Personal networks on social network sites (SNS) – Context and personality influences

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Chapter 1

Introduction

Society and markets move online: A considerable and ever-growing part of life and of economic activity takes place in the Internet today. People seek information and entertainment online and increasingly, also social interaction meeting and communicating with familiar persons as well as with strangers. A side effect of peoples' actions in the Internet is the digital trail of data left behind which is easily collected. With the emergence of interactive and personalized applications which invite as well as build on peoples' contributions the data trail is enriched by the data of personal profiles. Furthermore, the profiles facilitate histories of behavior as well as of interactions with other users given that the application permits social encounter. Hence, it is estimated that a person born these days leaves a digital trail of 10 terabytes of data throughout his life (Smith, 2006). These data may offer valuable insights on manifold issues because the availability of data of millions of persons is unprecedented. A recent instance of an interactive and personalized Internet application are social network sites which promote primarily the possibility to exhibit the social connections of their participants.

1.1 Motivation

Currently, social network sites (SNSs) receive great interest from all sides. They attract millions of users[1] who also frequently spend time in the SNS: of teenagers, almost half visit it daily (Lenhart and Madden, 2007a) while college students use it daily and spend on average 20 minutes per day there (Ellison et al., 2007). Adults visit SNSs less often, but regularly, e.g. once a month (Faber, 2007). Thus, SNSs are considered mainstream nowadays (Beer, 2008). Furthermore, SNSs receive continued media coverage and start to rouse academic interest as well (e.g. boyd and Ellison, 2007). Both, the media and research articles raise sociological as well as economical questions. For instance, it is asked how SNSs change our lives and how they can be employed for marketing purposes. In line with this, SNSs attract investors' interest. This is evidenced by recent acquisitions of SNS companies (Stroud, 2008) or of stakes thereof (Kuri, 2007). Moreover, SNS firms obtain high valuations, e.g. Facebook was recently valued at 15 billion $ (Kuri, 2007).

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[1]E.g. Facebook has 70 million users (Facebook, 2008), Friendster 65 million (Friendster, 2008), LinkedIn 20 million (LinkedIn Corporation, 2008), MySpace 110 million (Swartz, 2008), and Xing 3 million (Heise, 2007)

The business interest can be explained by two facts. First, SNSs represent economies of scale because the service, once running, can handle a certain amount of users and within this range, the operating costs per user decrease the more user the SNS has. Second and more important, they contain vast amounts of personal information of their users. This allows to infer information about users which they have not revealed themselves using the information reported by their contacts (He et al., 2006; MacKinnon and Warren, 2006). Consequently, possible applications for marketing purposes have been considered (Clemons et al., 2007; Stroud, 2008). Moreover, besides the personal information of users, also relational information about their connections to others, and again their connections, and so on, is available on SNSs. This further increases their attractivity for investors because SNSs can thus be a valuable source concerning information of personal relationships.

Personal relationships play a special role in marketing because the information and recommendations of other persons have consistently been shown to exert a much greater impact on persons' buying decisions than various forms of advertisement (Katz and Lazarsfeld, 1962; Dichter, 1966; Johnson Brown and Reingen, 1987). Thus, personal relationships shape consumer's decisions, e.g. persons of the same social circle have been shown to use the same brands (Reingen et al., 1984). It has been recognized early that the influence of personal recommendations rests on the very fact that the recommending person has no material interest of her own in the decision of the other (Dichter, 1966). Rather, persons recommend goods or services to others out of self-related motivations, e.g. feeling or appearing knowledgeable, or out of other-related motivations, e.g. intending to be helpful. Due to the success of personal recommendations, firms have tried to approximate these communications in their marketing campaigns and newer approaches even attempt to consciously engineer such seemingly private communications by hiring agents for this task (Carl, 2006). Consequently, it has been concluded that "much of marketing is relational" (Iacobucci, 1996, p. 15).

These informal conversations about products and services between friends or acquaintances, such as neighbors, have been termed word of mouth and they shape persons in their attitudes and behavior towards goods (Johnson Brown and Reingen, 1987). Regarding the Internet, first findings show that in online communities, the website itself on which the word of mouth took place influences the evaluation of the credibility of the received information next to the individual contributor (Brown et al., 2007).

The data of SNSs are relevant for marketing purposes in two respects, namely as a potential channel for word of mouth processes and as a source of data for the identification of optimal candidates to start a campaign of word of mouth marketing. For this, highly connected persons who are able to reach many third persons and thus increase the effectivity of the marketing efforts should be targeted (Krackhardt, 1996). This notion gives rise to concepts attempting to exploit the potential of the personal networks of customers. For instance, the customer network value expands the concept of the customer value by the expected influence of the focal person on others and integrates the relationships of the focal person in the estimation (Domingos and Richardson, 2001; Staab et al., 2005). Thus, relational data is the necessary basis for the evaluation of the customer network value and could be provided by SNSs.

Moreover, the availability of relational data is attractive since previously these data were difficult to gather because the collection involved extensive surveys. SNSs make

the process of the data collection of relational data very easy by posing "rich sources of naturalistic behavioral data" (boyd and Ellison, 2007). Consequently, this development has been acclaimed widely (Ghoshal and Holme, 2006; Licoppe and Smoreda, 2005).

