social network to be the most influential *structural* network properties in the proposed research model. The following paragraphs provide detailed justifications for the proposed moderating effect of *network size* and *frequency of use*.

In the context of the underlying research model, I assume that *frequency of use* will have a positive moderating effect on the precedent established relationships between *social support* and *social capital* as well as *social connectedness* and *social capital*. The assumed positive moderating effect of 'frequency of use' can be explained by the increased quality and quantity of *social support* and *social connectedness* a user potentially achieves through frequent and constant (online) social interactions with social ties present and active on the SNS.

These assumptions in the case of elderly subjects are in line with findings reported by Ashida/Heaney (2008, 875) and Seeman/Berkman (1988, 742ff), which indicate frequent social interactions to be positively associated with *social support* while less frequent social interactions was associated with lower achieved *social support*. Both previously described studies on the notion *social connectedness* show evidence that *frequency of use* is associated with the feeling of *social connectedness* since connectedness is rather influenced by the quantity of active information than by the type or content of exchanged messages (Köbler et al. 2010, 7f) (see section 5.2.1.4). Based on these considerations and previous theoretical reviews (see section 5.1), I impose 'frequency of use' as a moderating variable, which positively moderates the previously hypothesized relationships and therefore phrase the following two hypotheses:

> ***H4a:*** *In SNS, frequency of use positively moderates the relationship between social connectedness and social capital.*

H4b: *In SNS, frequency of use positively moderates the relationship between social support and social capital.*

Multiple studies have shown that *structural* characteristics of social networks are associated with the provision of *social support* (Ashida/Heaney, 2008, 876) and characterized the notion of *social connectedness* by the size of the available social network (Cornwell/Laumann/Schumm 2008, 187ff). For example, some of the referenced studies could show that *social support* is more often provided to individuals within social networks that are larger in size.

In contrast to Ashida/Heaney (2008, 876, 887) who hypothesized that network characteristics such as size, density, number of network members with frequent contact and number of members in close geographical proximity would be positively associated with both perceived *social support* and *social connectedness* in their proposed model. I hypothesize that *network size* would positively moderate the hypothesized relationships between *social support*, *social connectedness,* and *social capital*.

H5a: *In SNS, network size positively moderates the relationship between social connectedness and social capital.*

H5b: *In SNS, network size positively moderates the relationship between social support and the social capital.*

Based on sufficiently strong evidence, Helliwell/Putnam (2004, 1443) assume that all potential forms of *social capital* are positively associated with and bear strong positive effects on an individual's subjective *well-being* in several different forms (see section 5.1.2). Therefore I assume that the degree of an individual's perceived *social capital* through SNS is positively associated with the individual's over all *well-being*. Consequently, I hypothesize that:

H6: *In SNS, social capital is positively related to his/her overall well-being.*

Following the above discussion, I propose that participation in SNS will have positive implications for the overall *well-being* of active SNS users.

The subsequent section comprises the applied methodology to measure the proposed research model and test developed hypotheses.

5.4.1 Methodology

An online survey was designed to measure perceived *social connectedness, social support, social capital,* and *well-being* (see section 5.1) among participating SNS users. All variables were operationalized using multi-item survey scales. In contrast to the previously described empirical study, no actual values were directly obtained from the SNS Facebook due to the fact that it does not support an API that allows retrieving user data through function calls. In order to enhance validity of applied survey instrument, tested and validated scales from previous studies were implemented to measure variables (Stone 1978, 39ff). Additionally, established measurement items for *social connectedness* and *social capital* were adapted to a

Facebook context and refined based on insights gained in the course of previously described empirical study (see sections 5.4.1.1 and 5.4.1.2).

In an initial step, *content validity* of the measurement items were assessed by researchers and faculty members at the Chair for Information Systems at Technische Universität München. The generated feedback was used to refine the items. Following this, two rounds of *card sorting* exercise (*labeled* and *unlabeled*) were carried out based on Moore/Benbasat (1991, 200f). Four graduate students participated in each sorting exercise. For the *unlabeled sorting* exercise, the labels or descriptions that the sorters came up with closely corresponded with the actual construct names and on average more than 62% of the items were correctly sorted into their intended constructs. The results of the *unlabeled sorting* exercise were then used to drop some of the measurement items (which were wrongly sorted or found to be ambiguous) and to refine the scale. The *labeled sorting* exercise followed the same approach previously described and resulted in an even higher percentage of the items getting correctly sorted into their intended constructs, thus indicating a high level of content validity (see Appendix D).

The following paragraphs provide a brief definition of applied constructs (i) *social capital*, (ii) *social connectedness*, (iii) *social support,* (iv) subjective *well-being,* and (v) *frequency of use* as well as an overview of actual operationalization of these constructs on the item level.

5.4.1.1 Social capital measurement items

Table 23 summarizes the measurement items for the construct *social capital*. All items were measured by applying a 7-point Likert scale – if necessary items were adapted to an online social networking as well as Facebook context accordingly. The majority of applied items was adapted from Williams (2006, 606).

Item	Questionnaire Item	Type of Item	Reference
SCap1	There are several people in Facebook I trust to solve my problems.	7-point Likert	(Williams 2006, 606)
SCap2	There is someone on Facebook I can turn to for advice about making very important decisions.	7-point Likert	(Williams 2006, 606)
SCap3	When I feel lonely, there are several people on Facebook I can talk to.	7-point Likert	(Williams 2006, 606)
SCap4	If I needed an emergency loan of $100, I know someone in Facebook I can turn to.	7-point Likert	(Williams 2006, 606)
SCap5	The people I interact with in Facebook would be good job references for me.	7-point Likert	(Williams 2006, 606)
SCap6	If I needed to, I could ask a Facebook acquaintance to do a small favor for me.	7-point Likert	–
SCap7	I would be able to stay with a Facebook acquaintance if traveling to a different city.	7-point Likert	–
SCap8	I can turn to my Facebook acquaintance when in an urgent need for help.	7-point Likert	–
The level of agreement/disagreement with the statements regarding a participant's perceived social capital on Facebook was assessed through a scale of 'strongly disagree' to 'strongly agree'.			

Table 23: Measurement items for the construct 'social capital'
Source: Own illustration

In some cases, items were excluded from further analyses since factor loadings or cross loadings showed insufficient or improper values (see Appendix A). If necessary, the procedure was also applied on all of the items described below.

5.4.1.2 Social connectedness measurement items

The construct *social connectedness* was operationalized and measured with items applied in the previously described empirical study and are mostly based on previously developed and evaluated items by Ledbetter (2009, 471) and Lee/Draper/Lee (2001, 312) (see Table 24).

Item	Questionnaire Item	Type of Item	Reference
SCo_1	If I lost Facebook access, I think I would probably lose contact with many of my friends.	7-point Likert	(Ledbetter 2009, 471)
SCo_2	Without Facebook my social life would be drastically different.	7-point Likert	(Ledbetter 2009, 471)
SCo_3	I would communicate less with my friends if I could not talk with them on Facebook.	7-point Likert	(Ledbetter 2009, 471)
SCo_4	*I feel distant from people in my Facebook network.*	7-point Likert	(Lee/Draper/Lee 2001, 312)
SCo_5	*I feel like an outsider in my Facebook network.*	7-point Likert	(Lee/Draper/Lee 2001, 312)
SCo_6	*I feel disconnected from the Facebook world around me.*	7-point Likert	(Lee/Draper/Lee 2001, 312)
SCo_7	I feel close to people on Facebook.	7-point Likert	(Lee/Draper/Lee 2001, 312)
SCo_8	I am able to relate to my peers on Facebook.	7-point Likert	(Lee/Draper/Lee 2001, 312)
SCo_9	I am able to connect with other people on Facebook.	7-point Likert	(Lee/Draper/Lee 2001, 312)
SCo_10	I feel understood by the people I know on Facebook.	7-point Likert	(Lee/Draper/Lee 2001, 312)
SCo_11	*I have little sense of togetherness with my peers on Facebook.*	7-point Likert	(Lee/Draper/Lee 2001, 312)
SCo_12	I find myself actively involved in my Facebook friend's lives.	7-point Likert	(Lee/Draper/Lee 2001, 312)
The level of agreement/disagreement with the statements regarding a participant's perceived social connectedness on the SNS Facebook was assessed through a scale of 'strongly disagree' to 'strongly agree'.			

Table 24: Measurement items for the construct 'social connectedness'
Source: Own illustration

Although most items for *social connectedness* are suggested to be measured by a 6-point Likert scale (Lee/Draper/Lee 2001, 312), the scale for the underlying study was adjusted to a 7-point Likert scale.

5.4.1.3 Social support measurement items

Table 25 provides an overview on applied measurements items for social support. The derivation of items followed the theoretical conceptualization of *social support* introduced by House (1981, 24ff), which distinguishes between *emotional support, instrumental support, informational support,* and *appraisal support* (see section 5.1.1.2). While the latter two notions of *social support* were measured by items (SSu_1 to SSu_8) adopted from Schwarzer/Knoll/Rieckmann (2004, 162), *informational* and *appraisal support* were measured by items (SSu_9 to SSu_15) specifically developed in the course of the thesis based on considerations stated by House (1981).

Item	Questionnaire Item	Type of Item	Reference
SSu_1	There are some people on Facebook who truly like me.	7-point Likert Emotional Support	(Schwarzer/Knoll/Rieckmann 2004, 162)
SSu_2	Whenever I am not feeling well, other people on Facebook show me that they are fond of me.	7-point Likert Emotional Support	(Schwarzer/Knoll/Rieckmann 2004, 162)
SSu_3	Whenever I am sad, there are people on Facebook who cheer me up.	7-point Likert Emotional Support	(Schwarzer/Knoll/Rieckmann 2004, 162)
SSu_4	There is always someone there for me on Facebook when I need comforting.	7-point Likert Emotional Support	(Schwarzer/Knoll/Rieckmann 2004, 162)
SSu_5	I know some people on Facebook upon whom I can always rely.	7-point Likert Instrumental Support	(Schwarzer/Knoll/Rieckmann 2004, 162)
SSu_6	When I am worried, there is someone on Facebook who helps me.	7-point Likert Instrumental Support	(Schwarzer/Knoll/Rieckmann 2004, 162)
SSu_7	There are people on Facebook who offer me help when I need it.	7-point Likert Instrumental Support	(Schwarzer/Knoll/Rieckmann 2004, 162)
SSu_8	When everything becomes too much for me to handle, others on Facebook are there to help me.	7-point Likert Instrumental Support	(Schwarzer/Knoll/Rieckmann 2004, 162)
SSu_9	There are people on Facebook who offer relevant information when I need them.	7-point Likert Informational Support	–
SSu_10	I can rely on my Facebook friends for useful information.	7-point Likert Informational Support	–
SSu_11	Whenever I need information, I would first ask my Facebook friends.	7-point Likert Informational Support	–
SSu_12	I consider Facebook as a reliable source for information.	7-point Likert Informational Support	–
SSu_13	I consider the feedback of my Facebook friends as important.	7-point Likert Appraisal Support	–
SSu_14	I value the feedback I get from my Facebook friends.	7-point Likert Appraisal Support	–
SSu_15	I take both positive and negative feedback from my Facebook friends seriously.	7-point Likert Appraisal Support	–
The level of agreement/disagreement with the statements regarding a subject's perceived social support on Facebook was assessed through a scale of 'strongly disagree' to 'strongly agree'. Items SSu_9 to SSu_15 were specifically developed in the course of the thesis.			

Table 25: Measurement items for the construct 'social support'
Source: Own illustration

In parallel to applied *social connectedness* measurement items, all items measuring *social support* were adjusted to a 7-point Likert scale for the underlying thesis research.

5.4.1.4 Subjective well-being measurement items

The *Well-being Index* of the WHO was applied in order to measure an individual's actual *well-being* (or happiness) since previous studies documented sufficient internal and external validity of measure and simple adoption to different contexts (Bonsignore et al. 2001, 27ff).

Item	Questionnaire Item	Type of Item	Reference
WeBe_01_01	Over the last two weeks I have felt cheerful and in good spirits.	7-point Likert	(World Health Organization 1998)
WeBe_01_02	Over the last two weeks I have felt calm and relaxed.	7-point Likert	(World Health Organization 1998)
WeBe_01_03	Over the last two weeks I have felt active and vigorous.	7-point Likert	(World Health Organization 1998)
WeBe_01_04	Over the last two weeks I woke up feeling fresh and rested.	7-point Likert	(World Health Organization 1998)
WeBe_01_05	Over the last two weeks I my daily life has been filled with things that interest me.	7-point Likert	(World Health Organization 1998)
The level of agreement/disagreement with the statements regarding a participant's perceived well-being was assessed through a scale of 'all of the time' to 'at no time'.			

Table 26: Measurement items adopted from the WHO Well-being Index
Source: Own illustration

In addition to the *Well-being Index*, the *Satisfaction with Life Scale* by Diener et al. (1985, 72) was applied given that items have been validated in previous studies (Pavot/Diener 1993, 165ff).

Item	Questionnaire Item	Type of Item	Reference
WeBe_02_01	In most ways my life is close to my ideal.	7-point Likert	(Diener et al. 1985)
WeBe_02_02	The conditions of my life are excellent.	7-point Likert	(Diener et al. 1985)
WeBe_02_03	I am satisfied with my life.	7-point Likert	(Diener et al. 1985)
WeBe_02_04	So far I have gotten the important things I want in life.	7-point Likert	(Diener et al. 1985)
WeBe_02_05	If I could live my life over, I would change almost nothing.	7-point Likert	(Diener et al. 1985)
The level of agreement/disagreement with the statements regarding a participant's perceived well-being was assessed through a scale of 'strongly disagree' to 'strongly agree'.			

Table 27: Applied measurement items adopted from the Satisfaction with Life Scale
Source: Own illustration

The former measurement items were excluded from further analyses since factor loadings and cross loadings showed insufficient or improper values.

5.4.1.5 Intensity and frequency of use measurement items

In order to measure how much a participant is actively engaged in her SNS use, the *Facebook Intensity Scale* has been used, which consists of self-reported items about time spent and number of friends on the SNS Facebook as well as items that measure a subject's attitude towards Facebook (Ellison/Steinfield/Lampe 2007, 1150) (see Table 28). In addition, items were applied that assess a subject's system use and accordingly adapted to a Facebook context (Straub/Limayem/Krahnna-Evaristo 1995, 1329ff).

Item	Questionnaire Item	Type of Item	Reference
Fa_intens_01	Facebook is a part of my everyday activity.	7-point Likert	(Ellison/Steinfield/Lampe 2007, 1150)
Fa_intens_02	I am proud to tell people I'm on Facebook.	7-point Likert	(Ellison/Steinfield/Lampe 2007, 1150)
Fa_intens_03	Facebook has become part of my daily routine.	7-point Likert	(Ellison/Steinfield/Lampe 2007, 1150)
Fa_intens_04	I feel out of touch when I haven't logged onto Facebook for a while.	7-point Likert	(Ellison/Steinfield/Lampe 2007, 1150)
The level of agreement/disagreement with the statements regarding a participant's perceived well-being was assessed through a scale of 'strongly disagree' to 'strongly agree'.			

Table 28: Measurement items for intensity of SNS use
Source: Own illustration

The following sections provide a description of applied sampling and data collection, and outline conducted validity tests and data analysis.

5.4.2 Sampling and data collection

Parallel to the previously described studies and various other studies (Ledbetter et al. 2010, 36), data collection primarily followed a *snowball sampling* approach by using several individual networks on the SNS Facebook. First, an invitation for participation was published on multiple Facebook profiles including an invocation to share the information. Next, direct private messages were sent out to online social ties asking for participation and to share the information with a recipient's network or to directly redirect the message to their corresponding online social networks. Lastly, I sent a highly personalized note to family members who are registered users on the SNS Facebook to share and redirect given reference. A detailed description and discussion of *snowball sampling* is provided in section 4.2.1.

Parallel to the *snowball sampling* efforts on the SNS Facebook to obtain data from elderly individuals, a reference was posted in several other SNS and VCs that target elderly users who are additionally registered with the SNS Facebook. The survey was online for a time period of approximately 20 weeks in 2011 and 2012.

5.4.3 Demographics and construct validity tests

Demographics

Due to the applied sampling approach, all respondents were users of the SNS Facebook. The sample was equally distributed between male and female Facebook users and comprised collected 175 responses. After a data cleaning process that included verification on valid and complete data, 147 data sets were included in the final analysis. Table 29 provides a detailed summary on the demographical variables of survey participants.

Variable	Categories	Frequencies
Gender	Male	58 (39.5%)
	Female	85 (57.8%)
	Not specified	4 (2.7%)
Age	18 - 24	26 (17.7%)
	25 - 34	74 (50.3%)
	35 - 44	19 (12.9%)
	45 - 54	6 (4.1%)
	55 - 64	14 (9.5%)
	65 - 74	3 (2.0%)
	75 - 84	1 (0.7%)
	Not specified	4 (2.7%)
Education	High School	30 (20.4%)
	Bachelor	35 (23.8%)
	Master / Diploma	59 (40.1%)
	PhD	7 (4.8%)
	Other	10 (6.8%)
	Not specified	6 (4.1%)

Table 29: Demographic data of collected sample (N = 147)
Source: Own illustration

The average age of the participant was 33.31 years of age with a median age of the total sample at 28 years of age. Most participants (50.3%) were between 25 and 34 years old, with the next largest group of subjects (17.7 %) comprised of 18 and 24 year olds. 9.5% of all answers were submitted by individuals between the age of 55 and 64 whereas 12.2% of subjects in the sample are older than 55 years of age. In parallel to the sample collected in the *explorative quantitative study* (see section 4.2.1), it could be observed that female participants submitted over 57.8% of all answered surveys. Concerning the relationship status 30.6% of subjects indicated to be single at the time of the study whereas 59.9% of individuals were in a relationship or married, 6.1% of the sample were divorced and 2.7% widowed. 32.7% of the participants are parents to one or more children and 7.5% indicated to have grandchildren. Subjects who indicated to have one or more children also declared that their children either live in the same house or apartment (n = 18; respectively 37.5%), in the same part of town (n = 6, respectively 12.6%) or in the same town or village (less than 50 kilometers apart) (n = 8, respectively 16.7%). Respectively 27.1% (n = 13) of parents within the sample declared that their child/children live more than 100 kilometers away. 68.7% of subjects were employed at the time of the study or pursued part time employment. The majority of participants indicated a Master's or an equivalent diploma as the highest obtained degree (40.1%) and 23.8% completed a Bachelor's diploma. 73.5% of participants declared to be of European nationality,

where 63.3% of subjects were German and 13.6% of participants declared a North American nationality.

Construct validity tests

In parallel to the previously described study, PLS analysis was used to perform the data analysis. *Internal consistency*, *convergent validity*, and *discriminant validity* were assessed to validate applied instruments (see also Appendix A).

Table 30 shows the factor loadings of applied measurement items for the construct 'social capital' and provides information on the *internal consistency* of the research model.

Construct	Item	Factor Loadings	Composite Reliability	AVE
Social Capital	SCap1	0.7108	0.9185	0.5865
	SCap2	0.7802		
	SCap3	0.7262		
	SCap4	0.6925		
	SCap5	0.7056		
	SCap6	0.8460		
	SCap7	0.7645		
	SCap8	0.8791		

Table 30: Factor loadings of the construct 'social capital'
Source: Own illustration

Table 31 displays the factor loadings of applied measurement items for the construct 'social connectedness' and provides information on the *internal consistency* of the research model.

Construct	Item	Factor Loadings	Composite Reliability	AVE
Social Connectedness	SCo_1	0.5392	0.8794	0.4812
	SCo_2	0.5583		
	SCo_3	0.6775		
	SCo_7	0.7885		
	SCo_8	0.7720		
	SCo_9	0.6835		
	SCo_10	0.7856		
	SCo_12	0.6972		

Table 31: Factor loadings for the construct 'social connectedness'
Source: Own illustration

Table 32 lists the factor loadings of applied measurement items for the construct 'social support'.

Construct	Item	Factor Loadings	Composite Reliability	AVE
Social Support	SSu_1	0.5421	0.9138	0.5474
	SSu_2	0.6926		
	SSu_3	0.6599		
	SSu_6	0.6801		
	SSu_7	0.7852		
	SSu_10	0.8204		
	SSu_12	0.5835		
	SSu_13	0.7695		
	SSu_14	0.8313		

Table 32: Factor loadings for the construct 'social support'
Source: Own illustration

Table 33 displays the factor loadings of applied measurement items for the construct 'well-being' and provides information on the *internal consistency* of the research model.

Construct	Item	Factor Loadings	Composite Reliability	AVE
Well-being	WeBe_02_01	0.8828	0.9036	0.6540
	WeBe_02_02	0.8080		
	WeBe_02_03	0.8525		
	WeBe_02_04	0.8160		
	WeBe_02_05	0.6673		

Table 33: Factor loadings for the construct 'well-being'
Source: Own illustration

Table 34 shows the correlation between constructs, with the diagonal elements being the square roots of AVE. The values indicate how the variance shared by a particular set of constructs compare to the variance that is shared by another set of constructs and are used as an indicator of *discriminant validity*, in parallel to the previous study (see section 5.2.2.4).

	Social Capital	Social Connectedness	Social Support	Well-being
Social Capital	**0.7658**			
Social Connectedness	0.6270	**0.6936**		
Social Support	0.6731	0.7181	**0.7399**	
Well-being	0.2262	0.1940	0.2230	**0.8090**

Diagonal elements are the square roots of AVE (for latent constructs).
Marked number indicates low *discriminant validity* between corresponding constructs.

Table 34: Correlations between constructs
Source: Own illustration

In parallel to the previous study, *discriminant validity* was assessed by checking the factor loadings and cross loadings of the measurement items (see Table 35). Overall, the data provides empirical support for *reliability* as well as *convergent* and *discriminant validity* of selected scales of the measurement model.

	Social Capital	Social Connectedness	Social Support	Well-being
SCap1	**0.7108**	0.4388	0.4606	0.1751
SCap2	**0.7802**	0.4838	0.4658	0.1973
SCap3	**0.7262**	0.5581	0.6233	0.0912
SCap4	**0.6925**	0.3500	0.3675	0.2527
SCap5	**0.7056**	0.5324	0.5528	0.1389
SCap6	**0.8460**	0.4713	0.5050	0.1896
SCap7	**0.7645**	0.4382	0.4868	0.1454
SCap8	**0.8791**	0.4382	0.5971	0.2191
SCo_1	0.3636	**0.5392**	0.4080	0.0092
SCo_2	0.1978	**0.5583**	0.2607	0.0106
SCo_3	0.3693	**0.6775**	0.4385	0.0691
SCo_7	0.5122	**0.7885**	0.6072	0.2450
SCo_8	0.5128	**0.7720**	0.5712	0.1524
SCo_9	0.3511	**0.6835**	0.3799	0.1038
SCo_10	0.5437	**0.7856**	0.6550	0.2116
SCo_12	0.4774	**0.6972**	0.4951	0.1487
SSu_1	0.3920	0.3639	**0.5421**	0.2555
SSu_2	0.4205	0.5401	**0.6926**	0.0082
SSu_3	0.3605	0.5523	**0.6599**	0.0586
SSu_6	0.4520	0.4937	**0.6801**	-0.0094
SSu_7	0.5927	0.5036	**0.7852**	0.1916
SSu_10	0.5614	0.5805	**0.8204**	0.1775
SSu_12	0.3652	0.4448	**0.5835**	0.1477
SSu_13	0.4551	0.6114	**0.7695**	0.1035
SSu_14	0.5364	0.6193	**0.8318**	0.1696
WeBe_02_01	0.1763	0.2050	0.2281	**0.8828**
WeBe_02_02	0.2116	0.1350	0.0879	**0.8080**
WeBe_02_03	0.1568	0.1555	0.1646	**0.8525**
WeBe_02_04	0.2079	0.1749	0.2490	**0.8160**
WeBe_02_05	0.1429	0.1070	0.1776	**0.6673**

Table 35: Factor loadings and cross loadings of selected measurement items
Source: Own illustration

The remaining sections of the chapter are organized as follows: I first constitute conducted analysis including two measurement models and subsequently discuss the documented findings. I then depict the limitations and summarize contributions achieved by executing with underlying study.

5.5 Findings and discussion

At the time of the study, the SNS Facebook has been used for an average of 35.1 months by participants. Table 36 indicates that the majority of participants have used the SNS Facebook longer than one year and only a small minority of participants was recently registered with the SNS. Therefore, the sample indicates the average participant is an experienced Facebook user who employs *online social networking* as a part of their everyday life and social interaction routines.

Duration of Facebook use	Relative frequencies
Less than a month	1 (0.7%)
Between 1 and 3 months	1 (0.7%)
Between 3 and 6 months	1 (0.7%)
Between 6 and 12 months	2 (1.4%)
Between 1 and three years	76 (51.7%)
Between 3 and 5 years	51 (34.7%)
More than 5 years	11 (7.5%)
Not specified	4 (2.7%)

Table 36: Tenure of SNS Facebook use within the sample
Source: Own illustration

The average number of Facebook logins was estimated to be 26.69 times per week ($\sigma = 87.26$; 1st quartile = 7; median = 10; N = 143) with a stated average retention period of approximately 30.93 minutes ($\sigma = 50.57$; 1st quartile = 10; median = 15; N = 143). The average retention period on the SNS Facebook is difficult to assess since users might be logged in on the SNS in the background or use a mobile application while on the go. On average, participants send approximately 27 private messages a month via Facebook ($\sigma = 37.53$; 1st quartile = 5; median = 10; N = 143). Table 37 displays the intensity of the SNS Facebook use measured in the frequency of realized status message updates.

Intensity of Facebook use	Relative frequencies
Many times a day	4 (2.7%)
Daily	12 (8.1%)
Every two or three days	22 (15.0%)
Weekly	29 (19.7%)
Monthly	25 (17.7%)
Every two or three months	34 (23.1%)
Never	17 (11.6%)
Not specified	4 (2.7%)

Table 37: Intensity of Facebook use measured in frequency of status message updates
Source: Own illustration

Intensity of Facebook use and permeation of *online social networking* in the daily lives of participants was additionally measured by four items (see Table 38). While Facebook use seems to be a part of everyday activities (5.35; $\sigma = 1.99$; N = 143) or has become part of daily routine for the majority of participants (5.04; $\sigma = 2.07$; N = 143), participants rather disagree that they would feel out of touch with their (online) social ties when they have not logged onto the SNS for a while (3.73; $\sigma = 2.08$; N=143).

Item	Mean	σ
Facebook is a part of my everyday activity.	5.35 (N = 143)	1.99
I am proud to tell people I'm on Facebook.	3.18 (N = 143)	1.87
Facebook has become part of my daily routine.	5.04 (N = 143)	2.07
I feel out of touch when I haven't logged onto Facebook for a while.	3.73 (N = 143)	2.08
The level of agreement/disagreement with the statements were assessed through a scale of 'strongly disagree' (1) to 'strongly agree' (7).		

Table 38: Assessed permeation of Facebook in the daily lives of participants
Source: Own illustration

Data indicates that subjects assume many (41.96%) or at least some (39.16%) of their friends in their online social networks know each other. 9.14% of the participants even assess that most of their social online ties in turn are socially tied to each other. Furthermore, evidence suggests that the density of subjects' online social networks is relatively high since participants indicated that most of their real-life social ties are in turn connected with each other on the SNS Facebook. 39.9% of subjects stated that many of their social ties are also connected with each other on the SNS Facebook; respectively 37.06% (and 16.78%) assessed some (most) of their social ties to be connected on the SNS. Only a minority of subjects assume to have less dense online social networks.

Findings of the above described descriptive analysis are consulted in the following PLS analysis of the obtained data set. Analysis was conducted using the software SmartPLS Version 2.0 (Ringle/Wende/Will 2005).

In the following, I present various tested models and discuss the results. In an initial step, I tested two basic models (**Model 1a** and **1b**) incorporating only the main effects and then introduced the moderating effects in subsequent models (**Model 2a, 2b** and **2c**). **Model 1a** tested the hypothesized main effects corresponding to the hypotheses H1, H2, H3 and H6 and only explained 5.1% in the variance of the dependent variable 'well-being'.

Variable	Path Coefficients	Implications
Independent Variables		
Social Support → Social Connectedness	0.718***	**H1 Supported**
Social Support	0.460***	**H2 Supported**
Social Connectedness	0.297***	**H3 Supported**
Social Capital	0.226***	**H6 Supported**
R^2	**0.051**	
*p<0.05; **p<0.01; ***p<0.001		

Table 39: Hypotheses testing Model 1a (dependent variable 'well-being')
Source: Own illustration

Table 39 and Figure 36 display results on path coefficients and derived implications.

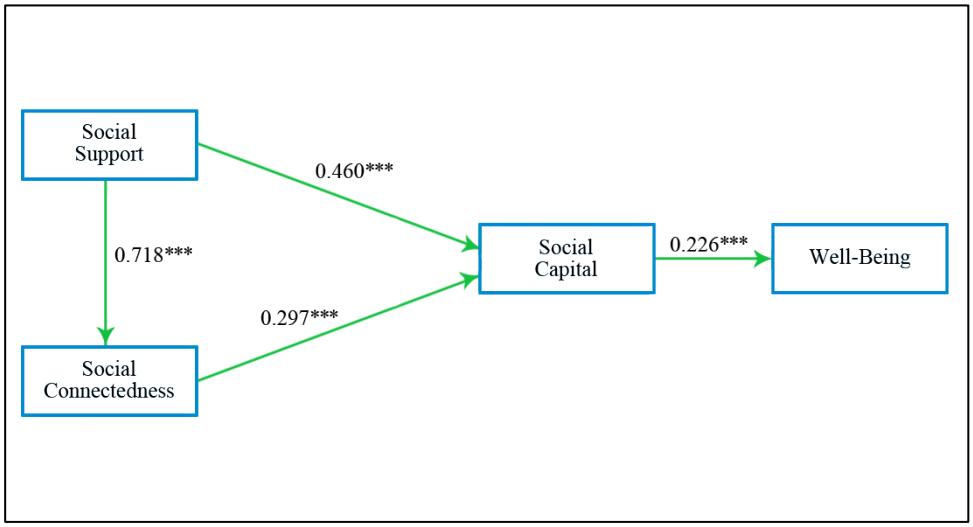

Figure 36: Measured research model (Model 1a) with path coefficients
Source: Own illustration

The above reported results could confirm previously documented results and considerations in that direct effect of *social support* and *social connectedness* on an individual's *well-being* is more difficult to measure (Bowling/Farquhar/Browne 1991, 563f). Furthermore, results suggest utilizing other theoretical constructs to approximate and measure individuals' subjective *well-being*. In the underlying thesis, I therefore apply the theoretical construct 'social capital' as a mediator variable for an individual's *well-being*. Table 40 summarizes results I obtained while measuring **Model 1b** with 'social capital' as the dependent variable. Overall, **Model 1b** could explain 50.0% of the variance in the variable 'social capital'.

Variable	Path Coefficients	Implications
Independent Variables		
Social Support → Social Connectedness	0.718***	**H1 Supported**
Social Support	0.462***	**H2 Supported**
Social Connectedness	0.297***	**H3 Supported**
R^2	**0.500**	
*p<0.05; **p<0.01; ***p<0.001		

Table 40: Hypotheses testing Model 1b (dependent variable 'social capital')
Source: Own illustration

Table 41 displays results of further model testing including the hypothesized moderating effects. Overall, **Model 2a** and **Model 2b** could respectively explain 5.2% and 5.1% of the variance in the dependent variable 'well-being'.

	Path Coefficients		
Variable	**Model 2a**	**Model 2b**	**Implications**
Independent Variables			
Social Support → Social Connectedness	0.718***	0.577***	**H1 Supported**
Social Support	0.556***	0.565***	**H2 Supported**
Social Connectedness	0.366***	0.332***	**H3 Supported**
Social Capital	0.227***	0.227***	**H6 Supported**
Moderating effect of Network Size			
Network Size * Social Support	-0.023	-0.015	**H5b Not Supported**
Network Size * Social Connectedness	-0.441	-0.484	**H5a Not Supported**
Network Size * Social Support → Social Connectedness	-	0.139	**H5c Not Supported**
Moderating effect of Frequency of Use			
Frequency of Use * Social Support	-0.270	-0.278	**H4b Not Supported**
Frequency of Use * Social Connectedness	0.056	0.145	**H4a Not Supported**
Frequency of Use * Social Support → Social Connectedness	-	0.057	**H4c Not Supported**
R^2	**0.052**	**0.051**	
*p<0.05; **p<0.01; ***p<0.001			

Table 41: Hypotheses testing Model 2a and Model 2b (dependent variable 'well-being')
Source: Own illustration

Figure 37 summarizes the results in a graphical representation of the measured research model (**Model 2b**) with corresponding path coefficients.

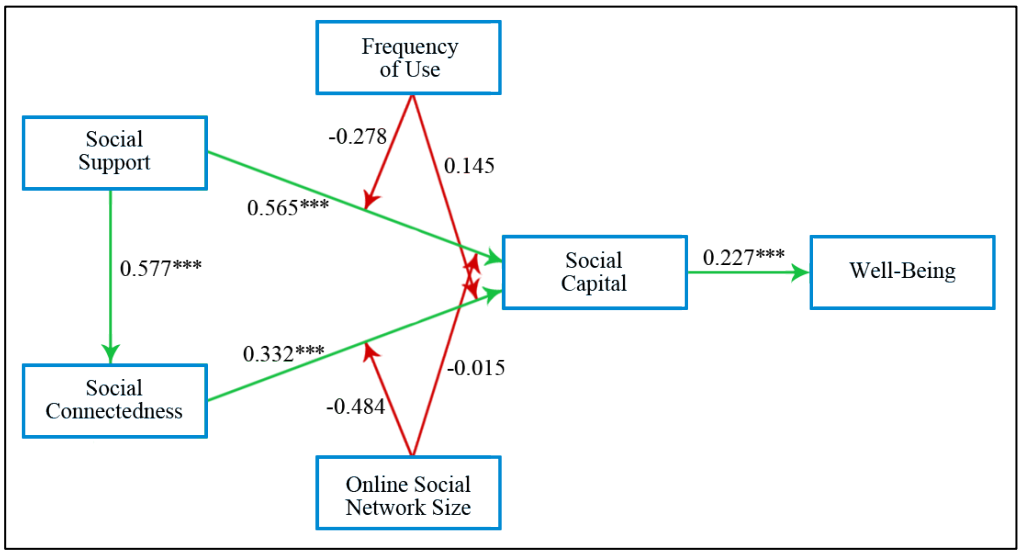

Figure 37: Measured research model (Model 2b) with path coefficients
Source: Own illustration

Parallel to the above described analysis, I additionally tested a model with 'social capital' as the dependent variable and hypothesized moderating effects of the variables 'frequency of use' and 'network size' (**Model 2c**). Further, I introduced two potential moderating effects of the variables 'frequency of use' and 'network size' on the relationship between *social support* and *social connectedness* (**H4c** and **H5c**). Overall, **Model 2c** could explain 52.6% of the variance in the variable 'social capital'.

Variable	Path Coefficients	Implications
Independent Variables		
Social Support → Social Connectedness	0.579***	**H1 Supported**
Social Support	0.563***	**H2 Supported**
Social Connectedness	0.336***	**H3 Supported**
Moderating effect of Network Size		
Network Size * Social Support	-0.015	**H5b Not Supported**
Network Size * Social Connectedness	-0.481	**H5a Not Supported**
Network Size * Social Support → Social Connectedness	0.138	**H5c Not Supported**
Moderating effect of Frequency of Use		
Frequency of Use * Social Support	-0.269	**H4b Not Supported**
Frequency of Use * Social Connectedness	0.134	**H4a Not Supported**
Frequency of Use * Social Support → Social Connectedness	0.053	**H4c Not Supported**
R^2	**0.526**	
*p<0.05; **p<0.01; ***p<0.001		

Table 42: Hypotheses testing Model 2c (dependent variable 'social capital')
Source: Own illustration

In all tested models, I could demonstrate that the constructs of 'social support' and 'social connectedness' are positively associated with each other (**H1**) and that the reception of *social support* may facilitate an individual`s sense of *social connectedness* (Ashida/Heaney 2008, 876). I further conclude that in SNS the feeling of *social connectedness* can solely occur by exchanging *connectedness-orientated* communication with other individuals in the social network whereas the exchanged messages does not necessarily convey any form of *social support.*

In the underlying thesis, I introduced *social capital* as an outcome of network membership that refers to the value of social relations within and between social networks and the ability to produce collective or individual (economic) benefits from (online social) network members. The model testing could show that the extent to which network members can appropriate *social capital* from their online social network is determined by either their achieved *social connectedness* or *social support* within the network (**H2** and **H3**). Therefore, I comprehend that *social capital* reflects the tangible or intangible benefits that can be realized by *online social networking*.

In the context of the underlying research model, I assumed that 'frequency of use' has a positive moderating effect on the relationships between 'social support' and 'social capital' as well as 'social connectedness' and 'social capital' (**H4a** and **H4b**) in *online social networking.* In contrast to findings reported by Ashida/Heaney (2008, 875) (in the case of elderly individuals, Seeman/Berkman (1988, 742ff)) that indicate frequent online social interactions to be positively associated with *social support* while less frequent social interactions were associated with lower achieved *social support*, H4a and H4b had to be rejected. However, results

suggest a weak moderating effect of 'frequency of use' on the formation of *social connectedness* on SNS and further strengthen the assumption that *frequency of use* is associated with the feeling of *social connectedness* in the way that connectedness is more influenced by the quantity of active information than by the type or content of exchanged messages (Köbler et al. 2010, 7f).

Multiple studies could show that *structural* characteristics of social networks are associated with the provision of *social support* (Ashida/Heaney 2008, 876) and further prove that the notion of *social connectedness* is characterized by the size of the available social network (Cornwell/Laumann/Schumm 2008, 187ff). I hypothesized that 'network size' would be positively moderating the hypothesized relationships between 'social support', 'social connectedness', and 'social capital' (**H5a** and **H5b**). Analysis could not show a moderating effect of the variable 'network size' on the three hypothesized causal relationships. In contrast to some of the referenced studies, *social support* is not typically more often provided to individuals within social networks that are larger in size. In the context of the thesis, I like to stress the latter finding since empirical evidence suggests online social networks of elderly individuals to be smaller in size measured in the amount of accepted friend requests on the SNS Facebook when compared to their younger counterparts. Therefore I assume that the provision of *social support*, formation of *social connectedness,* and the realization of *social capital* through *online social networking* are independent of the size of an individual's online social network and rather are positively influenced by the frequency of social interaction on SNS, e.g., in the form of frequently exchanged *connectedness-oriented communication.* The stronger moderating influence of 'frequency of use', when compared to the variable 'network size', could also be explained by the fact that most subjects in the collected sample intensively use the SNS Facebook since *online social networking* seems to be a part of their everyday activities. I propose that the effect of frequent SNS use on the provision of *social support*, formation of *social connectedness,* and the realization of *social capital* might be even stronger in future applications since *online social networking* increasingly penetrates an individual's everyday life based on mobile and ubiquitousness of online connectivity.

With the conducted study, I could reproduced findings previously documented by Helliwell/Putnam (2004, 1443) who found evidence that all potential forms of *social capital* are positively associated with and bear strong positive effects on an individual's subjective *well-being* (**H6**). However, all measured research models comprising 'well-being' as the dependent variable could only explain approximately 5.0% of the variance. Since Rook (1990, 219-250) argues that provision of *social support* is not solely the result of increased subjective *well-being* but is rather the consequence of interactions in a meaningful social context (Schwarzer/Knoll/Rieckmann 2004, 161), I introduced 'social capital' as a mediator variable between 'social support' and 'social connectedness', and 'well-being' in variations of the basic research model. The analyzed research models could explain approximately 50.0% of the variance in the variable 'social capital' and could show that *social capital* can be formed by computer-mediated communication and online social interaction based on active, constant, and frequent participation on SNS.

In section 8.1, I summarize theoretical contributions of the executed study to the IS and HCI research disciplines.

At this point I abstain from a detailed description of potential limitations arising from the previously documented empirical study and rather provide a brief overview of limitations in conjunction with the compilation and evaluation of the proposed social design principles (see section 6.1). Yet, in a next step, I attempt to transform gained theoretical understanding into concrete design implications for SNS functionalities to leverage social benefits applying *theory-driven design* (Card 1989, 501ff) and *evidence-based social design* (Kraut/Resnick 2012, 9ff) novel approaches in the field of IS and HCI research to solve practical problems and to advance state-of-the art implementations. Findings and gained insights of conducted studies in scope of the thesis research serve as justifications in the form of *theory-driven* and/or *evidence-based rationales* for each presented social design principle (see section 6.1).

6 Deduction and evaluation of social design principles

The following chapter not only comprises the *theory-driven* and *evidence-based* deduction and compilation of proposed social design principles and explanations on respective rationales, but also quantitative and qualitative evaluation of selected corresponding prototypical implementations. The evaluation primarily focuses on assessing the extent to which proposed social design principles (i) fulfill requirements based on expectations, needs, and concerns towards *online social networking* expressed by elderly individuals as well as (ii) demonstrate the potential to leverage social beneficial outcomes such as *social connectedness*, *social capital,* and psychological *well-being* through the use of SNS functionalities among elderly individuals.

6.1 Social design principles for an elderly SNS audience

As already mentioned in the introduction, compilation of proposed social design principles followed a *user-centered design* perspective (Norman/Draper 1986, 2ff) and was additionally guided and structured by two frameworks, namely (i) the *Facebook Social Design Guidelines* (Facebook Developers 2012) and (ii) the *behavior chain model* introduced by Fogg/Eckles (2007, 202).

Facebook Social Design Guidelines

The recently published *Facebook Social Design Guidelines* constitute a framework for best practices targeting the design of social components and functionalities provided by the SNS Facebook that intends to guide development of third-party applications as well as the modeling of social experience (Facebook Developers 2012). The framework further displays an initial step towards systematization of *social design* and distinguishes three core elements:

(i) *identity* or "our own sense of self and how we are seen by our communities";

(ii) *community* or "the people we know and trust and who help us make decisions"; and

(iii) *conversation* or "the various interactions we have with our communities" (Facebook Developers 2012).

As I mentioned earlier, *social design* is a relatively novel concept and can be thought of as "a way of thinking about product design that puts social experiences at the core" (Facebook Developers 2012) whereby these social experiences are engendered and shaped by (i) utilizing community, (ii) building conversations, and (iii) curating identity on SNS. However, the current verbalization of *Facebook Social Design Guidelines* exhibits a high level of abstraction and lacks precise instructions for implementation. Moreover the proposed guidelines constitute a collection of patterns and best practices recently observed in successfully modeled computer-mediated social experiences. I consequently applied the framework in order to define a logical structure for compiled and deduced social design principles resulting from ex-

plorative and empirical evidence, and for novel insights conducted in the course of the underlying thesis.

Behavior chain model

In parallel to the *Facebook Social Design Guidelines*, I additionally applied the *behavior chain for online participation model* (or *behavior chain model*) introduced by Fogg/Eckles (2007) to organize deduced social design principles along its proposed phases of online participation in social and collaborative systems (such as SNS) namely (i) *discovery*, (ii) *superficial involvement,* and (iii) *true commitment* (Fogg/Eckles 2007, 202). According to the model each phase is "characterised by several target behaviours that materialise through a number of instrumental uses" (Vasalou/Joinson/Courvoisier 2010, 720) whereby the phase of *true commitment* comprises three pivotal target behaviors that are presumed to follow a repetitive and cyclical pattern. SNS users' target behaviors in the phase of *true commitment* potentially include (i) creating value and content, e.g., posting status messages, (ii) staying active and loyal, and (iii) involving other users, e.g., sending a friend request.