The aim of using SNSs for research as well as economic purposes necessitates a sound evaluation of the way in which people use SNSs and of the factors influencing their way of use. The social networks developing in different SNSs vary due to features of the SNS itself and due to different ways of using it. Thus, also the evaluation of the properties of the social networks developing in different SNSs is vital for the further employment of SNSs data. Up to now, such an evaluation has not been conducted. This work attempts to fill this gap and to establish a reliable basis for inferences resulting from SNSs data.

1.2   Research questions

This work aims to answer the following research issues:

1. Which factors influence the use of SNSs and the resulting personal networks?

2. What is the information in SNSs?

3. To what extent do individual differences shape the personal networks displayed in SNSs?

The first research issue targets the influence of the SNS itself as a technical environment. It comprises questions about the impact of the features of SNSs on the attracted users as well as on the formation of displayed contacts and aims at the comparability of online with offline personal networks. The answers to this research question provide first insights on the usability of SNS data, i.e. about feasible applications and about potential sources of bias in the data.

Further elaborating the subject of contacts displayed, the second issue of investigation concerns the meaning of the displayed information of connections on SNSs. For instance, the personal networks displayed in the contact lists may constitute an image of the existing personal network in real life or a collection of newly established online contacts. Furthermore, the research questions encompasses the purpose of persons for using SNSs and for seeking contacts on them which may range from seriously attempting to extend one's personal network to entertainment, e.g. browsing profiles or maximizing the sheer number of contacts. These differences also determine the information displayed on SNSs. Thus, the first research issue lays the groundwork and establishes the validity for further investigations.

Finally, the third research issue constitutes an example of the employment of SNS data. It inquires the extent to which individual differences, such as personality traits, play a role in SNSs, e.g. their influence on the personal networks there. Equal to the last research questions, the comparability of previous offline findings to online results is also targeted.

1.3   Overview and structure

In this work, the personal networks displayed on SNSs are studied, in particular regarding their size, composition, and inclusion of contacts established on the SNS. Following the first research question, the differentiating characteristics of SNSs such as technical features, regulations, the mission statement, and its culture are examined. These constitute general factors which equally influence all users of a SNS with regard to becoming a user in the first place, i.e. creating a profile, and later with regard to the manner of using the SNS, e.g. initiating new contacts online. The second research issue is adressed in a survey study exploring the information contained in the display of personal networks on SNSs on the example of a German SNS. On the same SNS, the third issue regarding the influence of individual differences on the personal networks built on SNSs is investigated.

The outline of this work is as follows. In chapter 2, the foundations for the further thesis are provided. First, the main research field of social network analysis is introduced. After defining the term social networks, the principal concepts of actor centrality and the strength of ties are presented. Subsequently, the object of study of this work, social network sites, are described. For this, its features such as the profiles of users and common facilities are illustrated as well as the process of establishing links on SNS is explained. Moreover, the chapter discusses the research questions of this work in more detail and closes with the general research model which provides a framework for the contributions of this work.

The main part comprises chapters 3 and 4 which respectively present the examination of the environmental influences on the personal networks on SNSs and the impact of individual differences on them. The third chapter is divided into a conceptual part followed by an empirical part which reports three studies. Initially, a conceptual scheme is developed in order to systematically analyze the influences of a SNS as a technical environment for the social interaction taking place on it on the elements of the social network developing in it. Specific aspects of the influence on the social networks elements, actors and ties, are considered in the process: with respect to the actors, potential influences on their number as well as their homogeneity are distinguished while concerning the established links, the possible impact on their number and on their meaning are differentiated in the conceptual scheme. Possible sources of influence of the SNS itself are identified in the analysis. The empirical second part of chapter 3 presents the results of two studies investigating two of the effects proposed in the conceptual analysis. Moreover, the information of the links in SNSs is evaluated in a third study exploring the ways in which persons use SNSs. Finally, the findings of the conceptual as well as empirical analyses are summarized.

Chapter 4 focuses on the impact of individual differences such as the sociodemographic background, different motivations, and personality traits on two aspects of the personal networks displayed on SNSs, namely on the size of personal networks as well as on the establishment of links with unknown persons. For this, an empirical study was conducted. The chapter starts with an introduction of the concepts of motivation and personality which are used in the study as well as of the measurement of psychological concepts. Next, the hypotheses are developed on the basis of existing literature and the design of the study is described. The predicted effects are tested with correlational analysis and the results are reported. The chapter closes with a discussion and summary of the findings.

The conclusion summarizes the research contributions of this work. After a short recapitulation of the chapters, the research questions posed in this chapter are answered with the findings of this work. Finally, an outlook on further research issues in this field is given.

1.4   Related publications

Parts of this work have already been published and presented at research conferences. Concerning the conceptual analysis in the first part of Chapter 3, the influence of the features of SNSs on the attracted user population and on the number of contacts which are established on the SNS is currently under review for publication (Schaefer, 2008a). Also, further parts of Chapter 3 have already been published: The field study on the influence of fake hubs on the structure of social networks has been published in Schaefer and Hoser (2007a) and the survey study examining the meaning of SNS data on the example of a German SNS will be published in Schaefer (2008c). Furthermore, first results of the research on the influence of SNSs as environment have been presented at the conferences on social networks: Proceedings of the XXVII International Sunbelt Social Network Conference, Corfu, Greece (Schaefer and Hoser, 2007b) and proceedings of the XXVIII International Sunbelt Social Network Conference, St. Petersburg, USA (Schaefer, 2008b). Finally, drafts and ideas of the work on the influence of individual variables in Chapter 4 have been presented at the 45th Congress of the German Association of Psychology, DGPs2006 (Schaefer, 2006a), the 13th European Conference on Personality (Schaefer, 2006c), and the 30th Annual Conference of the German Classification Society (GfKl, Schaefer, 2006b) as well as published in Schaefer et al. (2006).

Chapter 2

Foundations

Social network sites are a relatively new phenomenon in the Internet: most of the popular SNSs have been launched in 2003 (boyd and Ellison, 2007). However, they have become popular, well-known, and successful in a short period of time. SNSs aim to portray the social web among persons in order to assist users in the management and use of connections. They have thus raised the common awareness of the notion of social networks and their connectivity. This also gave impetus to the related field of research of social network analysis which is currently employed in manifold applications. The online application "social network sites" is the object of study of this work. Therefore, SNSs and the corresponding field of research of social network analysis are introduced.

This chapter presents the foundation the rest of this work is built upon. In order to provide an insight into the object of study, the processes of and possibilities in social network sites are described in detail. The field of social network analysis and relevant theories thereof are introduced to establish the theoretical framework for this work. The current state of the art of research concerning social networks in the Internet is conveyed in the review of previous work. This integrates the thesis into the related research. The presented research model provides a frame for the following chapters in order to facilitate the orientation in this work.

In this chapter, the theoretical foundations are introduced. The field of social network analysis as framework for this work is presented in section 2.1. Therein, the concept of a social network is defined and models differentiating persons as well as relationships are discussed. The object of study of this work, social network sites are portrayed in section 2.2. The basic activities on a SNS are described and their characterizing features illustrated. In section 2.3, the discussion of previous research on SNSs shows the lack of as well as the need for systematic research specifying the information comprised in SNSs. The chapter closes with the illustration of the conceptual model (2.4) which leads to the main chapters and a summary (2.5).

2.1 Social network analysis

The field of social network analysis (SNA) and concepts thereof which are used in later chapters are introduced in this chapter. In the next paragraphs, the construct of a social network is defined and basic terminology established. Subsequently, SNA is discussed as a paradigm and as a methodological toolkit and its application for business studies and

markets is shown in the first subsection. In the second subsection, concepts measuring the importance of actors are described. Differentiating between ties, the concept of the strength of ties is introduced in the third section. Subsection four briefly summarizes.

Individuals don't exist in a vacuum, but are embedded into a social environment. The field of social network analysis (SNA) describes and investigates persons in connection with their social network as well as the networks themselves. A social network describes the pattern of relationships in which actors interact with one another and through whose emergent structures they are in turn influenced in their behavior. Formally, a *social network* is defined as a *set of actors and the ties among them* (Wassermann and Faust, 1994, p.9). Actors refer to the entities which are linked in the social network. The actors can be individuals as well as groups, organizations, or websites. They are also referred to as nodes, therefore, these terms are used interchangeably in this thesis. Data which can be used to model a social network is called relational data.

Most social networks analyzed consist of *one set of actors which are in some way interrelated* (see left side of figure 2.1). These networks are termed *one-mode networks*. A special case of such a network is the "ego-network" which focuses on one single actor, termed "ego". The actors connected with ego are the "alters" (Wassermann and Faust, 1994). An *ego-network* consists minimally of *all ties of ego with his alters and the ties among them* which is exemplarily illustrated on the right side of figure 2.1. It can be further expanded to include the ties of the alters to persons not connected to ego which is called the second degree. Equally, the ego-network up to the third degree contains all connection of ego, his alters and again, their alters.

If the network is constructed by *two sets of nodes which are structurally different*, it is called a *two-mode network* (Wassermann and Faust, 1994). A special kind of a two-mode network is the *affiliation network* which describes the *affiliations of a set of actors with a set of events* (middle of figure 2.1). E.g. a network established by the joint attendance of events consists of the set of actors going to the events and a set of events. In affiliation networks, neither the actors nor the events have direct ties among themselves, but only to each other. The economic interweavement was often investigated with the social network of board interlocks, i.e. the two-mode network with the directors as one set of actors and the management boards of companies as another (Borgatti and Foster, 2003; Mizruchi, 1996).
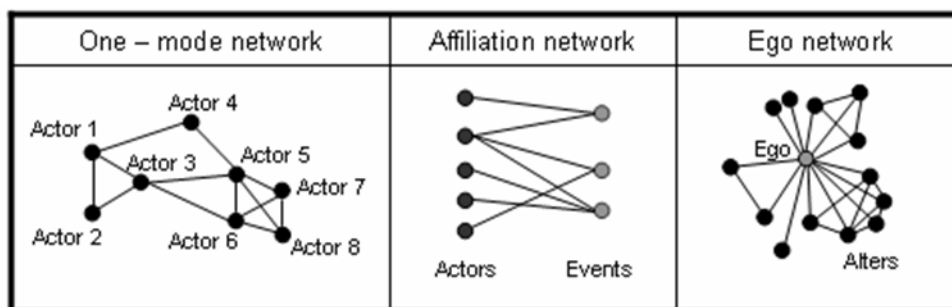