It should be noted that the *behavior chain model* constitutes more a framework of best practices grounded by rigorous case study research analyzing currently implemented and state-of-the-art design practices than an empirically tested and analytical model. The framework originally aimed at capturing the range of behaviors users display in SNS use, which designers and developers attempt to enable in their users through adequately implemented designs (Fogg/Iizawa 2008, 36) and "thus introduces a useful framework for bringing designers' objectives into the analysis of users' actual uses" (Vasalou/Joinson/Courvoisier 2010, 721). A detailed description of the *behavior chain model* can be found in Fogg/Eckles (2007, 202) whereas Vasalou/Joinson/Courvoisier (2010, 721) provide application of the model by investigating how designer's intentions materialize through users' reported practices in the case of the SNS Facebook.

In the following, I present each of the deduced and compiled social design principles by additionally providing (i) a brief description of the current state-of-the-art implementation found in the dominant contemporary SNS (where possible) and (ii) a justification in the form of *theory-driven* and/or *evidence-based rationales* and exemplary suggestions for implementation.

Social design principles – General

I would like to begin by providing a set of general social design principles that potentially support designers to stimulate elderly SNS users' target behaviors in all phases of the *behavior chain model* (Fogg/Eckles 2007, 202) in their development efforts of SNS or social systems.

#G.1

Design online social interactions as a supportive mean to offline interactions

Current implementation: Current implementations of SNS map and aggregate information characterizing users' offline social networks and describing their offline social interactions. The stream of information in most cases can be depicted from offline to online whereas only rarely aggregate information on SNS is used to support offline social interactions.

Rationale: On the background that research studies could generally claim computer-mediated communication to be equal or even exceeding the quality and effectiveness of face-to-face communication (Walther 1996, 4, 10), in contrast to earlier research on online communication that suggests computer-mediated communication potentially degrades online and offline interpersonal ties (Sproull/Kiesler 1986, 1509f), the thesis contributes that *online social networking* potentially serves as a supportive means to offline social interactions. Designers need to be aware that online social interaction in the form of *online social networking* should be strictly regarded as a supportive mean to real-world social interaction and should never constitute the dominant form of social interaction among elderly individuals – a concern raised by participants in the underlying conducted semi-structured and focus group interviews. For example, interviewed SNS non-users expressed qualms that once registered and active on SNS, social interaction could shift from one initially purely offline, to one dominated by online form of social interaction and in extreme cases resulting in a total loss of real-life social interaction. However, explorative research among elderly SNS users show that 75.5% of the subjects indicated a perceived increase of social interactions with close social ties and family members ascribed to *online social networking*, which inferentially leads to the assumption that users already facilitate SNS use as a supportive means and integral part in their daily lives as well as communication and social interactions routines. Results in the underlying thesis not only confirmed findings documented in similar previous studies (Lampe/Ellison/Steinfield 2006, 169), but also illustrate that online social interactions strongly cohere with existing offline social relationships and further strengthen the argumentation that *online social networking* displays a secondary modality and supportive means to offline social interactions.

Specifically, findings documented in the empirical study on the formation of *social connectedness* through SNS use could demonstrate that active and passive use of the status message functionality could provoke real-life meetings or activities. For example, approximately 45.0% of individuals within the sample set have met at least once based on status message information in the last six months prior to the study. Additionally, these real-life social interactions were found to positively influence the feeling of being socially connected.

To conclude, developers are prompted to design online social interaction as a supportive means to offline interactions. For example, the status message functionality could be extended in the way that encourages users to setup events or real-life meetings, and to be informed when online social ties are in close proximity and/or engaged in similar activities. Not only could those functionalities support the initiation of real-life interaction, but also document real-life interaction on SNS, e.g., by mentioning a user's name/'tagging a friend' in a posted status message. This functionality was recently realized by Facebook, such that when a user types the name of what is intended to be reference to, a drop-down menu appears that allows the user to choose from her list of friends and other connections, including groups, events, etc. To sum up, developers and designers are advised to use information available online to initiate and support offline social interactions.

#G.2

Design for clear language and explain concepts unique to online social networking

Current implementation: Most predominant SNS use their own specific terminologies and language to name and describe its underlying functionalities that usually appear foreign to elderly users encountering such systems for the first time. One example constitutes the "friending" concept in SNS that is based on the a *social-circles network model,* since it requires users to understand general concepts of how their individual online social networks are formed and furthermore implies interpretation of the terminology "friend", which is often complex in nature and strongly varies between individuals, e.g., especially in the case of elderly and younger individuals.

Rationale: Explorative research conducted in the underlying thesis could show that elderly users are likely to encounter complexity in interpreting phrasing and terminologies commonly used in most dominant SNS to describe functionalities and user activities. For example, terminologies such as 'friend request', 'scribble on the wall', and 'poke' (specifically applied in the SNS Facebook) usually appear completely foreign to elderly users encountering such systems for the first time. In particular, elderly individuals – SNS non-users as well as SNS users – experience problems in understanding the "friending" concept applied in predominant SNS that are based on a *social-circles network model* (boyd/Ellison 2007, 218). Particularly, the terminology and concept of 'friends' appears to be strongly confusing among elderly individuals.

Therefore designers are advised to clearly present and explain applied functionalities and SNS specific concepts by using analogies to offline social interaction. Moreover, the "friending" functionality in predominant SNS should be extended in the way that (elderly) users are able to define the type and degree of their online social ties in greater detail and more specificity. For example, Facebook recently started to introduce more diverse definitions and types of social ties, e.g., indicating kinship and specifying relative relationships. Especially in the case of elderly users, SNS should diversify types and degree of social relationships to a greater extent, since social circles of elderly individuals are often more nuanced compared to younger individuals.

Social design principles – Identity

Below, I outline compiled social design principles and their corresponding rationales that relay to a user's *identity* according to the *Facebook Social Design Guidelines,* which primarily "refers to our own sense of self and how we are seen by our communities" (Facebook Developers 2012). Given that contemporary SNS are primarily built on a *social-circles network model* that can be best illustrated by placing an individual as the center of a (social) circle and (social) nodes spanning a circle around the individual (Hamill/Gilbert 2010, 81f) – forming an egocentric network – a user's profile and its corresponding information are a crucial and central part of the SNS concept. I therefore understand a user's profile information and privacy settings as representations of a user's identity on SNS and consequently focus on how both aspects can be adequately designed for an elderly target audience in the following.

#I.1

Design for initially restricted user profile information

Current implementation: In the majority of contemporary SNS, especially in the case of the SNS Facebook, the initial configuration of privacy settings are highly unrestricted and result in an increased dissemination of user profile data not only inside the SNS but also outside the SNS; visible to the entire Internet user population and accessible for search engine crawlers. Furthermore, users are enforced to upload a personal picture to complete their profile information and are induced to follow a real name policy.

Rationale: The protection of privacy and data integrity of personal information was of great concern to the majority of participants in both the focus group interviews and semi-structured interviews as well as subjects in the conducted explorative quantitative study, especially in regards to sensitive data, e.g., home addresses. Findings suggest that elderly individuals are more concerned about data privacy on SNS compared to younger users and additionally feared negative real-world implications to a greater extent than their younger counterparts. Against the background of portrayed evolution of privacy settings in the case of the SNS Facebook, these concerns stated by elderly SNS non-users and users are comprehensible.

Designers are therefore asked to implement not only comprehensive privacy settings, e.g., easy information restrictions concerning user profiles and activities, but also to implement an initial total restriction on users' profile information as well as to provide elderly individuals with guidance in gradual release and/or focused provisioning of their personal profile information to their online social ties. The latter concept could be implemented in the form of profile previewing, e.g., allowing users to see their profile from the point of view of each online social ties in their network.

#I.2

Design for clear and simple data privacy settings

Current implementation: Data privacy settings for SNS are frequently covered, assessed, and discussed in media reports as well as in multiple research studies – and constitute a crucial aspect in users' adoption of systems in general. I consulted the data privacy settings realized on the SNS Facebook as a reference since Facebook represents the current de facto standard in *online social networking.* At present, data privacy can be managed through predefined settings and functionalities that allow users to customize their level of privacy along categories of functionalities. The desired level can then be selected by predefined settings from a drop down menu that indicates the range of diffusion of profile and shared information.

Rationale: Participants in both explorative studies explicitly expressed that they would like to have clear guidelines on how to manage their personal settings and specify characteristics of existing social relationships more adequately. Additionally they demanded for simplified settings concerning data security and privacy settings, and consequently considered clear and simple data security and privacy settings as a vital prerequisite for prospective SNS use and long-term adoption of *online social networking*. The underlying social design principle constitutes the only principle that was clearly expressed in the form of a distinct requirement for the design of social systems and in particular SNS by elderly subjects and frequently discussed in various conversations with elderly individuals alongside conducted explorative studies. Clear and simple data privacy settings additionally constitute the premise for the provision of (online) *social support* and the formation of *social connectedness* implying perceived trust in *online social networking* and frequent use of SNS. The underlying social design principle should also be applied on data privacy settings that impact third party applications accessing user information provided through the underlying SNS.

To conclude, designers of social systems and SNS should mastermind functionalities and concepts that not only guarantee clear and simple data privacy settings, but also explain and demonstrate to users how changes in data privacy settings impact access, sharing, and visibility of information in their individual online social networks. *Google+ Circles* demonstrate an interesting starting point in the graphical representation of data privacy settings to be more intuitive compared to *Facebook Lists*. Continuative, designers should compile functionalities that simulate how specific information (e.g., profile or shared information) potentially diffuse their established online social network through graphical and interactive representations.

#I.3

Design for peer-reviewed user profile information

Current implementation: In contrast to Facebook, Google+ introduced a policy requiring real names for its user profiles in early 2012 with the primary intention to decrease fake user profiles and corresponding false user profile information, but ultimately triggering a discussion in media as well as among developers and researchers on whether a policy would result in more trustful profile information or have the opposite effect.

Rationale: In the course of the explorative research, subjects expressed doubts on the trust-worthiness of information and especially questioned the authenticity of published profile information on SNS. Specifically, most participants of the EFG interviews criticized some users (especially younger) of increasingly utilizing fake profile names and in some cases stating wrong information on their profile sites since false information led to a feeling of insecurity among elderly users. Explorative research could also reproduce results from similar studies and show that age-related differences are also apparent in the type, intensity, and level of detail of shared user-generated content on SNS, and this especially holds true for information on user profiles. Elderly users generally provide more information and specify their real name, address, and telephone numbers, while their younger counterparts disclaim highly descriptive of the self on SNS profiles, e.g., using nicknames or fake names (Berg 2011, 3). While stated concerns might not be existent in the case of profile (and shared) information of a user's close (online) social ties such as family members, concerns towards profile information potentially raise from profile information provided by weaker social ties. On the background that weaker social ties increasingly play an important part in the provision of informal care and (offline) social support among elderly individuals and that the formation of *social connectedness* and *social support* on SNS requires trusted social relationships, I argue that securing for trustful profile (and shared) information in online social networking plays a decisive role.

Consequently, designers should strive to increase the degree of perceived trustworthiness of profile (and shared) information among (elderly) SNS users. One promising approach could be that provided user profile information is (randomly assigned and) peer-reviewed (or crowdsourced) and thus collectively filtering of false information.

#I.4

Design for easy and transparent information sharing settings

Current implementation: Currently applied state-of-the-art implementations to control for individual settings for information sharing mainly depend on lists (of social ties) that can be configured and personalized by the user (in Facebook). In the case of Facebook, control of information sharing settings is complex and highly confusing for (elderly) users. In contrast, Google+ introduced a more natural and convenient modality to control for information sharing settings by introducing *Google+ Circles* that constitutes a more promising approach by applying graphical representations of a user's online social network.

Rationale: In general, subjects in both explorative studies conducted in the course of the thesis expressed significant fear of miscreant behavior going on in the Internet at large, and therefore expected more incidences of similar malicious behavior on SNS – such as identity theft and fraud – in the future. Furthermore, data collected during the explorative quantitative study reveals that 33.3% of elderly survey participants avoided posting status messages on the SNS Facebook due to fear of information disclosure. Moreover, 25.5% of survey participants indicated to be concerned with the use of functionalities that facilitate sharing and commenting of user-generated content such as pictures and videos due to information disclosure and privacy settings. One explanation for this strong rejection – previously mentioned – could be that the mode of action of sharing functionalities is yet not fully understood by elderly users since these functionalities differ in their modality distributing information when compared to traditional face-to-face communication and most ICT systems. For example, in the case of the SNS Facebook status message functionality – and Twitter in general – the change is very well recognizable since the mode of interaction shifts from a *one-to-one* to a *one-to-many communication,* disseminating information to multiple addressees. Results show that administration of social ties on SNS is associated with high cognitive load among elderly SNS users.

Designers should reflect currently implemented state-of-the-art information sharing settings, e.g., the applied concept of lists to control individual information sharing in Facebook not only seems awkward but also incomprehensible to users, especially among the elderly, since they display an unnatural implementation (*Facebook Friend Lists*). Google+ thus successfully introduced the concept of individual *Google+ Circles* in order to share the right information with the right social ties in a user's online social network – a concept that is easier to understand. Designers are therefore prompted to intensify graphical design solutions and designs that better portray the impact and how shared information is spread through users' online social networks.

Social design principles – Community

According to the *Facebook Social Design Guidelines* the element *community* "refers to the people we know and trust and who help us make decisions" (Facebook Developers 2012). Since contemporary SNS that are primarily built on a *social-circles network model*, I therefore focus on design guidelines that aim on how representation of users' online social networks can be adequately portrayed and structured and how they interact with their individual online social networks based on empirical evidence found in the underlying thesis.

#Com.1

Design along family structures and close ties

Current implementation: By the time the underlying thesis was executed and completed, Facebook introduced a functionality that enables users to share with their online social connections information concerning family composition and how users relate to each other as family members. In parallel, to friend requests, users send a request to their potential family member asking the receiver to verify the relationship information.

Rationale: Evidence found in the explorative quantitative study suggests that the existence of children and grandchildren registered with SNS has positive influence on the attitude towards *online social networking*, especially in the *discovery* and *superficial involvement* phases of online participation, i.e., and consequently results in joining the SNS. As previously mentioned, similar studies found that the increase of elderly demographic user segments with SNS might be explained by the fact that the novel modality of social interaction "bridges generational gaps" (Madden 2010, 7). Prevention and gerontological research found that the help and support by friends, neighbors, and acquaintances increasingly play an important role for social support of the elderly generation (Nussbaum et al. 2000, 263). Although the majority of elderly people mostly rely on family structures for social support and health care (Shanas 1979, 169ff), more and more elderly individuals expand or even replace family social networks with (weaker) social ties such as neighbors, friends, and acquaintances.

Given that *social support* can be understood as the actual or perceived availability of helpful behaviors by other individuals and requires the "existence or availability of people on whom we can rely, people who let us know that they care about, value, and love us" (Sarason et al. 1983, 127), designers of social systems and SNS should focus on concepts and functionalities that enable (elderly) users to form their online social networks along family structures and/or social ties, e.g., by providing functionalities that allow users to create social sub networks along predefined roles in conjunction with suitable privacy settings. Furthermore, elderly users could be prompted to build their online social networks along family structures in a first step (in the *discovery* and *superficial involvement phase* according to the *behavior chain model*) and in a next step grow their online social network from a core of related social ties to close social ties and beyond. Specific functionalities could guide elderly users to pursue the outlined strategy in building and fostering online social networks.

#Com.2

Design for social searching

Current implementation: As previously mentioned contemporary implementations of SNS mainly provoke *social searching* behavior as a modality to discover online social ties and to enlarge one's online social network when compared to VC that commonly facilitate *social browsing* behavior. Yet no distinction is made based on (demographic) characteristics of SNS users to provide the most appropriate or guided means to meaningful expand users' online social networks.

Rationale: Descriptive statistical analyses provide evidence that previously documented findings on the two distinct behavioral mechanisms in *online social networking* (Lampe/Ellison/Steinfield 2006, 170) additionally hold true for elderly SNS user populations, given that analyzed data revealed a strong tendency to *social searching* related intention of SNS use (Lampe/Ellison/Steinfield 2006, 170). 85.3% of subjects showed strong expectation towards strengthening and intensifying social relationships that they already maintain in the real-world through active participation on and use of the SNS Facebook – strongly indicating a prospective use intention in favor of *social searching* use behavior compared to creating purely online ties via SNS (*social browsing*). EFG and semi-structured interviews provide evidence that elderly individuals also expected very simple means to establish ties with their offline social circles and acquaintances and to be supported in their intention to mostly execute *social searching* behavior on SNS (Lampe/Ellison/Steinfield 2006, 170). Moreover, I argued that elderly SNS users exhibit an even higher tendency to *social searching* behavior in SNS than their younger counterparts since expectations regarding *social browsing* were found to be significantly less important among subjects. Accordingly, I presume on the background of similar findings (Pfeil/Arjan/Zaphiris 2009, 647) that elderly individuals intentionally maintain and tend to foster more intimate social ties on SNS. Consequently online social circles of elderly individuals are exclusively composed of family members, relatives, and long-time friends, which additionally is a precondition in for the provision of (online) *social support*.

Designers are therefore invited to reflect on evidence and findings presented in the underlying thesis so that elderly users are provided with an appropriate modality depending on their individual background and demographical data. In general, evidence suggests fostering *social searching* behavior among elderly SNS as the appropriate mean to expand and construct their individual online social networks. A meaningful functionality could be a *Family Member Finder* that equals to the *Friend Finder*, but explicitly targeting on potential family member and relatives for elderly users that have children or grandchildren. However, designing for either *social searching* and *social browsing* behavior should depend on demographical data such as age and living situation of users since *social browsing* displays a meaningful strategy to expand online social networks of elderly users who, e.g., live alone or are widowed.

#Com.3

Design for gradual extension of elderly users' online social networks

Current implementation: The dominant SNS Facebook and Google+ currently provide various functionalities to enlarge one's individual online social network, which either support a *social searching* or *social browsing* strategy. More recently, functionalities in third party applications enable users to expand their online social ties, which in most cases is comparable to *social browsing* behavior. However mentioned SNS miss functionalities that limit users in the pace of growth as well as absolute size of their online social networks. An interesting novel approach was recently applied by the SNS Path, which limited the total size of a user's online social network to 150 individuals.

Rationale: Explorative research conducted in the course of the thesis could document administration of online social ties on SNS is perceived as a high cognitive task among elderly users. In addition, research could show that friend inflation and *information overload* hinder provision of social support and formation of social capital through *online social networking* (Koroleva et al. 2010, 3ff). Although I presume that the likelihood of friend inflation through SNS use among elderly users might be lower since studies attest online social circles of elderly users to be generally smaller when compared to their younger counterparts (Pfeil/Arjan/Zaphiris 2009, 648) – I consequently assume on the background of socio-psychological research conducted by Dunbar (1993, 687) that elderly users might experience problems and might expend high cognitive capacity in administrating their online social networks. Furthermore, empirical studies presented in the underlying thesis could reveal that provision of social support, feelings of social connectedness, and formation of social capital on SNS rather depends on the frequency of online social interactions than the size of an individual's online social network.

Designers could implement functionalities that constrict the rate of growth of individual online social networks of elderly SNS users, e.g., setting threshold values for novel online social ties for a specific period of time, in order to decrease the cognitive load elderly users experience in administrating their online social networks. A more drastic measure could constitute a functionality to determine a maximum of online social ties elderly users intend to be connect with on the SNS. In addition, functionalities could track a user's online activity with each social peer in her corresponding online social network and recommend individuals with low online social interaction in a given period of time to be deleted from a user's network of online social ties.

Social design principles – Conversation

The following social design principles specifically focus on the later phases of SNS participation and involvement corresponding to the *superficial involvement* and *true commitment* phase according to the *behavior chain model* (Fogg/Eckles 2007, 202). Since both phases are characterized by how we communicate and socially interact with each other on SNS, I consequently consolidate proposed social design guidelines in the *conversation* element which "refers to the various interactions we have with our communities" following the *Facebook Social Design Guidelines* (Facebook Developers 2012).

#Con.1

Design for passive following of status messages

Current implementation: In the course of the underlying thesis, Facebook changed the design of its SNS user profiles by adopting a status update page as a start page so that it is identical to the old *Facebook status update page*. This page only comprised status messages posted by social ties of a user on Facebook before and during the execution of the study. In addition, the status message functionality was more prominently placed on user profiles, which consequently fosters and provokes active following behavior of status message information among SNS users.

Rationale: Burke/Marlow/Lento (2010, 1909) recognize SNS as a complement network of relationships to the "offline world by providing a platform for active communication between friends and more passive observation through aggregated streams of social news" and not only highlight the importance of the status message functionality in these social systems, but also the passive consumption of information transmitted in this novel one-to-many communication modality. Analysis conducted in the course of the explorative empirical study show that a high level in status message functionality use is concomitant with a high subjective experience of feeling connected to other social peers – and therefore suggests quantitative relationship between the feeling of being connected to other social ties in the SNS Facebook and the extensiveness of information shared. However, I assume that the active following of status messages might be the primary cause for *information overload* in *online social networking* since status messages are frequently updated and shared by SNS users and the amount of information that has to be processed by the user increases with the size of the corresponding online social network. Since *information overload* has been proven to cause reduced levels of user activity, a negative attitude towards shared information by provoking an emotional state of dissatisfaction and therefore potentially diminishing the degree of perceived *social connectedness* and *social capital* for individuals (Koroleva et al. 2010, 3ff). The deduced social design principle consequently aims to create a means to foster the passive following of status messages especially among elderly SNS users.