Figure 2.1: Examples of different types of social networks

The defining feature of a tie is the establishment of a linkage between a pair of actors (Wassermann and Faust, 1994). Actors directly linked by a tie are said to be adjacent. The possible range and type of a tie is extensive, i.e. a tie may refer to any kind of relationship,

e.g. economic, transactional, political or informational, and is in terms of content "limited only by a researcher's imagination" (Brass et al., 2004, p. 795). At the interindividual level, relations of affect, information flow, material exchange and types of influence are typically the object of study. These are, for example, friendship, email-communication, buyer-seller-link, and advice seeking. Friendship is more often than not based on mutual liking and it is therefore not relevant to differentiate the direction of the tie. On the contrary, an email is sent from one person to the other or one person seeks advice from another. In these examples the direction of the tie matters, as there is a difference between those who seek a lot of advice and those who give it a lot. Therefore, directed and undirected ties are differentiated.

2.1.1 SNA as paradigm and toolkit

The field of social network analysis can be seen on an abstract level as a different paradigm from that of other social sciences in general or used on the practical level as a collection of analytical tools for concepts pertaining to the investigation of groups and their members.

Social network analyis considers itself as a distinct research approach within the social and behavioral sciences because of the assumed importance of relationships among persons or groups. Persons are not seen as autonomous and neither are their actions considered as independent, but rather they're seen as interdependent (Wassermann and Faust, 1994; Breiger, 2004) or even dependent on the structure of the social network (oversocialized conception of actors, Granovetter (1985)). This view is contrary to the general (undersocialized) assumption of most social sciences which presumes persons to be first and foremost unaffected by those around them, i.e. acting or reaching decisions according to maximized utility or because of a specific activated state of mind, and therefore independent. With regard to the study of individuals, this leads to the view of social networks as environments which constitute opportunities as well as constraints for the persons acting in them. The relational ties between the actors are considered as important because they constitute channels transferring both material and immaterial ressources, e.g. information or emotional support (Wassermann and Faust, 1994).

The network paradigm has recently gained much attention from organizational research and its concepts have been connected with a wide range of outcomes, such as individual and group performance, and on the macro level, with firm survival (for a review see Borgatti and Foster, 2003; Brass et al., 2004). Regarding economic outcomes, the influence and impact of social relations on them has been elaborated by Granovetter (1985). For instance, persons with an extensive personal network are quicker to find a new employment than persons with smaller networks. Since then, its application has led to new insights on the issues of prices, innovation and the labor market (see the review of Granovetter, 2005). On the individual level, DiMaggio and Louch (1998) could show that persons rely on their network when quality assessment of the good or service to be purchased is difficult, e.g. when buying a used car.

On the other hand, various studies used SNA as a toolkit. They used its analytic tools to test predictions of various theories which do not view persons as interdependent (Kilduff and Tsai, 2003). For example, the tools of SNA have been recognized as fitting well to study the impact of new technologies in organizations (Zack, 2000) and also used

to investigate the development of a price equilibrium in a stock market (Baker, 1984).

The rise of connections between personal computers and the diffusion of Internet access made a new form of social data available, namely online communication. These data serve as basis for computer-supported social networks in the working as well as private context (Wellman et al., 1996) and were often used to investigate offline as well as newly emerging online social networks (Hogan, 2008). Also, a new related subfield of SNA, hyperlink network analysis (HNA), has been formed which investigates websites and the hyperlinks among them as networks (Park, 2003). HNA assumes hyperlinks to be social or communicational channels that represent the networks among the producers of the websites. In HNA, the actors are the websites which represent their producers. Because hyperlinks can be set from one website to another without the destination website owners' knowledge or approval, hyperlinks are unidirectial ties (which can, of course, be reciprocated). This differentiates hyperlink networks from those of SNSs in which links between profiles are always symmetric. A second difference can be seen in the scope of the resulting network. In HNA, this is the Internet itself, while the connections studied on SNSs are restrained on that system.

2.1.2   Discriminating actors: Centrality

A central issue in the analysis of social networks is the conceptualization and measurement of the relative importance of actors. This has been termed for example an actor's status, popularity, prominence, or visibility. Since the beginning, researchers have been particularly interested in the "stars" or also "hubs" and in the counterpart, the "isolates" (Moreno, 1934). Whereas the latter have no ties at all, the former have most or the most important ties in the network which has often been associated with access to ressources, control and brokerage of information (Knoke and Burt, 1983) which may constitute a position of power. With regard to marketing, the "hubs" are especially of interest because of their potential to reach many others by word-of-mouth. Nowadays, the term actor centrality serves collectively for all measures of an actor's importance.

Prominent actors are those that are extensively involved in relationships with other actors and therefore visible in the network (Knoke and Burt, 1983). Consequently, a first measure of centrality, the degree centrality, is the count of relationships an actor is involved in, i.e. his direct ties (Knoke and Burt, 1983; Wassermann and Faust, 1994). This notion of centrality equates prominence with activity or involvement without considering the direction of a tie. When differentiating incoming and outgoing ties, the number of incoming ties constitutes the actor's indegree centrality and, respectively, the number of outgoing ties the outdegree centrality. Other common centrality conceptions which are not elaborated here are closeness and betweennes centrality which consider also the extended network around an actor and the possible paths to other actors who are not directly connected, but only indirectly via third actors.

The eigenvector centrality measure is based on the notion that an actor's importance is dependent on the importance of his ties. Even though two actors may have the same number of relations to others, these other actors may have in turn differential further relations. This fact distinguishes already the first two actors. Therefore, also the centrality scores of adjacent actors should be considered when computing a centrality measure. However, this conceptualization is recursive since all actors' centralities are dependent on

all other actors' centralities. It can be formalized and solved as an eigenvector problem and is thus called eigenvector centrality (Knoke and Burt, 1983). For a formal description of eigenvector centrality see Bonacich (1972). Eigenvector centrality combines the ideas of the number of relations and the quality of them.

2.1.3   Discriminating ties: The strength of ties

The amount of ties differentiates between actors, however, not all connections are equal. With some people we are connected by an intimate friendship or intense professional cooperation while with many others the relationship is not as close. This difference was conceptualized as the strength of a tie by Granovetter (1973). An intimate friendship, for example, may be expressed by spending a lot of time together, but also by confidence in the other. Thus, several factors play together to describe a tie's strength. In his seminal article, Granovetter (1973, p.1361) defined tie strength as the

> "combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and reciprocal services which characterize the tie."

He further noted that strong ties are connections between persons who tend to be similar to each other and spend much time together (Granovetter, 1973, 1982). Examining the concept of tie strength empirically, Marsden and Campbell (1984) found that it has two distinct aspects: the time spent in the relationship and the depth of it.

Although the conceptualization and empirical validation are both multidimensional and imply a continuum both of the underlying dimensions as well as of the tie strength, in most research studies, the tie strength is operationalized plainly. Ties are mostly categorized into strong and weak ones using only one dimension, e.g. intimacy ratings. Thus, depending on the research context, strong ties are commonly assumed between friends and relatives as well as for ties of mutual choice. Respectively, work colleagues and acquaintances as well as unreciprocated ties are seen as weak ties. Furthermore, friends of friends and persons with whom one has less than a predefined level of communication frequency (Granovetter, 1982) are subsumed as weak ties. Table 2.1 lists examples of indicators of the different dimensions of tie strength which have been used to assess tie strength. The depicted indicators have been employed as single measures or in combination with each other. In the table, the indication for a strong tie as well as a weak tie is given for each dimension. An overview of indicator use in different studies is given by Petróczi et al. (2007). These indicators have differing accuracy for measuring the tie strength with the best indicator being a subjective measure of the closeness of the relationship (Marsden and Campbell, 1984; Petróczi et al., 2007). Transferring the concept of tie strength to online social networks, a recent approach developed a questionnaire for measuring the tie strength in particular of online ties (Petróczi et al., 2007).

The two types of ties have been connected with different consequences on a range of topics such as health, environmental protection, criminology, job seeking, and marketing (Petróczi et al., 2007). Whereas the strong ties mostly provide emotional and other kinds of support, the most cited benefit of weak ties is informational, i.e. we hear novel information, (Granovetter, 1973, 1982; Ellison et al., 2006). For instance concerning the employment market, job seekers who used their network including their loose contacts for the job search found a new employment sooner than those using only their immediate network (Granovetter, 1982). Moreover, in a study investigating the patterns and influence

	Concept of tie strength		
Dimension	Strong tie	Weak tie	Example
Subjective evaluation/ Social role	friends & family	all others, e.g. acquaintances	Johnson Brown and Reingen 1987
Frequency of contact	daily or weekly	less frequently	Haythornthwaite 2005, Johnson Brown and Reingen 1987
Subjective intimacy, trust	confiding in each other	more superficial topics	Mesch and Talmud 2007
Multiplexity of the tie	spanning many contexts	staying in one context	Granovetter 1973, Haythornthwaite 2005
Reciprocity	existing	absent	Petróczi et al. 2007
Emotional support exchanged	yes	no	Mesch and Talmud 2007, Petróczi et al. 2007

Table 2.1: Examples of indicators used to assess the different dimensions of tie strength.

of word-of-mouth communications, weak ties were shown to serve as bridges between different strong knit groups whereas strong ties constitute a more influential as well as more used source of information (Johnson Brown and Reingen, 1987).

Mostly overlooked, Granovetter defined in his seminal article a third "state" of a tie. The absent tie includes "both the lack of any relationship and ties without substantial significance" (Granovetter, 1973, p.1361). Naturally, the "substantial significance" is determined by the context studied, e.g. when investigating information dissemination in a social network all relations between persons who greet each other, but never engage in further communication could be considered insubstantial and, therefore, absent. One might assume that, until now, this type of tie has not received any attention as it was not relevant in research. Network data was collected for a long time by surveying persons and it is highly probable that participants simply forget to mention irrelevant or very weak contact persons (for a review of effects of social network surveys, see Marsden, 1990). Nowadays, digital data of all kinds is used for social network analysis. As every communication or behavioral act is digitally logged without filtering, the differentiation between present and absent ties becomes a relevant issue (Schaefer, 2008b). This point will be elaborated further with regard to SNS in Section 2.3.

In this work, the concept of Granovetter (1973) is employed as a basis. Tie strength is thus considered as a multifaceted construct of the dimensions of frequency of contact, reciprocity, closeness, and intimacy. However, the links on SNS are, with few exceptions, reciprocal as will be detailed in the next section. The dimension of reciprocity is therefore not investigated in the further work. With regard to absent ties, mainly the dimensions of frequency of contact and closeness are used to distinguish absent from present ties.