Designers could focus on intelligent filtering mechanisms to limit incoming status message update frequency especially for elderly SNS users. For example, systems could learn from past behavioral patterns and integrating user preferences in individually filtering status messages and thereby reduce cognitive load of (elderly) SNS users. Moreover, status messages of highly active users could be aggregated to a sequence of posted status messages and displayed as a single notification for the user. Recently, Facebook also introduced a functionality that enables users to subscribe to the stream of status messages of specific online social ties to prioritize posted information for the user. Status message information could also enrich other activities on SNS and thus be displayed depending on the context, e.g., online or offline activity of the user such as her current location. Furthermore, designers should implement or use established APIs to transfer status message information to various social systems and third-party applications such as application running on mobile phones or televisions. For example, status message information could be unobtrusively displayed when an elderly individual is watching her favorite television show. Designers should seek intelligent ways to ubiquitously distribute status message information across devices and systems to allow for a highly passive following of status message information.

#Con.2

Design for cross-generational online social interaction

Current implementation: Communication and online social interaction currently occurs undirected since predominant SNS exclude implementations that adapt to a user's demographical background and further consider their predominant use behaviors in providing them with the most adequate functionalities to satisfy communication and online social interaction needs.

Rationale: Findings from the conducted explorative study document a major motivational driver to join a SNS was (cross-generational) communication with close social ties and relatives. *Online social networking* is expected to enable elderly individuals to be a more significant part of their family members' and close relatives' lives and regarded as a novel possibility in being able to keep in frequent touch with children, grandchildren as well as other close relatives of subsequent generations such as nephews and nieces. I assume that fulfillment of expressed expectations and needs for cross-generational online social interaction could positively influence long-term adoption and actual use among elderly users and adequately designed cross-generational online social interaction to affirmatively affect elderly SNS users in their behavior typically observable in the *discovery* and *superficial involvement* phases according to the *behavior chain model*. However, evidence primarily found in the conducted explorative research suggests that contemporary means of computer-mediated cross-generational communication and online social interaction needs to be adjusted to the modern way of life for younger generations and their predominant communication behavior on SNS – and additionally to prevailing communication patterns of elderly individuals, in such a way that younger users initially takes on the role of *information providers* and elderly users that of *information consumers* on SNS.

Consequently, I assume that this prevailing pattern influences online social interactions between younger and older users on SNS, in the following way: since younger users primarily act as *information providers*, elderly users potentially are (highly) aware of younger users' current life situations due to (frequently and excessively) shared information allowing elderly users to react by providing online *social support*. Conversely, this means that a promising approach constitutes the modification of the prevailing communication pattern in such a way that (i) younger and elderly users in equal parts act as *information providers* and *information consumers* or even that (ii) elderly users take on the role of *information providers* during later phases of the *behavior chain model* (Fogg/Eckles 2007, 202).

Designers are invoked to trigger cross-generational communication and to initiate cross-generational online social interaction among young and elderly online social ties. Filters for status messages that currently only support a selection and listing based on the most recently and the most active status message post could be extended to filter shared status message according to age or specific ranges of age, e.g., generations. Accordingly, status messages and shared information of elderly SNS user (especially if specific information is available on the type of relationship between younger and older users) could be highlighted in displayed streams of status messages among younger users. Another approach could pursue the extension of the status message functionality beyond the commenting option by adding functionalities that support specific use case scenarios, e.g., directly calling for *instrumental support* such as the request for help in housework.

#Con.3

Design for triggering real-world social interactions

Current implementation: In the majority of predominant SNS, functionalities are laid out to convert offline social interactions and activities to online (social) information to primarily support the mapping of a user's real-world social environment onto her corresponding egocentric online social network. Yet, only a minority of functionalities enables the user to trigger real-world social interaction such as to create an event or sharing specific information through a status message update.

Rationale: Various research studies focused on the overlap and interaction between offline and online social networks and how activities influence individual's offline and online social interactions and lives (Subrahmanyam et al. 2008, 425ff) whereby Valenzuela/Park/Kee (2009, 888) found that SNS users who exhibit highly frequent use and socially interact online with other individuals, also display higher social trust and civic participation. The initial empirical study on the formation of *social connectedness* through SNS use could show that approximately 45% of the individuals within the sample have met at least once based on the SNS Facebook status message information in the six months prior to the study. Given that *online social networking* is introduced as a supportive mean to real-world social interaction and to enable a novel and prospective alternative to (virtually) integrate elderly citizens in their local communities and neighborhoods as well as their social living environment in the underlying thesis, the underlying social design principle is not only crucial, but also calls for reversing and balancing the information stream form offline to online in order to use online (social) information to support offline social interactions.

As previously mentioned the status message functionality could be expanded by functionalities that exclusively trigger real-world social interactions. For example, an elderly SNS users solicits instrumental support through a specific *Request* functionality whereby individuals are provided with corresponding functionalities to reply to the underlying request.

The following use scenario illustrates an example: *Mr. John Doe (85) does not have the best constitution due to a recent illness. Winter has left the sidewalk in front of his house covered with snow. Mr. Doe decides to post a 'request' to his neighborhood for snow plowing on his sidewalk on the SNS. He hopes that someone will accept his request and voluntarily clear his sidewalk of the snow. The request is read by Thomas, the son of a neighboring family. He posts a 'bid' as a response to the request posted by Mr. Doe to shovel the sidewalk for free. Mr. Doe accepts the voluntary bid and sees on Thomas´ profile page that he needs tutoring for his mathematics homework. He decides to answer this request and help him with his homework.*

#Con.4

Design for aggregation of important activities since last login

Current implementation: Recently Facebook implemented the *Activity Log* functionality that represents a chronological list of a user's total shared information and general activity on the SNS such as established social connections. However the functionality introduced as a safety instrument for users to control their SNS activity and primarily aims at increasing a user's data privacy. Twitter and Google+ recently initiated a functionality that aggregates recent activities and shared information of a user's online social ties in the form of an email newsletter. However, aggregated information does not correspond to specific individual social contexts and preponderantly contains information shared by users outside of the recipient's online social network.

Rationale: As previously mentioned it has been discussed that *information overload* caused by frequent use of SNS might result in reduced levels of user activity as well as a negative attitude towards shared information, potentially lowering the possibility of beneficial aspects such as *social capital* (Koroleva/Krasnova/Günther 2010, 6f). In addition, studies documented that *information overload* might even cause confusion and dysfunctional effects in the form of stress and anxiety among SNS users (Eppler/Mengis 2004, 333) and in some cases lead to a diminished decision quality (Chen/Shang/Kao 2009, 50-56). Since the empirical studies conducted in the course of the thesis found that the provision of social support, an increased feeling of social connectedness and the formation of social capital on SNS depends on the frequency of use and not the size of an individual's online social network, I reason that functionalities should ensure frequent interaction and processing of meaningful (social) information and additionally prevent users from suffering *information overload*.

One potential solution could constitute the aggregation of activities connected to a user profile since the last login whereby functionalities could provide customizable settings to filter for specific information such as to only aggregate and display the information shared by specific social ties or groups of social ties. It is highly important to limit aggregated and displayed information covering the time period between the last login and current activity of the user to prevent *information overload*. Indirectly the proposed social design principle is partly implemented in a current version of Facebook, since a user is able to group her social ties in specific lists whereby notifications prompt the user for newly shared status messages of her online social ties.

#Con.5

Design for initial one-to-one communication

Current implementation: Dominant SNS such as Facebook and Google+ promote share functionalities and therefore aim for *one-to-many communication* among their users, e.g., by making the status message functionality the pivotal element in current implementations. Both SNS additionally support *one-to-one communication* through a personal messaging functionality; however, the functionality can only be indirectly invoked from a user's starting screen or her social ties' profile. In the case of Twitter, *one-to-many communication* constitutes the primary modality of communication since all 'tweets' are available for anyone to view online as part of a user's Twitter stream. However, in order to use the *one-to-many communication* (so-called 'direct messages' in Twitter), recipients must not only be 'following' the sender, but also the corresponding functionality is fairly hidden in the current implementation (see section 5.2).

Rationale: Explorative research in course of the underlying thesis could reveal a misconception of the primary mode of communication in SNS, which is vitally different to existing and accustomed (online) *one-to-one communication* routines such as in email communication or telephone conversations among elderly SNS users. Given that the primary mode of communication in SNS is characterized by a *one-to-many communication* exemplified in the sharing of user-generated content on the SNS Twitter or status messages on the SNS Facebook. Results of both explorative studies point to an increased recognition of (social) benefits that originate from SNS functionality use such as the status message functionality by elderly SNS users and further suggest a shift in relevance of functionalities away from functionalities that facilitate *one-to-one communication* to functionalities that support the user in *one-to-many communication* and online social interaction.

Based on the theoretical review conducted in course of the underlying thesis, I further assume that the provision of *social support* and especially that of *emotional* and *informational support* requires a certain level of trust among individuals. On SNS *one-to-one communication* constitutes the primary mean to share trusted information and personal messages.

Designers should therefore promote functionalities among elderly SNS users that facilitate *one-to-one communication* in the early stages of user involvement in social systems. Another approach could be the extension of direct messaging functionalities by adding the possibility to include multiple receivers or otherwise, the restriction of status messages through the application of meaningful filters and settings that limited the circle of recipients – especially in later stages of user involvement according to the *behavior chain model* (Fogg/Eckles 2007, 202) – to gradually introduce elderly SNS users to this novel modality of *one-to-many communication*.

As introductorily mentioned, the ultimate goal of designers – and respectively researchers in the IS and HCI disciplines – is to understand how functionalities of designed systems get embodied into users' behaviors and practices to satisfy their motivations and expectations from the system (Vasalou/Joinson/Courvoisier 2010, 720ff). In the following, I therefore describe the undertaken efforts to evaluate a subset of the previously introduced social design principles.

6.2 Evaluation of a selection of proposed social design principles

Since the extent of user satisfaction can act as an evaluation of the design and implementation characteristics of a system (Wixo/Todd 2005, 89), I accordingly draw upon previous research on system use and acceptance to identify the relevant theoretical models that can be used for evaluating prototypes in the IS and HCI disciplines[36].

System use and acceptance research is primarily based on the *technology acceptance model* (TAM), which posits that the adoption and use of different systems is determined by the extent to which users consider the system to be useful for performing certain tasks, and whether they perceive it to be easy to use (Davis/Bagozzi/Warshaw 1989, 985ff; Venkatesh et al. 2003, 446ff). However, the TAM usually does not take actual use experience into account in predicting the *intention to use* a system (Bhattacherjee 2001, 352). Therefore, researchers have started employing *expectation confirmation theory* (ECT) for investigating users' system use and continuance intentions. ECT draws from consumer research where it is used to predict consumer satisfaction and purchase intentions based on prior expectations regarding a product or service, and the subsequent confirmation or disconfirmation of those expectations (Oliver 1980, 462).

According to ECT, users are satisfied with their use experience when their expectations from the system are confirmed, and this satisfaction in turn positively influences their use and continuance intentions of a product or service (Oliver 1980, 461) – and respectively systems. By taking the actual experience of using a system into account for predicting the *intention to use*, ECT provides a more realistic measure of *intention to use* an underlying system, which is a key indicator of system success.

Figure 38 is a diagrammatic representation of ECT in which expectations are usually measured *a priori* (in time t_1), while the other variables such as 'perceived performance', 'confirmation', 'satisfaction', and 'repurchase intention' are measured *a posteriori* (in time t_2).

[36] The following sections are taken and adapted from a publication entitled "NFriendConnector: Design and Evaluation of An Application for Integrating Offline and Online Social Networking" previously published in the AIS Transactions on Human Computer Interaction (Köbler et al. 2011) and coauthored by Suparna Goswami, Philip Koene, Jan Marco Leimeister and Helmut Krcmar.

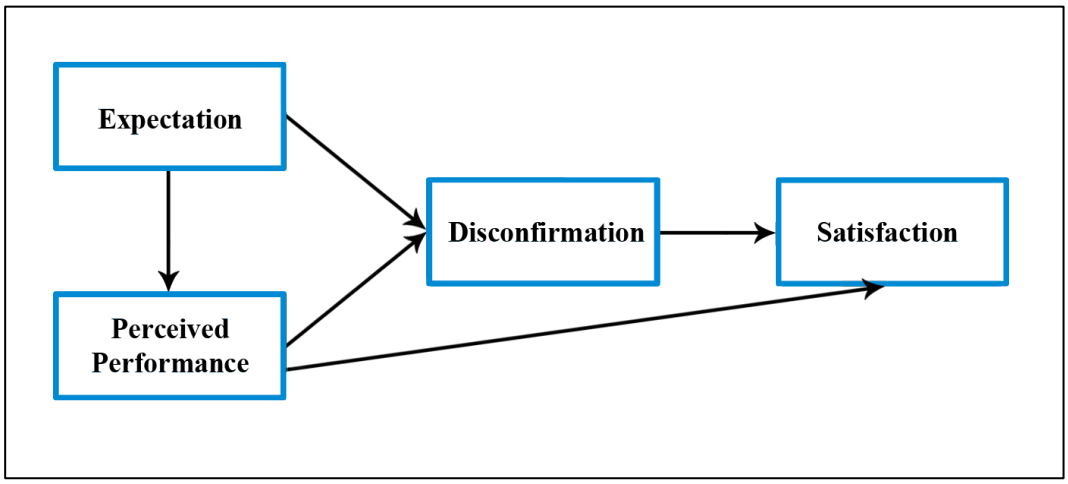

Figure 38: Structural representation of the Expectation Confirmation Theory (ECT)
Source: Own illustration adapted from Oliver (1980, 461f)

Various attempts have been documented in IS and HCI research literature to measure expectation and their potential confirmations towards the underlying assessed system.

The *assimilation model,* which argues that higher expectations result in higher evaluations, has found support in IS literature (Szajna/Scamell 1993, 493ff) where it is shown that increasing users' expectations regarding system quality results in an overall increase of system evaluations. The *contrast model*, on the other hand, proposes that higher expectations lower the resulting perceptions regarding system effectiveness, and consequently overall satisfaction (Staples/Wong/Seddon 2002, 126). Other models, such as the *generalized negativity model,* contend that realistic expectations will increase user satisfaction with the system (Goyal/Venkatesh 2010, 288) while the *assimilation contrast model* suggests setting low or accurate expectations rather than setting them high in order to increase system use (Brown/Venkatesh/Goyal 2011, 62). The *expectations only model* shows that *a priori* expectations can be captured through perceptions and these perceptions predict user intentions (Davis/Bagozzi/Warshaw 1989, 985ff). In contrast, the *experience only model* (such as the TAM) shows that *a posteriori* experiences play a primary role in determining perceptions (Brown et al. 2008, 58). For example, the *expectation confirmation model* (ECM) adapts the original ECT to make it suitable for studying system use, and accordingly provide designers with deeper insights into how to address issues pertaining to users' satisfaction with system use and continued patronage (Bhattacherjee 2001, 353f). However, the ECM according to Bhattacherjee (2001, 356) is based on the *experiences only* mechanism and therefore focuses on *a posteriori* variables, instead of considering both pre- and post-use variables (see Figure 38). In consequence, the effects of pre-acceptance variables are already captured within the 'confirmation' and 'satisfaction' variables (Bhattacherjee 2001, 359f).

In its original form, ECT is primarily concerned with *a priori* expectations; however, expectations regarding a product or a system are likely to change after an initial experience with the system and this is particularly valid in the context of system use. Therefore, the ECM amends the theory by considering *a posteriori* expectations. *A posteriori* expectations in the ECM are represented by perceived usefulness or performance. The ECM and the TAM are similar in that both consider individual cognitive factors for predicting system use intents and employ

the belief-affect-intention causality route that is characteristic of most system use and adoption research (Bhattacherjee 2001, 366). However, while the TAM is based on the *experiences only* mechanism and uses perceived usefulness to represent *a priori* expectations, the ECM captures post-use expectations through perceived usefulness.

These different models can result in different strategies creating and evaluating user expectations depending on the context of research. For instance, the *assimilation model*, *contrast model*, *generalized negativity model*, and *assimilation contrast model* are likely to be more useful when the study involves setting initial expectations regarding the system. However, in the context of the underlying research, I was not interested in setting or modifying expectations, but rather in assessing users' evaluations and experiences towards a system in general as well as towards SNS functionalities implemented according to a selection of previously proposed social design principles (see section 6.1).

Consequently, I examined both *a priori* and *a posteriori* variables in the underlying evaluation exercise and therefore the established and applied evaluation model followed theoretical considerations developed by Oliver (1980, 461f) and Spreng/MacKenzie/Olshavsky (1996, 17). It should be mentioned that the application of an evaluation model based on the ECT that additionally assessed *a priori* expectations towards the prototype configurations was reasonable, since previously investigated expectations of elderly individuals towards SNS in the course of the underlying thesis potentially accentuate interpretations and discussions of findings.

The specific evaluation model and corresponding hypotheses development are presented in section 6.2.1.1. The measurement of the *structural model* is based on established and standard measurement items documented in IS literature.

6.2.1 Methodology

An experimental methodology was chosen to evaluate a selection of proposed social design principles, which comprised of (i) a *laboratory experiment* and quantitative evaluation applying three specifically configured SNS prototype systems and (ii) a *longitudinal field test* and primarily qualitative analysis applying a single SNS prototype system instantiation.

6.2.1.1 Laboratory experiment and quantitative evaluation

For the underlying evaluation, a *laboratory experiment* is an appropriate methodology as it allows controlling for factors that are extraneous to the variables of interest. Initially, subjects were randomly assigned into three different groups. The groups differed in their provided configuration of the SNS prototype system where the configuration allowed switching on and off of specific functionalities that were designed and implemented based on a selection of proposed social design principles (see section 6.1).

Table 43 summarizes the chosen configurations of provided systems and general laboratory experiment setting that corresponded to multivariate testing (A/B/N), a specific form of A/B testing commonly applied in HCI research and among practitioners.

Functionality	Social Design Principle	Group 1	Group 2	Group 3
Posting and editing of status messages	**#Con.1**	✔	✔	✔
Commenting on status messages	**#Con.1, #Con.2, #Con.3**	✖	✔	✔
Viewing of individual activity log	**#Con.4**	✖	✔	✔
Editing and viewing individual profile information	**#I.1, #I.2, #I.4**	✔	✔	✔
Viewing of individual online social network	**#Com.1**	✔	✔	✖
Composing private messages	**#Con.5**	✔	✔	✖

✔ symbol indicates availability of functionality in the underlying prototype configuration
✖ symbol indicates unavailability of functionality in the underlying prototype configuration

Table 43: Prototype configurations tested in the laboratory experiment
Source: Own illustration

Prototype configurations were implemented based on a set of general design decisions following the social design principles and rationales (**#G.1** and **#G.2**) prevailing in all prototype implementations used in the laboratory experiment and longitudinal field test setting.

- *Intuitive interaction and navigation:* A shallow navigational structure was realized by the restriction to two hierarchical levels. Captions on navigation and interaction were adapted to the national and local language/dialect, and tested on comprehension. Specific coloring and formatting guidelines were followed to account for physical and cognitive restrictions of the elderly.

- *Geographically limited/closed online social network:* The prototype represented a virtual mapping of an individual's living environment (e.g., neighborhood) guaranteeing a closed individual online social network. The restriction to a geographical area of moderate size was a necessity to account for a realistic setting in the longitudinal field test in order to study potential effect between online and offline social interactions.

- *Community consciousness:* All users were initially connected to each other to provide easy integration of real-life social ties. This automation could be deactivated if users desired a more personalized online social network. Given that the primary mode of computer-mediated communication and online social interaction was intended to be realized by using status messages, the universal design decision aimed at boosting user activity by increasing the frequency of postings, ensuring an updated community consciousness with a less tech-savvy subjects.

In section 6.2.2, I provide a brief description on the sampling and data collection applied during the *laboratory experiment*. The subsequent section briefly delineates the underlying evaluation model and developed hypotheses tested in course of the *laboratory experiment*.

Evaluation model and hypotheses development

Confirmation of expectations results in satisfaction. Expectations form the baseline level against which confirmation is assessed by users to determine their evaluative response to a system. Users evaluate their use experience based on the extent to which their expectations are confirmed, and this evaluation results in satisfaction or dissatisfaction with the system or specific implemented functionalities.

The development of the evaluation model and corresponding hypotheses was adapted from the proposed theoretical development provided by Oliver (1980, 461f) and Spreng/MacKenzie/Olshavsky (1996, 17). The evaluation model was further expanded by introducing the variable 'intention to use' as the *depended variable*. The hypotheses development followed established argumentation based on previous IS research whereas I additionally provide explanations for the hypothesized causal relationships between the variables 'satisfaction' and 'intention to use' (**H6**) as well as 'expectation' and 'satisfaction' (**H7**), both of which have been added to the default model.