2.1.4 Summary

The field of social network analysis has been introduced with a definition of social networks and a review of the basic terminology. The measurement of actor centrality as one of the primary goals of SNA has been discussed and different indices for it presented. With regard to the differentation of ties, the concept of tie strength has been described. Furthermore, the application of these concepts in economic research has been shown. As

already noted, the Internet poses a new source of relational data as well as a habitat in which new social networks can develop; a currently very successful habitat are social network sites as discussed in the following chapter.

2.2   Social network sites

Currently, social network sites receive extensive media coverage: newspaper articles discuss the potential benefits, but also harms of SNSs for one's career and business or ask how these sites change our everyday live (Die Zeit, 2008). On the business side, SNSs receive high valuations by public and private investors as can be seen by acquisitions of stakes of SNSs companies (Kuri, 2007) or their stocks. SNSs aim to support people in making new contacts and also maintaining their existing connections on the application they provide. As a secondary effect, they give their users the possibility to represent themselves in the Internet. With these basic functions, they seem to meet a common need of today as they have soon become mainstream (Beer, 2008).

   In this section, SNSs are introduced as applications of the Web 2.0. After a definition, their processes and common facilities are described as well as differences to other web services are identified. Next, the technical environment that SNSs provide for social interaction is characterized with several dimensions. Further, the terminology used in this work is shortly introduced and an overview over the existing literature on SNSs given. Lastly, the chapter is briefly summarized.

2.2.1   Description

With the rise of the so called Web 2.0[1], new websites invited users to participate in the Internet: for example, folksonomies (Smith, 2004), in which all users jointly share, amass, and classify data[2], blogs for publishing personal opinions, or, more recently, whole virtual worlds in which users can start a "Second Life". Social network sites (SNSs) are also applications of the Web 2.0 which invite people to share information about themselves and their circle of contacts. They give their members the opportunity to represent themselves online in a personal profile, and to browse profiles of others as well as to set hyperlinks to other profiles. SNSs aim to support the management of one's circle of contacts, i.e. the personal network, and to facilitate getting to know new persons. They do so mainly by displaying and mapping the personal networks of their members (Lampe et al., 2006).

   As more and more Web 2.0 applications integrate social networking functionality, i.e. the possibility to create a personal profile and then link one's profile to that of others, the distinction between categories of applications becomes blurred (Beer, 2008). Thus, while some authors use the term SNS to refer to all applications with integrated social networking functionality (boyd and Ellison, 2007), others restrict the term to sites on which social networking is the main practice sometimes denoting this narrower meaning with the term social network*ing* sites abbreviated as well with SNS (Beer, 2008). Thus, this difference in terms is easily confusing and therefore neglected here. Equally, definitions of SNS vary. In this work, SNS are defined as follows:

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[1]The term web 2.0 denotes a trend of websites to integrate the user in the provided services, e.g. harnessing collective intelligence. It became popular on the first Web 2.0 conference (O'Reilly, 2005).

[2]e.g. about the Internet itself (BibSonomy), knowledge (Wikipedia), or media (flickr, YouTube).

> Social network sites are Internet applications whose main service for users
> consists of building a personal network around themselves. Therefore, they
> provide online environments in which persons create **self-descriptive pro-
> files**, **articulate their personal networks**, and **establish or maintain con-
> nections with others**.

This definition covers the services aimed at the users as customer which constitutes the
focus of this work. However, other services for different customer groups are readily
conceivable, e.g. the use of SNS data for marketing purposes has already been proposed
(e.g. Beer, 2008). Although this definition may be extended correspondingly, integrating
these further services as well as relationships with and between other customer groups
would go beyond the scope of this work. In the following, SNSs are characterized using
the defining features written in bold from the above definition.

Self-descriptive profiles. When joining a SNS, the prospective user first completes a
personal profile with a description of himself. Next to general attributes, such as name,
age, gender, and geographic location, the descriptive content varies depending on the
focus of the SNS. On sites with a professional or business focus, information about edu-
cation and professional status as well as current and former employees is included. Also
skills, such as languages, and interests are included. Furthermore, sections detailing what
one offers to and seeks from contacts can be completed in free text, e.g. knowledge ex-
change or contact persons in a certain field. Address details can be included in a section
of the profile which is not publicly visible. Figure 2.2 shows an example of a profile of
the business focused SNS Xing[3]. Finally, most SNSs regardless of their focus, cultivate
the upload of a personal picture (boyd and Ellison, 2007).

On SNSs with a focus on private relationships, the information on the profiles is less
predetermined. It includes mostly details about leisure activities and interests as well as a
personal statement. If available, the fields of seeking and offering (e.g. "wants" and "has")
rather aim at leisure activities. An example of a profile of a SNS focusing on students is
shown in figure 2.3.