Regardless of *a priori* expectations that users have, they will form *a posteriori* expectations of the system after its use based on its performance. According to Bhattacherjee (2001, 353), it can be argued that the variable 'perceived performance' (or 'perceived usefulness') additionally measures *a posteriori* expectations. Perceived usefulness in turn reflects the instrumentality of system use and has been identified as a salient belief influencing system acceptance behaviors (Davis/Bagozzi/Warshaw 1989, 985f). Users form their beliefs regarding the performance (or usefulness) of a system by combining their evaluation vis-à-vis their initial expectations of the system. The extent to which users' initial expectations are confirmed after experiencing and using the system determine the extent to which they perceive the system as being useful. Therefore I hypothesize that

> ***H1:*** *Users' extent of perceived performance (or perceived usefulness) will be positively associated with confirmation of their a prior expectations.*
>
> ***H2:*** *Users' expectations will be positively associated with their extent of perceived performance (or perceived usefulness) of the prototype system.*
>
> ***H3:*** *Users' expectations will be positively associated with their extent of confirmation.*

Satisfaction with technology has been empirically found to be associated with experience of using the technology (Mahmood et al. 2000, 764), to be dependent on the quality of the system (Delone/McLean 2003, 11), and therefore can be regarded as an evaluative response to system use that can be either positive, negative, or indifferent (Bhattacherjee 2001, 355). Hence, I hypothesize that a

H4: *Users' extent of confirmation will be positively associated with their satisfaction with the prototype use.*

Perceived performance (or perceived usefulness) reflects a belief regarding the usefulness of a system. Perceived performance is contended to be the most salient *a posteriori* expectation influencing users' post-acceptance affect. Satisfaction is an affect that has been found to be significantly related to perceived performance (or perceived usefulness) in the context of system use and continuance (Bhattacherjee 2001, 356f). Further, research has suggested that perceived usefulness and satisfaction are theoretically connected, and there is a need to consider them simultaneously in research and evaluation models (Wixom/Todd 2005, 89ff). Moreover, previous research has shown that perceived usefulness is a salient belief that influences system acceptance behaviors or behavioral intentions across a broad range of end-user technologies (Davis/Bagozzi/Warshaw 1989, 997f). Use of a system is often viewed as a means to achieve enhanced performance. The extent to which the system is perceived as useful subconsciously invokes cognitive decision rules regarding behavioral intentions (Davis/Bagozzi/Warshaw 1989, 998). Since evaluating the underlying prototypes is an instance of system use that will result in beliefs and subsequent affects, I hypothesize that

H5: *Perceived performance (or perceived usefulness) will be positively associated with users' satisfaction with prototype system use.*

Satisfaction plays an important role in users' decision to continue using a system. In the context of this study, users encounter the prototype for the first time and therefore their first use determines the formation of the affect – satisfaction or the lack of it. The variable 'satisfaction' has already been validated as a significant predictor of 'intention to use' in various technology acceptance studies (Davis/Bagozzi/Warshaw 1989, 996ff), while negative experiences or dissatisfaction have resulted in service termination or discontinuance of use. Therefore I hypothesize that

H6: *Users' satisfaction with the prototype systems will be positively associated with their intention to use it.*

According to ECT, users are satisfied with their use experience when their expectations from the system are confirmed, and this satisfaction in turn positively influences their use and continuance intentions (Oliver 1980, 460). Following previously mentioned considerations, scholars argue that higher expectations result in higher evaluations and consequently demonstrated that increasing users' expectations regarding system quality results in an overall increase of system evaluations and thus in users' satisfaction with a system (Szajna/Scamell 1993, 493ff). However, scholars propose that higher expectations lower the resulting perceptions regarding system effectiveness and therefore overall satisfaction (Staples/Wong/Seddon 2002, 126). Consequently I hypothesize an undirected relationship between both variables.

H7: *Users' expectations towards the prototype system will be associated with their satisfaction of it.*

Figure 39 represents the established evaluation model including the developed hypotheses (**H1-H7**).

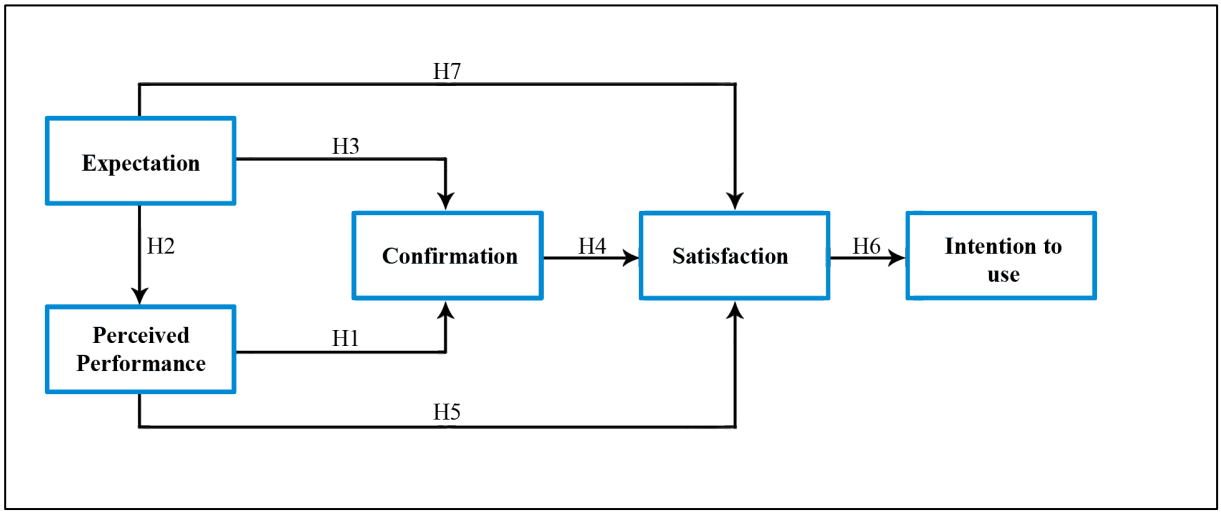

Figure 39: Structural model of the applied evaluation model based on the ECT
Source: Own illustration adapted from Oliver (1980, 461ff)

Distributed questionnaires comprised both *a priori* and *a posteriori* measurement items previously proposed in comparable studies documented in IS literature.

6.2.1.2 Longitudinal field test and qualitative analysis

In addition to the conducted *laboratory experiment,* a high-fidelity SNS prototype was implemented that corresponded to the prototype configuration *Group 2* (see Table 43) and was made available to the total sample (N = 51) for a period of over 12 weeks in order to execute a qualitative evaluation of selected social design principles. A description of demographic characteristics and levels of prior ICT experience and computer literacy within the sample can be found in section 6.2.3.

All participants were represented through an active user profile on the SNS prototype during the *field test* and actively used the SNS prototype. During the laboratory experiment – previously conducted to the *longitudinal field test* – selected potential use cases simulated prospective use scenarios and additionally served as training exercises to prepare subjects for the *longitudinal field test*. In the course of the *longitudinal field test*, two researchers provided support through email and telephone in case subjects required assistance in system use.

As previously mentioned, literature differentiates between *exploratory focus groups* (EFG) and *confirmatory focus groups* (CFG) whereas CFG can be applied as a confirmatory method to test hypotheses and used to demonstrate the utility of the artifact design in the application field (Hevner/Chatterjee 2010, 159). For the underlying case, CFG provide an appropriate qualitative methodological mean to ensure discussions around how a system was used and how the completion of specific tasks was altered by its use. In total two CFG interviews were conducted during the *longitudinal field test* in chronological staggered execution: (i) an initial CFG interview was realized after nine weeks of system use and (ii) a second CFG was held after approximately 12 weeks after initiation of the field test. Parallel to the EFG conducted in course of explorative research in the underlying thesis, the CFG followed a semi-structured

protocol in case the sequence was neglected to encourage and foster discussions among participants.

6.2.2 Sampling and data collection

Potential participants for both the *laboratory experiment* and *longitudinal field test* were recruited based on a mail distribution list at the Generation Research Program of the Ludwig-Maximilians-Universität München and followed similar approaches previously described in the course of the thesis (see section 4.1.1). Special emphasis in the sampling process was devoted to recruit individuals from different social and professional backgrounds based on their demographic background. For the execution of the *laboratory experiment*, individuals who responded to the invitation were randomly distributed into three groups (see Table 43).

If possible, groups were equally distributed in terms of gender. All individuals participated in the *laboratory experiment* and *longitudinal field test.* A demographic description of the sample can be found in section 6.2.3.

The following paragraphs describe the data collection for the *laboratory experiment* and *longitudinal field test* and CFG interviews*,* respectively.

Data collection during the laboratory experiment

I chose an experimental methodology to evaluate a selection of *social design principles* (section 6.1) and test hypothesized relationships based on the ECT and corresponding research model (see section 6.2.4.1). For this research, a *laboratory experiment* was an appropriate methodology as it allowed controlling factors that are extraneous to the variables of interest.

The evaluation was held over six sessions in a designated laboratory. Each experimental session lasted for about 180 minutes. All sessions followed a standard protocol. Since the majority of subjects had no prior experience in *online social networking*, participants received a brief introductory explanation on *online social networking* in general – and descriptions about the applied prototypes in specific – its various functionalities as well as exemplary descriptions of potential use scenarios. The protocol included four use cases that all subjects had to run through by accomplishing a series of tasks using the provided functionalities.

Table 43 summarizes the arrangement of groups and description of applied configuration. The laboratory was equipped with laptop computers where each subject was assigned to one laptop. Participants were not allowed to directly communicate face-to-face however they were encouraged to communicate via the provided prototype system and to collaborate to solve specific tasks predefined in the use scenarios during the laboratory experiment.

Each participant was required to complete two short questionnaires, which measured the variables of interest. The first questionnaire was completed at the beginning of the experiment, before the participants were introduced to the prototype, and mainly collected demographic information such as age, educational level, and *a prior* variables proposed by the ECT. The second questionnaire was completed after the subjects had used the prototype and measured

the experimental variables such as ‘confirmation’, ‘perceived performance’, ‘satisfaction’, and ‘intention to use’. All variables were measured applying established and standard measurement items (Davis/Bagozzi/Warshaw 1989, 990f) (Bhattacherjee 2001, 370). Where necessary, the measurement items were modified to suit the context of the underlying study.

Furthermore variables were measured using a 7-point Likert scale with the exception of the variable ‘satisfaction’, which was assessed using a 5-point Likert scale. No time limits were imposed on the participants, as the main purpose of the experiment was to allow them to get a better understanding of the prototype and explore its functionalities in addition to performing predefined tasks.

Data collection during the longitudinal field test

In parallel to the explorative research initially conducted in the course of the underlying thesis described in section 4.1, data collection in the course of the longitudinal field test primarily relied on two executed CFG interviews. Invitations for both focus group interviews were sent via private messages through the prototype system and via email to the entire sample of participants (N = 51), and included a short description explaining the procedure and potential contents and subject matters to prepare prospective participants.

Both groups were equally distributed in terms of gender and, in contrast to the conducted EFG interviews, only a minority of participants already knew each other, e.g., from sport clubs, other interest groups, or previously conducted laboratory experiments. It shall be noted that demographic data was not surveyed during both CFG interviews due to limited authorization and to establish a comfortable atmosphere for participants.

Since participants in both *focus group interviews* represent a subsample of the total sample recruited for the *laboratory experiments* and longitudinal field test, demographic data can be derived from description of demographic characteristics of the entire sample (see Table 44). Both CFG interviews lasted approximately two hours, tallying to a rough total of 240 minutes and 20 participants. Two researchers additional to the moderator attended both sessions in order to brief participants regarding the purpose of the focus group interviews, ask questions, and facilitate discussions. Furthermore, they were mostly responsible for data documentation by taking notes and audio recordings.

A potential secondary data source constituted an installed tracking system, which anonymously recorded and logged system use behavior of participants and interactions at a functional level during the entire duration of the field test. However, I only refer to the data to support interpretations of findings and to clarify inconsistent results and potential ambiguous conclusions.

6.2.3 Demographics

The average age across the sample is 64.25 years (median 65) with a standard deviation of 7.46. I assume a standard normal distribution of age across the sample based on a conducted

Kolmogorov-Smirnov test (see Figure 40). The entire sample of subjects therefore corresponds to the target demographic group of the underlying thesis defined in section 2.1.2.

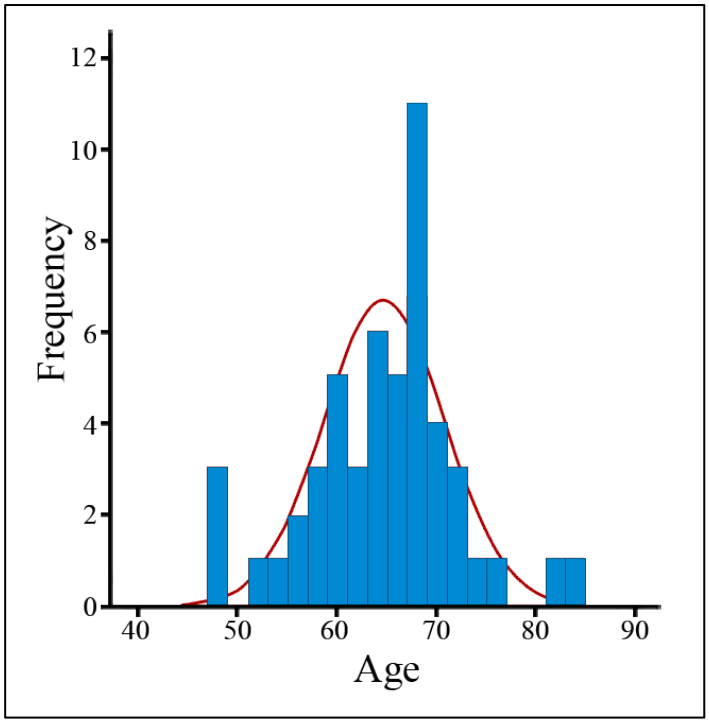

Figure 40: Age distribution across the sample
Source: Own illustration

The total sample comprised 51 subjects, composed of 19 male and 22 female individuals who participated in the *laboratory experiment*, *longitudinal field test,* and subsequently conducted *focus group interviews* (see Table 44).

	Group 1	Group 2	Group 3	Total Gender
Males	8	10	11	29
Females	9	9	4	22
Total Group	17	19	15	51

Table 44: Gender distribution across groups and entire sample (N = 51)
Source: Own illustration

Table 45 displays additional demographic data on subjects' life situation as well as their highest level of education. Approximately half of the subjects had a higher level of education (e.g., university or college degree) and 30% had an average level of education (e.g., high school degree or similar degrees).

Variable	Categories	Frequencies
Education	Hauptschulabschluss* Mittlere Reife** Abitur*** College Degree University Degree Not specified	8 (15.7%) 13 (25.5%) 2 (4.0%) 15 (29.4%) 11 (21.6%) 2 (4.0 %)
Employment Status	Yes No	15 (29.4%) 36 (70.6%)
Marital Status	Divorced Unmarried/Single Relationship Widowed	6 (11.8%) 1 (2.0%) 38 (74.5%) 6 (11.8%)
Children	Yes No	43 (84.3%) 8 (15.7%)
Housing Situation	Own house Condominium Renting With partner	27 (52.9%) 7 (13.7%) 16 (31.4%) 1 (2.0%)
* Equals to a certificate of secondary education ** Equals to an American high school diploma, but does not qualify to attend a German university *** General qualification for university entrance		

Table 45: Additional demographic data of collected sample (N = 51)
Source: Own illustration

In addition to demographic data, the distributed questionnaire solicited the general prior experience and comprehension of ICT. On average, participants have been using a computer for 17.63 years (standard deviation 9.128; median = 17). 74.5% of participants use a computer on a daily base, 19.6% more than once a week, 2.0% more than once a month, and 3.9% of the sample rarely. On average, participants had access to the Internet for 11.31 years (standard deviation 5.013, median = 10). 64.7% of the participants used the Internet on a daily base, 25.5% more than once a week, 3.9% more than once a month, and 5.9% rarely.

Table 46 displays prior experience and comprehension of ICT of subjects assessed through three self-assessment items on a scale from 1 (‘very low experienced’) to 6 (‘very well experienced’).

How would you...	Mean	Median	σ
...assess your degree of prior experience with computers?	2.67	2	1.291
...assess your degree of prior experience with the Internet?	2.71	2	1.361
...assess your general technical comprehensions?	2.96	3	1.248

Table 46: Level of prior ICT experience and computer literacy
Source: Own illustration

According to the established *classification of SNS users within the demographic segment Age 50+* presented in section 4.3, participants mostly correspond to *Means to an end*, *Skeptical* and *Close-lipped users*.

6.2.4 Findings and discussion

The subsequent two sections comprise findings and brief discussions on (i) the quantitative results obtained by execution of the *laboratory experiment* and (ii) qualitative results realized in the longitudinal field test and subsequently conducted *confirmatory focus group interviews*.

6.2.4.1 Results of the laboratory experiment

As shown in Table 47, Cronbach's alpha for the variables used in the underlying model were all above the suggested threshold of 0.7 (Straub 1989, 160), thus supporting the reliability of the measures besides the value for the variable 'satisfaction' in *Group 3*.

	Expectation	Perceived Performance	Confirma-tion	Satisfaction	Intention to Use
Group 1	0.940	0.949	0.969	0.814	0.990
Group 2	0.914	0.976	0.956	0.871	0.991
Group 3	0.912	0.900	0.873	0.669	0.940
Total	**0.922**	**0.956**	**0.948**	**0.822**	**0.980**

Table 47: Cronbach's alpha values for applied ECT measurement items
Source: Own illustration

In the following, I briefly present the results of the measured research model for each specific prototype configuration and corresponding group.

Table 48 displays determined values of the regression analysis based on ECT variables for *Group 1* with 'intention to use' as the dependent variable. In total four regression models were calculated.

Variables	Standardized coefficients B	Significance
Model 1: Depending Variable – Intention to use		
$R^2 = 0.473$; Adjusted $R^2 = 0.438$; F = 13.448; Significance = 0.002		
Satisfaction	0.688	0.002 (t = 3.667)
Model 2: Depending Variable – Satisfaction		
$R^2 = 0.543$; Adjusted $R^2 = 0.437$; F = 5.145; Significance = 0.015		
Expectation	-0.455	0.175 (t = -1.434)
Confirmation	0.209	0.483 (t = 0.722)
Perceived Performance	0.879	0.041 (t = 2.262)
Model 3: Depending Variable – Confirmation		
$R^2 = 0.580$; Adjusted $R^2 = 0.520$; F = 9.661; Significance = 0.002		
Expectation	-0.019	0.950 (t = -0.064)
Perceived Performance	0.777	0.019 (t = 2.649)
Model 4: Depending Variable – Perceived Performance		
$R^2 = 0.651$; Adjusted $R^2 = 0.627$; F = 27.949; Significance = 0.000		
Expectation	0.807	0.000 (5.287)

Table 48: Regression analysis based on ECT variables for Group 1 (n = 17)
Source: Own illustration

Table 49 displays determined values of the regression analysis based on ECT variables for *Group 2* with 'intention to use' as the dependent variable, in parallel to *Group 1*. Four regression models were calculated.

Variables	Standardized coefficients B	Significance
Model 1: Depending Variable – Intention to use		
$R^2 = 0.446$; Adjusted $R^2 = 0.413$; F = 13.659; Significance = 0.002		
Satisfaction	0.667	0.002 (t = 3.696)
Model 2: Depending Variable – Satisfaction		
$R^2 = 0.575$; Adjusted $R^2 = 0.490$; F = 6.776; Significance = 0.004		
Expectation	-0.246	0.227 (t = -1.261)
Confirmation	0.052	0.822 (t = 0.228)
Perceived Performance	0.811	0.003 (t = 3.466)
Model 3: Depending Variable – Confirmation		
$R^2 = 0.462$; Adjusted $R^2 = 0.395$; F = 6.874; Significance = 0.007		
Expectation	0.164	0.444 (t = 0.786)
Perceived Performance	0.586	0.013 (t = 2.812)
Model 4: Depending Variable – Perceived Performance		
$R^2 = 0.227$; Adjusted $R^2 = 0.181$; F = 4.986; Significance = 0.039		
Expectation	0.476	0.039 (t = 2.233)

Table 49: Regression analysis based on ECT variables for Group 2 (n = 19)
Source: Own illustration

Table 50 shows determined values of the regression analysis based on ECT variables for *Group 3* with 'intention to use' as the dependent variable. In parallel to previous analysis, four regression models were calculated.

Variables	Standardized coefficients B	Significance
Model 1: Depending Variable – Intention to use		
$R^2 = 0.156$; Adjusted $R^2 = 0.091$; F = 2.404; Significance = 0.145		
Satisfaction	0.395	0.145 (t = 1.550)
Model 2: Depending Variable – Satisfaction		
$R^2 = 0.099$; Adjusted $R^2 = -0.147$; F = 0.403; Significance = 0.754		
Expectation	0.132	0.714 (t = 0.376)
Confirmation	0.210	0.560 (t = 0.601)
Perceived Performance	0.040	0.894 (t = 0.137)
Model 3: Depending Variable – Confirmation		
$R^2 = 0.327$; Adjusted $R^2 = 0.215$; F = 2.914; Significance = 0.093		
Expectation	0.562	0.038 (t = 2.328)
Perceived Performance	0.044	0.859 (t = 0.181)
Model 4: Depending Variable – Perceived Performance		
$R^2 = 0.037$; Adjusted $R^2 = -0.037$; F = 0.494; Significance = 0.494		
Expectation	0.191	0.494 (t = 0.703)

Table 50: Regression analysis based on ECT variables for Group 3 (n = 15)
Source: Own illustration

Table 51 summarizes the results of the two-sided t-distributions for each group and corresponding decisions on acceptance and rejection of particular hypotheses based on three differential confidence levels.

Group	H	Confidence Level 90%	Confidence Level 95%	Confidence Level 99%
1	1	✔	✔	✖
	2	✔	✔	✔
	3	✖	✖	✖
	4	✖	✖	✖
	5	✔	✔	✖
	6	✔	✔	✔
	7	✖	✖	✖
2	1	✔	✔	✖
	2	✔	✔	✖
	3	✖	✖	✖
	4	✖	✖	✖
	5	✔	✔	✔
	6	✔	✔	✔
	7	✖	✖	✖
3	1	✖	✖	✖
	2	✖	✖	✖
	3	✔	✔	✖
	4	✖	✖	✖
	5	✖	✖	✖
	6	✖	✖	✖
	7	✖	✖	✖
✔ symbol indicates that the hypothesis has been accepted				
✖ symbol indicates that the hypothesis has been rejected				

Table 51: Acceptance and rejection of hypotheses based on three confidence levels
Source: Own illustration

As previously mentioned, confirmation of expectations results in satisfaction. Expectations form the baseline level against which confirmations are assessed by users to determine their evaluative response to an information system. Users evaluate their use experience based on the extent to which their expectations are confirmed, and this evaluation results in satisfaction or dissatisfaction with the system.

Figure 41 displays the structural model and graphically delineates accepted hypotheses based on two confidence levels for the prototype configuration *Group 1*.

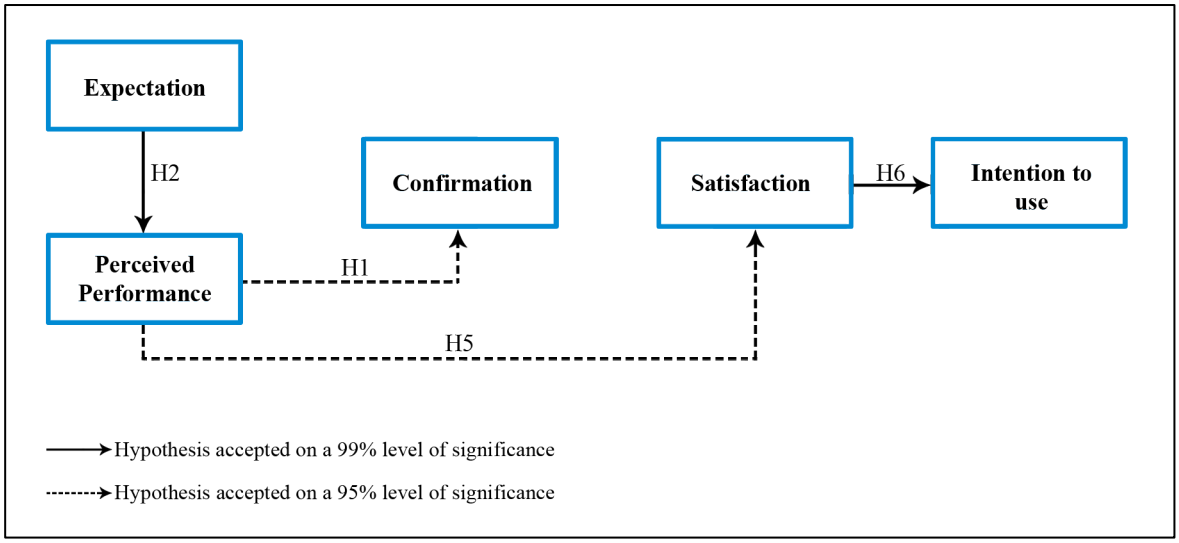

Figure 41: Graphical representation of accepted hypotheses for Group 1
Source: Own illustration

Figure 42 respectively displays the structural model and graphically delineates accepted hypotheses based on two confidence levels for the prototype configuration *Group 2*.

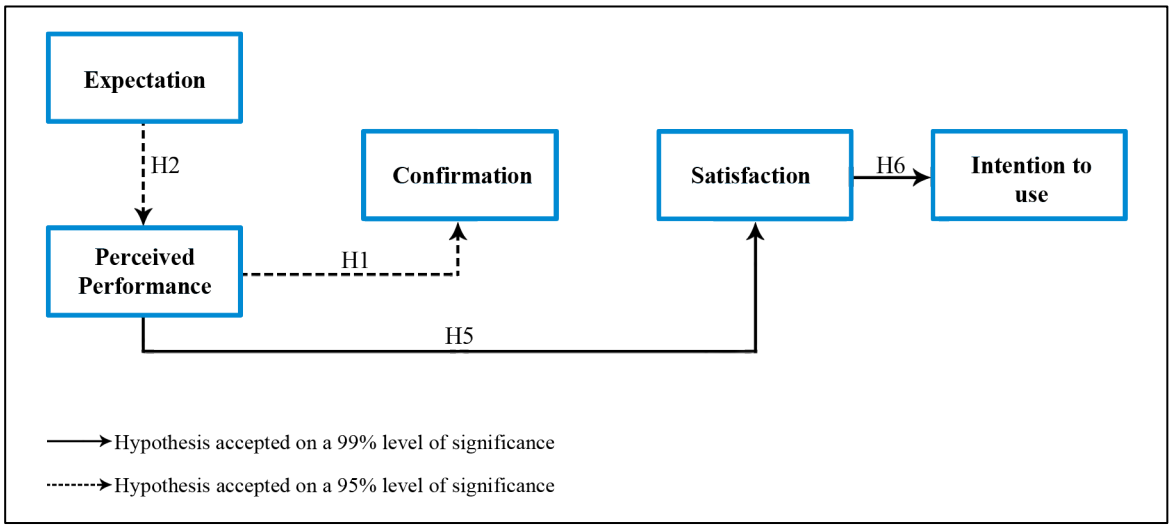

Figure 42: Graphical representation of accepted hypotheses for Group 2
Source: Own illustration

To conclude, in comparison to the measured evaluation model for *Group 1*, I assume the provided prototype configuration for *Group 2* (control group) to perform slightly better since the hypothesized relationship between 'perceived performance' and 'satisfaction' (**H5**) can be accepted on a confidence level of 99%. However, the measured evaluation model for the underlying prototype configuration in *Group 1* explains 62.7% in the variance of the dependent variable (adjusted $R^2 = 0.627$).

The hypothesized relationship between the variables 'perceived performance' and 'confirmation' is the fundamental hypotheses in the underlying evaluation model based on ECT (**H1**),

since the relationship indirectly assesses the extent to which users' initial expectations are confirmed after experiencing and using the system to determine the extent to which they perceive the system as being useful. H1 is accepted for subsamples *Group 1* and *Group 2* with a confidence level of 95% – however, I like to stress that the t-value for *Group 2* did not meet the required value for a confidence level of 99% (actual *t-value* = 2.812; target *t-value* = 2.861). Consequently, the hypothesis has to be rejected for the prototype configuration provided in *Group 3* in which the structured representation of a user's online social network and corresponding functionalities that support *social searching* and *social browsing* behavior as well as a functionality for private messaging were turned off during the *laboratory experiment*.

The assumed relationship between a user's expectations and assessed extent of perceived performance (or perceived usefulness) of the prototype system (**H2**) is rejected for *Group 3* and accepted for *Group 1* (on a confidence level of 99%) and *Group 2* (on a confidence level of 95%). However, a comparison between the mean values for the variable 'perceived performance' reveal differences between *Group 1* (mean = 4.551) and *Group 2* (mean = 5.046) that could be explained by the comprehensive provision of functionalities featured in the prototype configuration *Group 2*. Yet, a conducted two-sample t-test revealed no significant differences between *Group 1* and *Group 2* (two-sided significance = 0.337). Since the variable 'expectation' was assessed *a priori* to application of provided prototype configurations, measured means for the variable of interest are assumed to vary little in their scored means (mean *Group 1* = 4.596; mean *Group 2* = 4.566). H2 is rejected for prototype configuration assessed in *Group 3*.

The established evaluation model suggests a relationship between the variables 'expectation' and 'confirmation' since the extent to which users' initial expectations are confirmed after experiencing and using a system determines the extent to which they perceive the system as being useful (**H3**). The hypothesis can be rejected for prototype configuration subsamples *Group 1* and *Group 2* where the corresponding t-value for *Group 2* is considerably higher compared to *Group 1*. H3 can be accepted on a confidence level of 95% for the prototype configuration provided in *Group 3,* however subjects in *Group 3* indicated a significant lower mean value (mean *Group 3* = 4.125) in assessing their *a priori* expectations of the prototype compared to the other subsamples (mean *Group 2* = 4.566; mean *Group 1* = 4.596).

As previously mentioned, satisfaction with technology has been empirically found to be associated with experience of using the technology (Mahmood et al. 2000, 764) and consequently can be understood as an evaluative response to system use (Bhattacherjee 2001, 355), the ECT suggests a relationship (**H4**) between the variables 'confirmation' and 'satisfaction' such as the users' extent of confirmation will be positively associated with their satisfaction with the technology or prototype use. Since obtained values in conducted regression analysis missed the defined confidence levels, the hypothesis was rejected for all prototype configurations and corresponding subsamples. Consequently, the evolution model could not prove a casual effect between the extent of users' expectorations and their corresponding confirmation of these *a priori* constituted expectations or users' actuated satisfaction with the prototype systems (**H3-H4**).

Previous research demonstrated that the extent to which the system is perceived as useful subconsciously invokes cognitive decision rules regarding behavioral intentions (Davis/Bagozzi/Warshaw 1989, 986). Therefore the evaluation model tested a hypothesized relationship between the variables 'perceived performance' and 'satisfaction' (**H5**) since evidence suggests that perceived usefulness is a salient belief that influences system acceptance behaviors (Davis/Bagozzi/Warshaw 1989, 985f). The hypothesis could be accepted for the prototype configuration in *Group 2* on a confidence level of 99% and for *Group 1* on a confidence level of 95% and I rejected the hypothesis on all tested confidence levels. Accordingly, the evaluation model could prove a cohesive *casual effect model* between the variables 'expectations', 'perceived performance', 'satisfaction', and 'intent to use' (**H2-H5-H6**) for the prototype configurations *Group 1* and *Group 2* on differential confidence levels.

The hypothesized relationship between the variables 'satisfaction' and 'intention to use' (**H6**) can be accepted for *Group 1* and *Group 2* on a confidence level of 99% and a confidence level of 95% respectively. The hypothesis is rejected for *Group 3* on all tested confidence levels since the prototype configuration lacked the provision of a structured representation of a subject's online social network. I assume that deactivated functionalities in the prototype configuration *Group 3,* namely functionalities enabling users to send private messages and to interact with their individual online social network including a structured representation of a user's online social network, are essential for elderly users to participate in and actively use SNS.

The evaluation model included additionally introduced hypothesis (**H7**) compared to the proposed structural model based on the ECT and tested whether users' expectations towards the prototype system will be associated with their satisfaction of it. Justifications for a hypothesized relationship between users' expectations and their satisfaction with a prototype system were based on considerations stated by (i) Szajna/Scamell (1993, 493ff) who assume that higher expectations result in higher evaluations and consequently demonstrated that increasing users' expectations regarding system quality results in an overall increase of system evaluations and thus in users' satisfaction with a system and by (ii) Staples/Wong/Seddon (2002, 126) who propose that higher expectations lower the resulting perceptions regarding system effectiveness, and therefore overall satisfaction. However, H7 was rejected for all prototype configurations and subsamples.

In addition to testing the hypothesized relationships, I controlled for several extraneous factors that might have affected the findings by applying *analysis of variances* (ANOVA) and a series of *Mann-Whitney-U tests* on different variables. Table 52 reports the ANOVA results for the *Group 1* and *Group 2* prototype configurations, where analysis could not identify significant differences between both groups.

		Sum of squares	df*	Mean square	F	Significance
Expectation	Between groups	1.744	2	0.872		
	Within group	91.678	48	1.910	0.456	0.636
	Total	93.422	50			
Perceived Performance	Between groups	2.261	2	1.131		
	Within group	91.223	48	1.900	0.595	0.556
	Total	93.484	50			
Confirmation	Between groups	0.706	2	0.353		
	Within group	91.533	48	1.907	0.185	0.185
	Total	92.239	50			
Satisfaction	Between groups	1.016	2	0.508		
	Within group	19.046	48	0.397	1.280	0.287
	Total	20.061	50			
Intention to use	Between groups	9.222	2	4.611		
	Within group	117.413	48	2.446	1.885	0.163
	Total	126.635	50			
* df = degrees of freedom						

Table 52: Analysis of variance between Group1 and Group2
Source: Own illustration

I additionally applied *Mann-Whitney-U tests* on the variables 'gender' and 'age' to test differences between the three different prototype configurations. Since the variable 'expectation' was assessed prior to actual use of provided prototypes, I applied assessed values for the total sample within the conducted tests (see Table 53).

Group	Expectation	Perceived Performance	Confirmation	Satisfaction	Intention to use
1	0.834	0.423	0.541	0.021	0.008
2		0.968	0.604	0.780	0.905
3		0.280	0.753	0.040	0.078

Table 53: Mann-Whitney-U tests for the variable 'gender'
Source: Own illustration

Results indicate that the scored satisfaction with and intention to use the corresponding prototype differ based on the subjects' gender. Female subjects seem to be more satisfied with the configuration provided in *Group 3* (mean rank *female* = 11.88; mean rank *male* = 6.59), whereas male subjects score a higher satisfaction with the configuration provided in *Group 1* (mean rank *female* = 6.33; mean rank *male* = 12.00). Based on the results I assume that elderly SNS male users prefer a clearly portrayed and structured representation of their online social network and corresponding functionalities supporting *social searching* and *browsing* behaviors compared to functionalities that facilitated the posting status message or functionalities that display activities around a subject's network profile. In contrast, elderly female SNS users seem to give priority to functionalities that enable the posting of status messages and corresponding functionalities that allow users to react on posted status message of other social ties.

Furthermore, I applied Mann-Whitney-U tests to check for potential differences in subjects' attitudes towards and their assessments of each prototype configuration ascribed to their age (see Table 54). For this purpose, I divided the total sample in two subgroups: (i) subjects that are *65 years of age or younger* (n = 26) and (i) subjects that are *66 years of age or older* (n = 25). Conducted tests show no significant differences based on a subject's age and corresponding assessed prototype configuration. Only for the tested variable 'intention to use' was the null hypothesis rejected in *Group 3* (mean rank *65 and young* = 5.38; mean rank *65 and older* = 11.25). The results suggest that a clearly portrayed and structured representation of elderly users' online social networks is essential for elderly users that are younger than 65 years of age affecting their intention to use a SNS, while users older than 65 years of age seem not to be influenced by the absence of structured representations of their online social networks and their intention to use the underlying SNS.

Group	Expectation	Perceived Performance	Confirmation	Satisfaction	Intention to use
1	0.385	0.743	0.963	0.236	0.815
2		0.315	0.549	0.211	0.400
3		0.864	0.864	0.456	0.018

Table 54: Significances of Mann-Whitney-U tests for the variable 'age'
Source: Own illustration

In a final step, I conducted Mann-Whitney-U tests based on subjects' self-assessment of their Internet experience and therefore divided the total sample into two groups (see Table 55). The variable 'Internet experience' was assessed applying a 6-point Likert scale reaching from 'very low experienced' ('1') to 'very experienced' ('6') whereas subjects scoring a maximum of '2' (n = 26) were classified as *low experienced* Internet user while the remaining sample were classified as *highly experienced* Internet users (n = 25). All tests scored non-significant results and therefore I assume no interference of the level of Internet experience among elderly SNS users and their preference in a SNS functional configuration.

Group	Expectation	Perceived Performance	Confirmation	Satisfaction	Intention to use
1	0.175	0.404	0.180	0.404	0.462
2		0.482	0.711	0.650	0.592
3		0.536	0.152	0.281	0.955

Table 55: Significances of Mann-Whitney-U tests for the variable 'Internet experience'
Source: Own illustration

In the following section, I briefly describe the major qualitative findings extracted from conducted *confirmatory focus group interviews* and subsequently clarify consequences of quantitative and qualitative evaluation results by revising selected and implemented social design principles.

6.2.4.2 Results of the longitudinal field test

The *confirmatory focus group interviews* (CFG) conducted during the field test showed that the participants generally understood the concept of *online social networking* and endorsed the idea of SNS as a supportive mean to real-world social interaction and to enable a novel and prospective alternative to (virtually) integrate elderly citizens in their local communities and neighborhoods as well as their social living environment. All participants attested to the importance of real-world social networks at an advanced age, especially for everyday support in rural regions and embraced the concept of *online social networking* in supporting offline social interactions to prevent loneliness and to enable an independent life in advanced age.

The majority of focus group participants initially feared becoming victims of a crime through the use of the deployed prototype despite the fact that participation in the *field test* required a mandatory identity check and expressed similar concerns regarding prospective contemporary SNS use based on unintentionally shared information that would be uncontrollably dispersed in the form of status messages.

In the following, I attempt to outline and discuss evidence found in the qualitative evaluation of selected social design principles during CFG interviews executed in the course of the longitudinal field test. The following discussions also constitute rationales for two social design principles that underwent a refinement process since chosen implementations were problematic or criticized by field test participants.

The one about "…initially restricted user profile information"

There were reservations about the privacy and data protection policies currently enforced in established SNS. Reasons for these concerns were, for the most part, negatively charged reports about *online social networking* in recent media coverage due to the fact the sample excluded active users of contemporary SNS – a finding that could already be documented in the explorative research in course of the underlying thesis.

#I.1*

Design for user profile information visibility following the principle of "give and take"

Rationale: All participants understood and supported initial totally restrictive privacy settings realized in the prototype configuration according to the proposed social design principle, noting however, that keeping them restrictive considerably hindered the sprouting of computer-mediated communication and online social interaction. This effect increased in the progress of the field test since the majority of users neglected or intentionally decided against loosening the initial totally restricted user profile data privacy settings. Consequently the majority of participants agreed that the restricted user profile information prevented online social interaction, especially with weaker social ties, since it was difficult to evaluate an individual's personality based on limited profile information. A minority of participants even expressed feelings of anxiety due to total restriction of user profile information during prototype use and assumed that total initial limitation of profile information would negatively affect their attitude towards long-term adoption and use of a corresponding SNS.

When focus group participants were asked for potential suggestions enhancing the underlying proposed social design principles, they proposed to regulate visibility of user profile information according to a "give and take" principle, so that the degree of visible information of a SNS user profile that a user interacts with is individually adjusted to the degree of visible profile information the user permits to provide for the corresponding online social ties.

The one about "…aggregation of important activities since last login"

Suggested implementations, however, contain the potential risk to result in immense *information overload* and to cause confusions and dysfunctional effects in the form of stress and anxiety among elderly SNS users or to lead to a diminished decision quality, unless combined with intelligent and meaningful settings to filter the information. Yet, the proposed dissemination of activity information to more traditional communication modalities in non-mobile use of SNS for elderly users could positively influence their user involvement in later stages according to the *behavior chain model* (Fogg/Eckles 2007, 202) and not only result in long-time adoption of *online social networking* but also increased formation of *social connectedness* and provision of *social support*.

#Con.4*

Design for aggregated user activities across multiple communication modalities

Rationale: While the aggregation of important activities since a user's last login was not only perceived as highly useful by the majority of the focus group participants, they confirmed that the implemented individual activity log could ensure frequent interaction and processing of meaningful (social) information to prevent information overload and they also primarily criticized that provided corresponding information is only available after a successful login and thus exclusively accessible through the SNS. Hence participants reported on occasional frustration since they had the feeling of not only missing out on relevant activities, and also stated that provided information was consequently irrelevant given that provided information was related to real-world activities. In many cases, individuals who irregularly logged on to the SNS or had long elapsed time between two logins potentially perceived information overload since those users felt overwhelmed by the amount of information and activities of other users related to their profile or own activities to catch up with.

Therefore participants proposed settings to filter information according to parameters such as limiting the timeframe of displayed activity information or solely displaying information on specific activities and selected social ties. Furthermore, participants called for the dissemination of provided activity information to other (more traditional) communication modalities such as email or telephone in the form of text messages or even automated computer-read out phone calls. I like to mention, that during completion of the underlying thesis, contemporary SNS, such as Facebook and Twitter, introduced functionalities to enable dissemination of activity information in the form of emails and corresponding settings to filter information in order to alert users on activities. More recently introduced mobile versions of the SNS Facebook and Google+ feature settings for real-time (haptic) alerts based on other users' SNS activities and shared user-generated content, although mobile applications and their implications for (elderly) users were not a subject of the underlying thesis research.

Having portrayed and discussed the social design principles, I would like to summarize in the following chapter potential limitations, since the empirical study in the course of the underlying thesis and the compilation and evaluation of proposed social design principles are subject to a number of limitations. Subsequently, I provide fellow IS and HCI researchers with suggestions for prospective future research focusing on *online social networking*.

7 Limitations and future research

Given that I provided a description of relevant limitations regarding particular chosen approaches and applied research methods in throughout the thesis in the respective chapters, I abstain from a detailed recapitulation of previously mentioned limitations and rather focus on potential restrictions I see in the last parts of the underlying thesis research.

In an initial step, I like to briefly outline potential limitations that arise from the chosen research approaches and in the methods that data collection and analysis were executed in (i) the pivotal empirical study (see section 5.4) and (ii) the compilation and evaluation of proposed social design principles (see section 6.2).

7.1 Limitations

The conducted pivotal empirical quantitative study is subject to a number of limitations that I attempt to disclose in the following. Due to the applied *snowball sampling* method the generated sample only included a minor proportion of elderly Facebook users – 19.0% of subjects within the collected sample represented the targeted demographic segment *45 and above.* However when compared to other data sources that estimate the proportion of elderly SNS users (*45 and above*) to approximately 28.8% of the total *online social networking* audience (comScore 2010a), the obtained sample is assumed to produce meaningful findings and valuable insights. I argue that the documented findings not only apply to specifically younger SNS user segments but also to elderly SNS user segments.

Furthermore, findings of the conducted study provide novel insights on the theoretical development of *social capital* and subjective *well-being* in the context of *online social networking* since to this day, systematic empirical research has not been sufficiently documented the underlying phenomenon in IS and HCI literature. Furthermore, sampling efforts resulted in a sample size of 143 viable data samples that served as input for the conducted factor and PLS analysis. Although the sample size is rather small compared to the overall population of Facebook users, the data sample conforms to commonly applied sample size rules in PLS analysis. The chosen method has the advantage over *covariance-based methods* because it requires fewer data sets to accurately estimate loadings and produces meaningful results. As a result of a small sample size, documented findings and evidence might be confined in their degree of generalizability.