Further differences between SNSs profiles derive from the design of the profiles, the
validity of the given information and the available privacy settings for it. While most SNSs
determine the layout of the personal profile, some allow users to design the layout of the
profile themselves. Secondly, sites focusing on business goals assumably intend persons
to be truthful about themselves whereas in other sites, creative and self-presenting as-
pects are more important than facts (Donath and boyd, 2004). Lastly, the possible privacy
settings for one's profile differ. On most SNSs, the profile is by default publicly visible
within that SNS, but visibility can be restricted in several ways as well as extended. Ex-
tending visibility, profiles can be freely accessible from the Internet. Next to restricting
access to that SNS, further restriction can be achieved in steps of the personal network,
e.g. to solely direct contacts or including contacts one step further, i.e. contacts of con-
tacts, or even two steps further. On professionally focused SNSs, access to contacting
information can be restricted separately, and some SNSs allow for a discrete setting of
each contact detail, e.g. address, phone, email, etc, with regard to each contact. Further-
more, only business focused SNSs allow to hide or restrict visibility of one's contact list

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[3]www.xing.com

while on other SNSs the contacts or "friends" are always visible to all who can view the profile.

Figure 2.2: A sample profile of Xing, a German business focused SNS.

Figure 2.3: A sample profile of StudiVZ, a German leisure oriented SNS with a focus on students.

Articulate their social network. The user articulates his social network by setting hyperlinks from his profile to that of others to whom he has a relation. The sum of all linked profiles constitutes his personal network. The nature or content of the connections varies because the SNSs focus on different parts of one's personal network, mostly either on private or work-related contacts. Since currently SNSs enjoy tremendous popularity, also sites for pets, e.g. dogs, cats, hamsters, and guinea pigs[4], have been launched which are not addressed in the current work. For an overview of different SNSs see boyd and Ellison (2007).

Establish or maintain connections. The basic process of establishing a hyperlink to another profile is briefly outlined before describing the facilites for managing and maintaining as well as finding new contacts. The process is depicted in figure 2.4 with the small numbers indicating the order of the described steps. To establish a hyperlink to another's profile, one clicks on the corresponding button (labeled e.g. "add this person as a contact") on the profile of the person to be added. After confirming the action, the SNS delivers the link request to that user via its message system or in an email. Depending on the SNS, a personal message can be sent with the request. The contacted user can then decide whether to accept or decline the request. In case of acceptance, he may also send a personal message with his decision via the SNS and both users are added to the other's contact list. Thus, the relations on SNSs are bidirectional - with few exceptions (e.g. MacKinnon and Warren, 2006). In the case of a decline, the requester is not notified about it on most SNS[5].
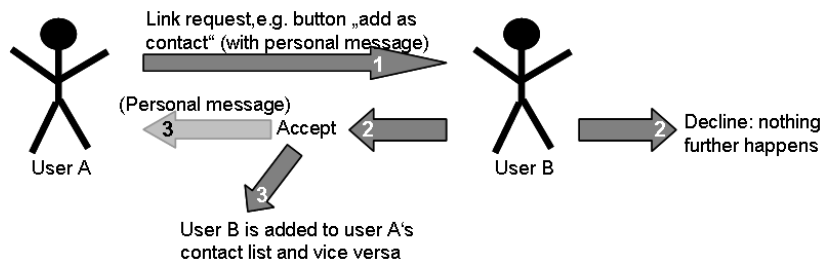
Figure 2.4: The basic process of establishing hyperlinks between profiles on SNSs

In line with their mission, SNSs include varying facilities to support the management and maintenance of existing acquaintances as well as the establishment of new contacts. Common facilities are described below and grouped along these three goals. For the management of contacts, especially the clarity of one's circle of contacts, some SNSs provide the possibility to organize contacts, i.e. by categorizing them with tags into self-determined classes or by defining the relative importance of contacts[6]. Further support for the management is given by a birthday reminder for one's contacts. Keeping in contact is supported by the message service offered by most SNS (boyd and Ellison, 2007). A facility for public communication are the "message boards" or guestbooks which are part of the personal profiles and on which users can leave public messages for that person. Furthermore, some SNSs offer to include public picture folders within one's profile. In order

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[4]www.dogster.com, www.catster.com, www.hamsterster.com, www.guineapigsnetwork.com, www.pet-files.com

[5]Further differences in the link establishment process are described and discussed in Sections 3.1.2.1 and 3.2.2.

[6]e.g. Top12 on the site MySpace

to find other persons, users can either browse the SNSs or search for a person specifically. Furthermore, SNSs offer special interest groups and discussion fora to support getting to know and linking to new (like-minded) persons. Mostly professionally focused SNS also offer facilities that foster trust among users, e.g. the possibility to recommend others or to introduce one's contacts to each other online. Lastly, on some SNS, users can publish announcements for all other users.

Nowadays, an Internet user can participate in many websites discussing issues, stating his opinion, giving advice or playing with others online. There are several important differences between SNSs and other online facilities. The obvious uniqueness of SNSs lies in the fact that people "articulate and make visible" (boyd and Ellison, 2007, p. 2) their personal network. Beyond that, SNSs are different from traditional online environments in that they "are about the person" in a twofold way, namely with regard to purpose and identifiability. While the intention of other web applications is communication and discussion, sharing media files or entertainment, the main intention of SNSs is to represent and support the connections of people. This difference also results in different social networks: for example, in multi-user-dungeons (MUDs) and discussion fora, the social networks result from the game structures and communications, respectively. More precisely, on a discussion forum, actors are connected by their contributions to a common topic. These networks are therefore a byproduct of other activites and have presumably little overlap with real life networks, whereas on SNSs, the construction of the personal network is the main goal with a focus on the management of existing contacts next to meeting new people. With regard to identifiability, the lack of it, i.e. anonymity, has been regarded as one of the main features of the Internet that influences online behavior (e.g. Sproull and Kiesler, 1986). On most online applications, people interact using virtual characters, i.e. nicknames or avatars[7], while on SNS they are in general identifiable either by giving their real name or by posting a personal picture. Thus, in contrast to most other online applications, SNSs are about the real persons which suggests that the social networks managed within them overlap with the real networks of their users.