Due to a limited sample size and the need to conserve degrees of freedom, various potential moderating effects of demographic characteristics were not evaluated or included in the analysis. Future studies should include a larger set of elderly subjects or could exclusively be comprised of elderly subjects to measure direct or moderating demographic effects typical for elderly individuals, such as the existence of children or grandchildren, the case of deceased life partners, or specific living situations, e.g., habitation in a nursing home. Furthermore, the collected sample was characterized by subjects that frequently used the SNS Facebook in their daily communication routines and as an auxiliary modality for real-life social interaction. I therefore encourage repeatedly executing the study and applying established measure-

ment items to collected samples composed of different demographic characteristics and individuals showing less exposure to *online social networking* who just recently registered with a SNS.

In addition, analysis of collected data was limited to the scope of the underlying thesis and executed PLS model testing was further guided by – and therefore also limited to – the theoretical development performed in prior steps in the course of the thesis. The selection of different theoretical constructs or varying specifications of applied variables could have produced a wide variety of diverse structural and measurement model configurations. Further, the presented structural model and corresponding measurement model only display one possible configuration and analyzed instantiation. Researchers are cordially invited to modify, expand, and test different measurement items and model configurations in future research.

It has already been mentioned that direct effects of *social support* and *social connectedness* on an individual's *well-being* are difficult to measure (Bowling/Farquhar/Browne 1991, 563f) given that scope and quality of existing measurement items for subjective *well-being* or *satisfaction with life* deliver varying results. Yet the theoretical notion of subjective *well-being* is of a highly complex nature and influenced by multiple external factors and psychological processes of individuals. For example, Rook (1990, 219-250) argues that provision of *social support* is not solely the result of increased subjective *well-being*, but is the consequence of interactions in a meaningful social context (Schwarzer/Knoll/Rieckmann 2004, 161). Besides, I assume subjective *well-being* to be highly influenced by real-life social interaction and highly dependent on an individual's experienced, current life situations, and on the underlying trait of character of each individual. The utilization of 'social capital' as a mediating variable between the variables 'social support' and 'social connectedness' as well as the subjective 'well-being' in the research models is not only justified by previous research findings but also a predictor of subjective *well-being* theoretically grounded in previous paragraphs – and could further be studied in future research. Moreover, future research could especially focus on the testing of established measurement items (Ledbetter 2009, 471) and the development of novel measurement items for *social connectedness* in light of computer-mediated communication and online social interaction, since applied measurement items for the construct 'social connectedness' in the underlying study displayed a rather low *discriminant validity* with the construct 'social support'.

Additionally data collection was restricted to a single point in time whereas the collection of data at multiple points in time could produce a richer picture on the influence of *online social networking* and its assumed potential benefits on elderly users and could generate greater insights on the interplay between online and offline social interaction and its beneficial outcomes. Moreover, in comparison to the previously presented empirical study focused on the SNS Twitter, conducted analysis in the latter empirical study were eventually limited only to perceived data since the SNS Facebook misses the provision of a corresponding API that allocates actual use data or demographic data of users.

Evaluating design principles and prototype configurations in an experimental setting gives rise to limitations that are inherent to this research methodology. In the case of conducted laboratory experiments, future studies could assess usability in more natural social settings

where users are less likely to feel constrained by an experimental setup. Each laboratory experiment and evaluation session lasted about for about 120 minutes, out of which subjects spent approximately 100 minutes evaluating and using the underlying prototype configuration. While, the 100-minute evaluation period can have an effect on the stability or their perceptions regarding the usefulness of the prototype, it can be considered sufficient for initial evaluation and acceptance of the prototype. However, future studies that allow participants to use and evaluate the particular prototype configuration over a longer period of time could be designed to get a better assessment of their feelings and experiences with the prototype and their willingness for continued patronage.

Therefore, I conducted a field test with a single prototype configuration to gain insights on possible effects of prototype use over a longer period of time by conducting focus group interviews at two distinct points in time. However, the field test setting and its analysis and evaluation are subject to numerous limitations. Although the prototype configuration was introduced in a real-world setting and used by elderly subjects in everyday life situations, I acknowledge that the conducted research using observational data and self-reported responses can have certain limitations. Thus the fact that I studied an actual system, with actual users, and their natural use behavior should reflect positively on the concerns of external validity. A rigorous data collection concerning actual and quantitative user data of subjects was technically made possible through a tracking and logging system, however I abstained from deeper analysis on collected data due to constraints expressed by the ethical commission supervising the conducted research.

Given that proposed social design principles were compiled by applying *evidence-based design* and *theory-driven design* grounded in findings and novel theoretical insights generated in the course of conducted explorative and empirical research presented in the underlying thesis, generalizability of social design principles to the total (elderly) SNS user base as well as global Internet population in general might be limited since subjects in both the explorative and quantitative research mostly originated from Western cultural backgrounds. Moreover collected samples in all empirical studies conducted in scope of the thesis were mostly composed of younger subjects and characterized by age distributions in favor of individuals below the age of 50 years. However, as mentioned earlier, I assume that elderly SNS users mimic use behavior of younger users and therefore I argue by reverse-conclusion that evidence and novel theoretical insights generated from samples that mostly comprised of younger subjects could be applied in the compilation and deduction of proposed social design principles. Yet, a selection of proposed social design principles was strictly evaluated with elderly individuals.

Lastly, I like to point out that research based on the *design science paradigm* always embraces and motivates evaluation of generated artifacts. In the underlying thesis, artifacts correspond to the compiled social design principles and the proposed theoretical models can be regarded as artifacts according to the *design science paradigm*. Therefore the testing of established measurement models through conducted survey research should additionally be considered as a form of evaluation. However, as previously mentioned, future research could focus on further testing of measurement models established in the course of the underlying thesis and additionally implement established and novel social design principles in prototype

configurations for evaluation since extent of evaluation efforts was limited to the scope of the thesis.

7.2 Future research

In the following section, I briefly outline potential future research approaches that might result in meaningful insights for and potentially add fundamental knowledge to both the IS and HCI research disciplines. Firstly, I delineate promising future approaches relating to research conducted in the underlying thesis residing in the IS research domain and recommend prospective future work in the field of HCI research.

A promising approach could be the expansion of the pivotal research model with other constructs such as the already applied *social awareness* and *social presence* as well as similar established constructs in socio-psychological and IS research. In addition, replacement of constructs that primarily measured *structural* characteristics of a social network in the pivotal research model by constructs that measure *functional* characteristics of an individual's (online) social networks in the form of mediating or moderating variables could deliver valuable insights on the formation of *social capital* and *well-being,* such as the effects of social influence, social comparison, perceived trust, and social reputation among online social peers and potential corresponding affects on an individual's offline social network and real-life.

Furthermore, future research could more intensely focus on negative effects of *online social networking* among elderly individuals such as *information overload*, *friend inflation,* or negative aspects linked to *jealousy* in SNS use and how they affect the formation of *social connectedness*, *social support,* and *social capital* and influence a person's *well-being*. For example, *information overload* has been proven to cause reduced levels of user activity, a negative attitude towards shared information by provoking an emotional state of dissatisfaction, and potentially diminishing the degree of perceived *social connectedness* and *social capital* for individuals (Koroleva et al. 2010, 3ff). Research on solving potential *information overload* caused by SNS use could focus on intelligent filtering mechanisms to limit incoming status message update frequency and general communication efforts in *online social networking* for younger but especially elderly SNS users. For example, systems could learn from past behavioral patterns and integrate user preferences in filtering user-generated content, thereby reducing cognitive load of (elderly) SNS users. In line with Koroleva et al. (2010, 7), researchers are requested to build and test solutions for the design of such mechanisms in future research. Since empirical evidence suggests that frequency of SNS use and specifically the continuous active and passive following and consumption of status message updates of social peers strongly increases the feeling of perceived *social connectedness* and thus positively influences the formation of *social capital*, individuals might be exposed to *information overload* and SNS overuse. Hence anecdotal evidence indicates the emergence of boredom towards *online social networking* use (Koroleva et al. 2010, 1) and studies report on "Facebook fatigue" (Coventry 2011) that results from predictable posting and sharing patterns of social peers. Consequently, recent research focuses on the reduction of potential and perceived *information overload* for users of SNS Facebook or Twitter (Koroleva et al. 2010, 4ff). Given that specific social design principles explicitly motivate and trigger use of the status message functionality (or related functionalities), researchers in the HCI discipline should

focus on non-intrusive ways to implement status message information in third-party applications and seek novel modalities to compile information, e.g., using sensors to automatically generate and share specific information in the form of individual messages, and build innovative awareness systems for specific user groups such as elderly or disabled individuals. Research regarding awareness systems in the HCI discipline is still emerging and focuses on experimental or laboratory settings whereas field tests are limited to specific and real-world environments. In parallel to various scholars, I call for future research on designing and testing of awareness systems in varying relevant environments such as retirement homes to investigate how generated information on SNS could be transferred in novel modalities to trigger real-life and physical implications for elderly or disabled people.

As previously mentioned, since mobile and ubiquitous technological developments are already enabling online social interaction in a highly non-intrusive fashion while real-life social interactions happen, I assume that this novel form of social interaction might become a decisive component in our daily social interaction routines, supporting and possibly enhancing everyday social life and our society at large. The compiled theoretical development and applied questionnaires in course of the underlying thesis could be transferred and adopted to purely mobile online social interaction to investigate affects of solely mobile *online social networking* among elderly subjects. Additional surveys that build on the proposed measurement and structural models could be conducted in the form of longitudinal surveys collecting data at multiple time intervals to gain insights on alterations of (beneficial) effects of *online social networking* among (elderly) SNS users. Another seminal approach could be the execution of comparison studies between younger and older SNS users based on the developed measurement and structural models and corresponding questionnaires to shed light in potential different implications *online social networking* might have on different age groups. Continuatively, studies could consider significant social sub networks such as family structures through clustering and pairing of collected data in order to research effects of cross-generational social interaction and its implications on subjective well-being not only for the elderly but younger generations.

Overall, the use of two distinct but complementary data sources applied in the empirical study on the SNS Twitter has proven to be a successful approach and provides a richer picture of the studied phenomenon and follows suggested practice in IS research (Sharma/Yetton/Crawford 2009, 485). The presented study is one of the few examples of research that combines measures of psychological perceptions with actual measures of frequency of use and network size from the SNS to investigate the link between subjective and objective variables. Yet, research in the IS and HCI is fairly sparse that combines complementary data sources collecting measurements of perceived psychological and actual use data from subjects in the field of *online social networking*.

Not only researchers in the field of HCI, but also designers and developers of applications and systems that specifically focus on and target elderly users could built on documented classifications of elderly ICT and SNS users in order to generate *personas* in order to conceptualize and build adequate and better social systems and functionalities that especially cater to elderly individuals. Given that *personas* represent an interaction design technique increasingly applied in activities included in *user-centered design, scenario-based design* and *interaction*

design in recent years (Pruitt/Grudin 2003, 1), research could broaden the theoretical knowledge base in the HCI domain and generate significant practical impact in the field of design and system development.

Theoretical findings and proposed social design principles could be further applied in designing novel applications and systems that foster mobile *online social networking* in unprecedented and novel modalities since mobile and ubiquitous technological developments enable developers to design online social interactions in a highly and more non-intrusive fashion and supportive mean for real-life social interaction. HCI researchers are therefore prompted to built and test prototype applications that support this novel and form of online social interaction among elderly individuals to make mobile *online social networking* a compelling and decisive component of our daily social interactions, everyday social life and society at large.

Nevertheless, since *online social networking* tends to become a decisive component of our daily social interactions on the background of previously described mobile and ubiquitous technological developments, I would like to warn for a certain degree of SNS use addiction in the way that social interaction shifts from primarily offline social interaction to a predominant online social interaction among (elderly) individuals. Online social interaction should be regarded as a supportive means to real-world social interaction and not constitute the dominant form of social interaction among individuals. Therefore research in this area could additionally contribute to our individual *well-being* and the society at large.

Finally, I advocate increment execution of research studies that apply *evidence-based design* and *theory-driven design* in both IS and HCI research disciplines since these approaches contradict the notion that breakthroughs in application and system design are merely a result of intuition, loose empirical observations or rapid prototyping and have proven to produce relevant and rigor research outcomes. Furthermore, in line with other scholars (Sharma/Yetton/Crawford 2009, 485), I would like to challenge fellow IS and HCI researchers to pursue comparable approaches by combining distinct but complementary data sources to provide a richer picture of the studied phenomenon and more rigorous interpretations of collected data and findings. Specifically research evolving from the IS and HCI domains with their richness in different research and data collection methods holds the potential to combine measures that of psychological perceptions with actual measures of system use to better investigate the link between subjective and objective variables.

8 Conclusion

On the background of an occurring demographic shift in most modern societies, social integration is decisive for the overall psychological *well-being* especially of the elderly who are more prone to social exclusion. The thesis therefore proposes to apply *online social networking* as means to convey and increase social interaction and integration as well as to generate social benefits through use of *social networking sites* (SNS) among elderly individuals. Based on research on *online social networking*, I propose that SNS addressing these specific requirements will be successful among elderly users and consequently have a positive effect on elderly people's overall *satisfaction with life* as well as countervail social exclusion of elderly individuals. Since early research on SNS use suggests that individuals who are more socially isolated in real life tend to be more isolated on SNS and additionally maintain less online social ties compared to individuals that are more active in the offline world (Sheldon 2009, Article 1), I argued and proposed *online social networking* and the use of SNS not to apply as the ultimate and exclusive form of social interaction for elderly, but as a prospective and meaningful supplement and supportive mean to offline social interactions.

In particular, the thesis addressed specific gaps in recent research such as the call for research to increase the understanding of functionalities implemented in contemporary SNS and their effectiveness in order to improve intervention efforts and accordingly leverage beneficial aspects to promote health and longevity as well as social and psychological *well-being* of elderly individuals, stated by Ashida/Heaney (2008, 889). Additionally the thesis attempted to meet demand for research that could benefit social psychologists, developers and designers to attain an "understanding of what SNS users are actually doing, and the relationship between their feature use and feelings of connection to others" by focusing on users' activities within SNS and potential beneficial outcomes resulting in increased (social and psychological) *well-being*, expressed by Burke/Marlow/Lento (2010, 1909).

The thesis consequently aimed to explore expectations, needs and concerns of elderly individuals towards *online social networking* by applying explorative research methods and to analyze socio-technical needs of elderly individuals as well as how these socio-technical needs can be better supported through the use of *online social networking*. Drawing from research in psychology and gerontology, I identified the need to feel socially connected and perceived *social support* as two important aspects of social needs that humans and especially elderly individuals have. Based on research on *online social networking*, I proposed that an SNS that addresses these social needs would be successful among elderly users and potentially have a positive effect on elderly people's overall psychological *well-being* and *satisfaction with life*. I therefore attempted to identify and evaluate design principles for SNS functionalities that potentially enhance the feeling of *social connectedness* and foster *social support* among elderly individuals based on *theory-driven design* (Card 1989, 501ff) and *evidence-driven social design* (Kraut/Resnick 2012, 9ff) recently receiving greater attention in the field of IS and HCI research. Theoretical findings could consequently be translated into concrete design guidelines for SNS or other forms applications that cater to elderly users.

To conclude, the underlying thesis therefore (i) primarily proposed the use of *online social networking* to facilitate social interactions among elder individuals and hence help reduce the risk of social exclusion by the use of adequately designed SNS functionalities; and consequently (ii) elaborated and suggested a set of evaluated and appropriate design principles for online social networks targeted to elderly users to avoid elderly demographic segments to be excluded from this novel form of computer-mediated communication and online social interaction as well as current and prospective developments in *online social networking*. Hence the originality of the conducted research constitutes in the attempt to identify aspects of social interaction that can enhance the lives of elderly people; and investigation on how SNS can be used to successfully address (social) needs among elderly users to potentially generate positive effects on elderly people's overall *satisfaction with life* and their subjective *well-being*. More specifically, the thesis further aimed for broadening the understanding of the impediments faced by elderly users and means of overcoming them through appropriate functionalities and user design of SNS.

Concluding, I like to summarize on theoretical and practical contributions and implications of the underlying thesis research in the subsequent chapters.

8.1 Theoretical contributions

The conducted *qualitative* and *quantitative research* in scope of the underlying thesis generally contribute to the stream of literature on beneficial effects and implications of *online social networking* for individuals (Burke/Marlow/Lento 2010, 1909ff; Ellison/Steinfield/Lampe 2007, 1145ff) and further expands knowledge and theoretical understanding of the provision of *social support*, formation of *social connectedness* and the realization of *social capital* through computer-mediated and online social interaction in the case of *online social networking* and SNS use (Ganley/Lampe 2009, 267ff; Koroleva et al. 2011, 3ff; Ledbetter et al. 2010, 33ff). The thesis further contributes to the important research stream investigating if and how online behavior translates to real-life (Ledbetter et al. 2010, 39ff).

In specific, empirical studies conducted in scope of the underlying thesis extend social psychology and IS research which has investigated similar constructs (Biocca et al. 2003, 38ff; Koroleva et al. 2011, 8ff; Rettie 2003, 476f; Shen/Khalifa 2009, 36ff) and especially contribute to the theoretical development and understanding of the psychological notion *social connectedness* and its formation in computer-mediated communication and online social interaction – in the specific case of *online social networking*. Evidence and findings documented in the underlying thesis research could support fellow researchers in enhancing, expanding and further testing of established and novel measurement instruments not only for the construct *social connectedness*, but also for the constructs *social support* and *social capital*. Given that current research on the formation of beneficial (social) aspects through SNS use lacks validated measurement instruments that are specifically developed to capture outcomes related to *social capital* (Koroleva et al. 2011, 8f), presented measurement models applied and extended existing psychological concepts and measurement instruments such as *social presence*, *social awareness* and *social connectedness* as potential predictors of *social capital* among SNS users.

Since various studies on SNS users and their *online social networking* behaviors are population-level studies (Golder/Macy 2011; Perreault/Ruths 2011) the thesis therefore provides a valuable contribution as it attempts to establish user-level inferences between *functional* and *structural* features of SNS on users' perceived formation of *social support*, *social connectedness* and *social capital* through online social networking. I therefore believe that the conducted user-level research can lead to more meaningful theoretical insights and consequently design implications for the development of future social systems. At this point, I desist from summarizing and concluding on specific findings and their potential implications since I provide a detailed discussion on conceivable contributions in the respective chapter in course of the underlying thesis.

Furthermore, since I apprehend that *behavioral science* and *design science* need to be regarded as two intertwining scientific paradigms in the IS and HCI disciplines the underlying thesis bears the potential for not only contributing to the *applied science* knowledge base, but also to the *behavioral science* knowledge base by the variety and intertwining of executed deduction modes and applied research methods in course of the underlying thesis.

The thesis therefore should inform and support fellow IS and HCI researchers in their decisions regarding and motivate them to pursue similar approaches in their future research not only in the area of social systems and *online social networking*, but whole range of research problems and relevant issues addressed in the IS and HCI disciplines. More specifically, the thesis additionally addressed the call for triangulation of distinct data sources in empirical IS studies (Sharma/Yetton/Crawford 2009, 485) – in the way that measures of psychological perceptions were combined with actual data obtained from the underlying system – in order to investigate the link between subjective and objective variables and accordingly to provide a richer picture of the underlying phenomenon on the background of more rigorous interpretations of collected data.

Ultimately, I attempted to transform gained theoretical understanding into concrete design implications for SNS functionalities to leverage social benefits applying *theory-driven design* (Card 1989, 501ff) and *evidence-based social design* (Kraut/Resnick 2012, 9ff) – representing two prospective and promising approaches in the field of IS and HCI research – in course of the thesis. Consequently, I motivate scholars but also practitioners such as developers and designers to apply *theory-driven design* and *evidence-based social design* in their scientific and system development efforts to solve practical problems and to advance state-of-the art implementations.

8.2 Practical contributions

Documented evidence and finding in course of the underlying thesis additionally provide various practical contributions and could have major implications for diverse stakeholders such as SNS providers and developers of social systems as well as geriatric care personnel, policy makers and urban planners to broaden the general knowledge of how social media effects its users – to name but a few. For example, evidence documented in the underlying thesis – especially in the executed explorative qualitative studies – could be applied in the introduction of *online social networking* in general and support the implementation of local and restricted

SNS in nursing homes to not only facilitate online social interaction among residents but also among their entire social ties. For instance, specific findings on SNS use behavior patterns characteristic for elderly individuals such as the strong tendency to *social searching* could be applied in compiling instructions and tutorials aligned to elderly individuals and prospective (elderly or disabled) SNS users. Furthermore based on evidence collected during the qualitative explorative studies, I assume concerns regarding data security, privacy and information disclosure among elderly SNS users to be significantly higher when compared to their younger counterparts and suggest that guidelines should especially help elderly individuals to manage their personal data and corresponding privacy settings in contemporary SNS.

As mentioned earlier, the *classification scheme for SNS users Age 50+* could serve as a starting point to be further enhanced and verified to establish detailed *personas* in order to better guide and support design decisions of developers designing social systems for elderly (and disabled) individuals. Given that *personas* represent an interaction design technique increasingly applied in activities along *user-centered design*, *scenario-based design* and *interaction design* to conceptualize and design adequate human-computer interactions and more specifically graphical user interfaces and therefore receive greater interest among both HCI researchers and practitioners (Pruitt/Grudin 2003, 1).

Yet, by conducting the underlying thesis research, I aimed to devote meaningful practical implications for designers and developers of (social) applications and systems to expand the current knowledge base in social design – a novel, recently emerging design paradigm which enjoys increased popularity in design and development of ICT application and systems. In order to achieve meaningful practical implications, I not only chose *theory-driven design* and *evidence-driven social design* as my primary approach, but also applied methods that are commonly used in course of software and system development in the industry such as *exploratory focus group interviews* and *confirmatory focus group interviews* as well as a *laboratory experiment.* Furthermore, I used state-of-the art implementations of SNS functionalities corresponding to current best practices for the deduction and compilation of the proposed set of social design principles for social applications and systems such as SNS and SCP focusing on elderly users. Designers and developers are invited to test, enhance and implement proposed social design principles for elderly users in order to build meaningful and innovative social application and systems leveraging social benefits for its users – and our society at large.

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Appendices

Appendix A

In the following, I present results of assessed *internal consistency*, *convergent validity*, and *discriminant validity* to validate applied instruments. All values were calculated based on the basic structural model (see section 5.4) excluding introduced moderating variables 'frequency of use' and 'network size'.

Table 56 displays the factor loadings of applied measurement items for the construct 'social capital' and further provides information on the *internal consistency* of the research model.

Construct	Item	Factor Loadings	Composite Reliability	AVE
Social Capital	SCap1	0.7109	0.9186	0.5871
	SCap2	0.7807		
	SCap3	0.7181		
	SCap4	0.7003		
	SCap5	0.6996		
	SCap6	0.8495		
	SCap7	0.7668		
	SCap8	0.8812		

Table 56: Factor loadings for the construct 'social capital'
Source: Own illustration

Table 57 displays the factor loadings of applied measurement items for the construct 'social connectedness' and provides information on the *internal consistency* of the research model.

Construct	Item	Factor Loadings	Composite Reliability	AVE
Social Connectedness	SCo_1	0.5386	0.6746	0.3509
	SCo_2	0.5530		
	SCo_3	0.6642		
	SCo_4*	-0.2334		
	SCo_5*	-0.4373		
	SCo_6*	-0.4336		
	SCo_7	0.7579		
	SCo_8	0.7704		
	SCo_9	0.6758		
	SCo_10	0.7493		
	SCo_11*	-0.2772		
	SCo_12	0.6908		
* Labeled items were potential candidates to be excluded from further analyses since factor loadings and cross loadings showed insufficient or improper values.				

Table 57: Factor loadings for the construct 'social connectedness'
Source: Own illustration

Table 58 displays the factor loadings of applied measurement items for the construct 'social support'.

Construct	Item	Factor Loadings	Composite Reliability	AVE
Social Support	SSu_1*	0.5138	0.9413	0.5243
	SSu_2	0.6303		
	SSu_3	0.6022		
	SSu_4	0.6753		
	SSu_5	0.6597		
	SSu_6	0.6249		
	SSu_7	0.7502		
	SSu_8	0.6537		
	SSu_9	0.7826		
	SSu_10	0.7882		
	SSu_11*	0.5403		
	SSu_12*	0.5452		
	SSu_13	0.7138		
	SSu_14	0.7815		
	SSu_15	0.7382		
* Labeled items were potential candidates to be excluded from further analyses since factor loadings and cross loadings showed insufficient or improper values.				

Table 58: Factor loadings for the construct 'social support'
Source: Own illustration

Table 59 displays the factor loadings of applied measurement items for the construct 'well-being' and provides information on the *internal consistency* of the research model.

Construct	Item	Factor Loadings	Composite Reliability	AVE
Well-being	WeBe_01_01	0.6521	0.8983	0.4748
	WeBe_01_02*	0.5264		
	WeBe_01_03	0.6939		
	WeBe_01_04*	0.5267		
	WeBe_01_05	0.6925		
	WeBe_02_01	0.8466		
	WeBe_02_02	0.7607		
	WeBe_02_03	0.7906		
	WeBe_02_04	0.7385		
	WeBe_02_05*	0.5841		
* Labeled items were potential candidates to be excluded from further analyses since factor loadings and cross loadings showed insufficient or improper values.				

Table 59: Factor loadings for the construct 'well-being'
Source: Own illustration

Table 60 shows the correlation between constructs, with the diagonal elements being the square roots of AVE. The values indicate that the variance shared by the items of a particular construct is higher than the variance that is shared by the construct with another construct and are used as an indicator of *discriminant validity*, in parallel to the previous study (see section 5.2.2).

	Social Capital	Social Connectedness	Social Support	Well-being
Social Capital	**0.766**			
Social Connectedness	0.6284	**0.5924**		
Social Support	0.7204	0.7269	**0.7241**	
Well-being	0.2427	0.2214	0.2238	**0.6891**
Diagonal elements are the square roots of AVE (for latent constructs) Marked numbers indicate low *discriminant validity* between corresponding constructs				

Table 60: Correlations between applied constructs
Source: Own illustration

In parallel to the previous study, *discriminant validity* was assessed by checking the factor loadings and cross loadings of the measurement items (see Table 61).

	Social Capital	Social Connectedness	Social Support	Well-being
SCap1	**0.7109**	0.4386	0.5034	0.1840
SCap2	**0.7807**	0.4857	0.5255	0.1823
SCap3	**0.7181**	0.5469	0.6261	0.0733
SCap4	**0.7003**	0.3608	0.4547	0.2464
SCap5	**0.6996**	0.5311	0.5519	0.1632
SCap6	**0.8495**	0.4892	0.5569	0.2252
SCap7	**0.7668**	0.4462	0.5123	0.1843
SCap8	**0.8812**	0.5237	0.6488	0.2372
SCo_1	0.3606	**0.5386**	0.4091	-0.0027
SCo_2	0.1959	**0.5530**	0.2789	0.0271
SCo_3	0.3684	**0.6642**	0.4310	0.0676
SCo_4*	-0.1049	-0.2334	-0.1498	-0.1076
SCo_5*	-0.2370	-0.4373	-0.2261	-0.2042
SCo_6*	-0.2591	-0.4336	-0.2191	-0.1611
SCo_7	0.5091	**0.7579**	0.6064	0.2308
SCo_8	0.5113	**0.7704**	0.6308	0.1680
SCo_9	0.3489	**0.6758**	0.4025	0.1287
SCo_10	0.5403	**0.7493**	0.6509	0.2094
SCo_11*	-0.1637	-0.2772	-0.1795	-0.0749
SCo_12	0.4747	**0.6908**	0.4856	0.1672
SSu_1	0.3929	0.3510	**0.5138**	0.2232
SSu_2	0.4149	0.4970	**0.6303**	-0.0002
SSu_3*	0.3546	0.5163	**0.6022**	0.0381
SSu_4*	0.4262	0.5507	**0.6753**	0.1004
SSu_5	0.5201	0.4350	**0.6597**	0.1534
SSu_6	0.4457	0.4587	**0.6249**	-0.0296
SSu_7	0.5889	0.4973	**0.7502**	0.1710
SSu_8	0.4824	0.4638	**0.6537**	0.0395
SSu_9	0.5550	0.5775	**0.7826**	0.1241
SSu_10	0.5586	0.5820	**0.7882**	0.1900
SSu_11	0.3405	0.4410	**0.5403**	0.1485
SSu_12	0.3613	0.4274	**0.5452**	0.1433
SSu_13	0.4517	0.5808	**0.7138**	0.1073
SSu_14	0.5337	0.5970	**0.7815**	0.1620
SSu_15	0.5030	0.5651	**0.7382**	0.1935
WeBe_01_01	0.0867	0.1520	0.1087	**0.6521**
WeBe_01_02	0.0243	0.0496	0.0155	**0.5264**
WeBe_01_03	0.1981	0.1829	0.1456	**0.6939**
WeBe_01_04	0.0662	0.1013	0.0134	**0.5267**
WeBe_01_05	0.1901	0.1109	0.1092	**0.6925**
WeBe_02_01	0,1774	0,2230	0,2378	**0,8466**
WeBe_02_02	0,2151	0,1754	0,1192	**0,7607**
WeBe_02_03	0,1584	0,1669	0,1809	**0,7906**
WeBe_02_04	0,2092	0,1782	0,2434	**0,7385**
WeBe_02_05	0,1432	0,1097	0,1741	**0,5841**
* Labeled items were potential candidates to be excluded from further analyses since factor loadings and cross loadings showed insufficient or improper values.				

Table 61: Factor loadings and cross loadings of applied measurement items
Source: Own illustration

Appendix B

Figure 43 gives a detailed overview on the structure and items of the distributed questionnaire applied in the *explorative quantitative study*.

Investigation of Social Network usage among the generation 50+

This research is being conducted as part of a Master's Thesis at the Technische Universität München with the following topic:

"Design of a Criteria Catalogue to evaluate Online Social Networks based on requirements of the Elderly"

The purpose of this study is to examine the needs, expectations and concerns that elderly users (50+) have regarding online social networking. The analysis of the survey should lead us to understand the reasons why elderly people are using social networks, which functionalities they like and which they do not.
Completing this survey takes **15-20 minutes** and we would greatly appreciate your participation. The participation is entirely voluntarily and you are free to withdraw from this study at any time. We assure you that all the information you provide is strictly confidential and will only be used for scientific purposes.
We appreciate your support for the project. If you are interested in the results of this study send send me an email.

If you have any questions regarding this survey do not hesitate to contact us at:

B.Sc. Dora Tili
dora.tili@mytum.de
Student in Information Systems at the Technische Universität München

This Master's Thesis is supervised from the Research Associate at Technische Universität München M.Sc. Felix Köbler

There are 38 questions in this survey

Demographic data

1 [Sex]Please state your gender *

Please choose **only one** of the following:

- ○ Female
- ○ Male

2 [Alter] Age

Please choose **only one** of the following:

- ○ 50-55
- ○ 56-60
- ○ 61-65
- ○ 66-70
- ○ 71-75
- ○ 76-80
- ○ 81-85
- ○ older then 85

3 [Nationalität]Which country are you from?

Please write your answer here:

4 [Bildung]Please state your highest academic degree

Please choose **only one** of the following:

- ○ None
- ○ High school
- ○ Bachelor
- ○ Master / Diploma
- ○ Ph.D.
- ○ Other

5 [Berufstätig] Are you still employed?

Please choose **only one** of the following:

○ No

○ If yes, how much longer? [ ]

6 [Familienstand] What is your marital status? *

Please choose **all** that apply:

☐ Single

☐ In a relationship / married

☐ Divorced

☐ Widowed

Example: New relationship after divorce, select "in a relationship/ married " and "divorced" !

7 [Kinder]Do you have children?

Please choose **only one** of the following:

○ No

○ If yes, how many? [ ]

8 [Kind_Wohnen] If you have children, where do they live?

Please choose **all** that apply:

☐ In the same house/ apartment

☐ In the same part of town

☐ In the same town/ village or in the neighboring town / village (less than 50 km apart)

☐ In a different town / village (less than 100 km apart)

☐ Farer away (more than 100 km apart)

Multiple answers are allowed. Please select one answer for each child.

9 [Enkelkinder]Do you have grandchildren?

Please choose **only one** of the following:

○ No

○ If yes, how many? [ ]

10 [Enkel_Wohnen] If you have grandchildren, where do they live?

Please choose **all** that apply:

- ☐ In the same house/ apartment
- ☐ In the same part of town
- ☐ In the same town/ village or in the neighboring town / village (less than 50 km apart)
- ☐ In a different town / village (less than 100 km apart)
- ☐ Farer away (more than 100 km apart)

Multiple answers are allowed. Please select one answer for each grandchild.

General information to your attitude towards the usage of new technologies

11 [PC] Do you have a computer (for example PC, Laptop) at home?

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ No, but i use other access (for example Internetcafe, Library, ...)

12 [PC_seit_wann] If you have a computer (for example PC, Laptop) at home, since when do you have it?

Please write your answer here:

13 [PC_wie_oft] If you have a computer (for example PC, Laptop) at home, how often do you use it?

Please choose **only one** of the following:

- ○ Every day
- ○ Several times a week
- ○ Several times a month
- ○ Seldom

14 [Tablet] Do you have a tablet (for example iPad) or a smartphone (for example iPhone) at home?

Please choose **only one** of the following:

- ○ Yes
- ○ No

15 [Tablet_seit_wann] If you have a tablet (for example iPad) or a smartphone (for example iPhone) at home, since when do you have it?

Please write your answer here:

16 [Tablet_wie_oft] If you have a tablet (for example iPad) or a smartphone (for example iPhone) at home, how often do you use it?

Please choose **only one** of the following:

- ○ Every day
- ○ Several times a week
- ○ Several times a month
- ○ Seldom

17 [Internet] Do you have internet access (for example DSL) at home?

Please choose **only one** of the following:

- ○ Yes
- ○ No

18 [Internet_wie_oft] If you have internet at home, how often do you use it?

Please choose **only one** of the following:

- ○ Every day
- ○ Several times a week
- ○ Several times a month
- ○ Seldom

19 [Alle_Kenntnisse] How would you describe your knowledge regarding tablets or smartphones?

Please choose the appropriate response for each item:

	1	2	3	4	5
Knowledge regarding computer	○	○	○	○	○
Knowledge regarding the internet	○	○	○	○	○
Knowledge regarding tablets	○	○	○	○	○
Knowledge regarding smartphones	○	○	○	○	○

1= very good
5= very bad

20 [Internet_warum] Who or what encouraged you to use the internet in the first place?

Please choose **all** that apply:

- ☐ Out of own interest
- ☐ Children
- ☐ Grandchildren
- ☐ Life partner
- ☐ Friends
- ☐ Business reasons
- ☐ Other reasons: [ ]

21 [Internet_warum] For what do you use the internet primarily?

Please choose **all** that apply:

- ☐ Emails
- ☐ Reading the news
- ☐ Looking for Information
- ☐ Buying products / Looking for advice for buying products
- ☐ Listening to the radio / watching videos
- ☐ Using home banking
- ☐ IP telephony (for example Skype)
- ☐ Social networks
- ☐ Other: [ ]

Which sites do you visit the most?

Social Network Facebook

22 [SN_gehört] When did you hear the first time about facebook?

Please choose **only one** of the following:

- ○ Last Year
- ○ About 2 years ago
- ○ About 3 years ago
- ○ About 4 years ago
- ○ About 5 years ago
- ○ i don't remember an accurate time

23 [SN_über_wen] How/ from whom did you hear the first time about facebook?

Please choose **all** that apply:

- ☐ Out of own interest
- ☐ Children
- ☐ Grandchildren
- ☐ Life partner
- ☐ Friends
- ☐ Business reasons
- ☐ The media
- ☐ Other: _____

24 [SN_reg] When did you register at facebook?

Please choose **only one** of the following:

- ○ Last Year
- ○ About 2 years ago
- ○ About 3 years ago
- ○ About 4 years ago
- ○ About 5 years ago
- ○ i don't remember an accurate time

25 [SN_warum]What was the reason why you registered at facebook? *

Please choose **all** that apply:

- ☐ Out of my own interest
- ☐ My own children / grandchildren are registered here
- ☐ Friends / family is registered here
- ☐ Looking for a new life partner
- ☐ Looking for new friends / acquaintances
- ☐ Business reasons
- ☐ Other:

26 [SN_wie_oft] How often do you log-in into facebook? *

Please choose **only one** of the following:

- ○ Several times a day
- ○ Every day
- ○ Several times a week
- ○ Several times a month
- ○ Seldom

27 [SN_Erwartungen] What kind of experience did you expect when you registered on facebook? *

Please choose **all** that apply:

- ☐ Keeping in touch with my family memebers /relations
- ☐ Keeping in touch with friends / acquaintances
- ☐ Chatting with likeminded people
- ☐ Finding new friends and acquaintances
- ☐ Networking
- ☐ Getting new clients
- ☐ Finding a life partner
- ☐ Representig yourself
- ☐ An alternative to your own website
- ☐ Other:

28 [SN_Erwartungen_erfül]Which of the expectatations for registering on facebook mentioned above were fulfilled? *

Please choose **all** that apply:

- [ ] Keeping in touch with my family memebers /relations
- [ ] Keeping in touch with friends / acquaintances
- [ ] Chatting with likeminded people
- [ ] Finding new friends and acquaintances
- [ ] Networking
- [ ] Getting new clients
- [ ] Finding a life partner
- [ ] Representig yourself
- [ ] An alternative to your own website
- [ ] Other:

29 [SN_Funkt] Which functions on facebook do you like the most?

Please choose **all** that apply:

- [ ] Posting status updates
- [ ] Internal message function
- [ ] Uploading/ commenting pictures/videos
- [ ] Bulletin board/ other group functions
- [ ] Chat (if it's offered)
- [ ] Posting an event (if it's offered)
- [ ] Adding friends
- [ ] Other:

30 [SN_Bedüfnisse] How would you finish this sentence: Because I use social networks like facebook ... *

Please choose **all** that apply:

- [ ] ... I feel less alone.
- [ ] ... I feel better unterstood.
- [ ] ... I have more contact to "old" friends.
- [ ] ... I have more contact to my family.
- [ ] ... I have more friends.
- [ ] ... I have a better contact to the outside world.
- [ ] ... I have found a new life partner.
- [ ] ... I have gotten more support for my current life situation.
- [ ] ... I have found people who understand me.

☐ ... I feel socially connected.

☐ ... I am up to date.

☐ Other:

31 [SN_Benutzerfreund] How would you estimate the usability of facebook regarding the following functionalities.

1 = very good usability
5 = very bad usability

Please choose the appropriate response for each item:

	1	2	3	4	5
Posting status updates	○	○	○	○	○
Internal message function	○	○	○	○	○
Uploading/ commenting pictures/ videos	○	○	○	○	○
Bulletin board/ other group functions	○	○	○	○	○
Chat (if it's offered)	○	○	○	○	○
Posting an event (if it's offered)	○	○	○	○	○
Adding friends	○	○	○	○	○

32 [SN_zuverl] How would you estimate the reliability of facebook regarding the following functionalities.

1 = very reliable
5 = not reliable

Please choose the appropriate response for each item:

	1	2	3	4	5
Posting status updates	○	○	○	○	○
Internal message function	○	○	○	○	○
Uploading/ commenting pictures/ videos	○	○	○	○	○
Bulletin board/ other group functions	○	○	○	○	○
Chat (if it's offered)	○	○	○	○	○
Posting an event (if it's offered)	○	○	○	○	○
Adding friends	○	○	○	○	○

33 [SN_antwortzeit] How would you estimate the performance of facebook regarding the following functionalities.

1 = very good performance
5 = very bad performance

Please choose the appropriate response for each item:

	1	2	3	4	5

	1	2	3	4	5
Posting status updates	○	○	○	○	○
Internal message function	○	○	○	○	○
Uploading/ commenting pictures/ videos	○	○	○	○	○
Bulletin board/ other group functions	○	○	○	○	○
Chat (if it's offered)	○	○	○	○	○
Posting an event (if it's offered)	○	○	○	○	○
Adding friends	○	○	○	○	○

34 [SN_ändern] What functions of facebook don't you use on porpose? What are the reasons therefor?

Please choose the appropriate response for each item:

	Not enough knowledge	Negative publicity	Afraid to put out too much private information online	No need to use this function
Posting status updates	○	○	○	○
Internal message function	○	○	○	○
Uploading/ commenting pictures/ videos	○	○	○	○
Bulletin board/ other group functions	○	○	○	○
Chat (if it's offered)	○	○	○	○
Posting an event (if it's offered)	○	○	○	○
Adding friends	○	○	○	○

35 [SN_Ätere_Angepasst] Should facebook be adapted for the needs of the elderly?

Please choose **only one** of the following:

○ Yes
○ No

36 [SN_empfehlen] For what reasons would you recommend joining facebook? *

Please choose **all** that apply:

Figure 43: Questionnaire structure and items
Source: Own illustration

Appendix C

Constructs	Number of measuremnt items	Subject 1		Subject 2		Subject 3		Subject 4		Subject 5	
		Item Sets	% Conformance	Item Sets	% Conformance	Item Sets	% Conformance	Item Sets	% Conformance	Item Sets	% Conformance
Social Presence	11	5+5*	91%	5+5*	91%	5+5*	91%	7	64%	5+5	91%
Social Awareness	7	4	57%	6	86%	5	71%	4	57%	4	57%
Social Connectedness	13	3	23%	10	77%	11	85%	9	69%	6+4	77%
Social Capital	22	8+5+4*	77%	8+5*	59%	10+4*	64%	12+4	73%	9	41%
Media Use/Offline Communication	10	10	100%	10	100%	10	100%	9	90%	9	90%
Perceived Size of online social network on Twitter	4	1	25%	4	100%	3	75%	4	100%	2	50%
Perceived Usage of Twitter	17	8+5*	76%	13	76%	8	47%	8	47%	8+4	71%
		Conformance	69%	Conformance	79%	Conformance	73%	Conformance	68%	Conformance	67%

Total Conformance	71%

* If a subject classified multiple measurement items with the same construct, measurement items are summed up starting from item number 4.

Table 62: Results of the unlabeled sorting exercise (quantitative pre study)
Source: Own illustration

Appendix D

Construct	Number of measuremnti items	Subject 1		Subject 2		Subject 3		Subject 4		Subject 5	
		Item Sets	% Conformance	Item Sets	% Conformance	Item Sets	% Conformance	Item Sets	% Conformance	Item Sets	% Conformance
Social Support	26	17	65%	7	27%	24	92%	9	35%	23	88%
Social Connectedness	19	11	58%	11	58%	15	79%	6	32%	12	63%
Social Capital	22	7	32%	7	32%	10	45%	13	59%	0	0%
Well-Being	10	10	100%	5	50%	10	100%	10	100%	10	100%
Media Use/Offline Communication	10	9	90%	9	90%	10	100%	9	90%	10	100%
Perceived Size	3	2	67%	3	100%	0	0%	2	67%	0	0%
Perceived Usage of Facebook	15	7	47%	13	87%	12	80%	12	80%	13	87%
Facebook Intensity	10	7	70%	7	70%	4	40%	6	60%	5	50%
		Conformance	61%	Conformance	54%	Conformance	74%	Conformance	58%	Conformance	63%

Total Conformance: 62%

* If a subject classified multiple measurement items with the same construct, measurement items are summed up starting from item number 4.

Table 63: Results of the unlabeled sorting exercise (quantitative study)
Source: Own illustration