2.2.2   Features of SNSs

SNSs constitute a technical environment for social interaction which shapes the interactions among the users and therefore also has an impact on the social network development. The different technical environments can be characterized by several characteristics of the SNSs. The characteristics are the technical and regulatory framework, the mission statement and the evolved culture on the SNS as depicted in figure 2.5. These concepts will be introduced in the following paragraphs. Further differences between SNSs in this regard will be taken up in more detail in Chapter 3.

The technical framework determines which actions are possible on a SNS while the regulatory framework defines permitted and forbidden behavior. This distinction can be further clarified with the example of uploading a picture to one's profile: A SNS without the facility to upload a picture prevents all members technically from uploading a picture. Another SNS features uploading pictures but prohibits certain kinds of pictures. On this SNS, every user can upload any picture, however pictures falling into the forbidden cat-

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[7]a graphical representation of a user

Technical environment

SNS

- Technical features
- Regulatory features
- Mission statement
- Culture
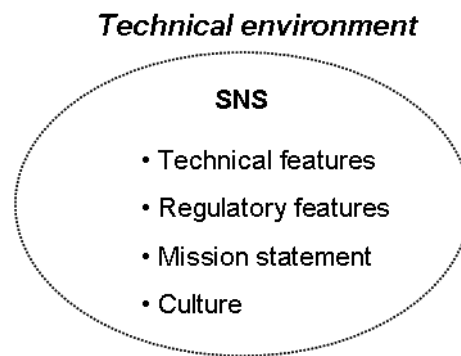
Figure 2.5: The characteristics of SNSs constituting the technical environment for the user behavior.

egory will be likely removed if noticed by the administration. This describes a restraint defined by the regulatory setup.

The technical framework encompasses all features of the SNS that technically influence the users directly or indirectly in their usage of or interaction with the SNS. In the first place, the technical setup regulates who is admitted as a member. SNSs can be differentiated into "open" and "closed" networks. Open SNS let any person register while others, termed "closed" networks for easy understanding, restrict access in a specified way. For the members, the main processes determined by the technical framework are the creation of the personal profile as well as the search for and interaction with other users. Regarding the profile, the design possibilities, the categories of information, and the available levels of visibility setting are defined. The possible search variables, the search algorithms and the display is also technically set. Lastly, the process of linking to other profiles as well as the possibilities of contacting others are established by the technical framework of a SNS. Moreover, further features of the technical framework which are not considered in this work are conceivable, e.g. usability issues.

The regulatory setup consists of the entirety of written rules of a SNS, e.g. the user agreement, general terms and conditions, the terms of service, written netiquette[8], and different monetary costs for services, if applicable. It states the desired behavior as well as allowed and forbidden actions. On open SNS, the admission of a new profile is the first instance of the regulatory framework as in most sites only real persons are admitted to set up a profile and all other profiles are deleted by the administration. Others admit also profiles of organizations, music groups, or fictitious characters. The regulatory framework further channels the use of a SNS and therefore, it also affects the personal profiles as well as the interaction of members. Thus, it defines for example, if the information in the profiles should be truthful or if the picture uploaded is to be a personal photo. Furthermore, it sets the rules of linking to and interacting with others.

The difference between the technical and the regulatory framework can be highlighted with the following example. The technical setup defines what a member can do on the portal, that is, which acts he can execute, e.g. the available categories for self-portrayal, whereas the regulatory setup includes the written rules, e.g. in the user agreement or the terms of service. Here it is stated what users are allowed to do. To further clarify the distinction, imagine a SNS without the facility to upload a picture. This is a technical

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[8]Convention on electronic fora to facilitate interaction

Figure 2.6: The letter of the administration of Xing (in German) in response to uploading a cartoon character as personal picture as an example of the regulatory setup of a SNS.

restraint preventing all users from uploading a picture. Another SNS features uploading pictures but prohibits certain kinds of pictures. On this SNS, every user may upload any picture, however pictures falling in the forbidden category will likely be removed if noticed by the administration. An example for this is given by figure 2.6. It shows the letter (written in German) of the administration of Xing[9], a business-oriented SNS (described in detail in Section 3.2.3.2), to a user who uploaded the picture of the cartoon character Simpson instead of a personal picture. With reference to the user agreement, the picture was removed by the administration and the user advised that he may be excluded in case of uploading such a picture again. This describes the enforced restraint of the regulatory setup.

The mission statement defines the purpose of the SNS. Thereby, it acts selectively attracting only Internet users congruently motivated and it also shapes the expectations of its members. The mission statement sets the focus which differentiates the SNSs. The main distinguishing feature is the distinction between professionally and personally focussed SNS. The latter focus either generally on friendship or have a further focus, e.g. on a section of the population such as students, or on a special hobby ("passion - centric", boyd and Ellison (2007)), or religion. Furthermore, some SNSs focus explicitly on the person's immediate environment (e.g. facebook: "connects you with people around you").

Lastly, the interaction of the members with the described characteristics of the technical and regulatory framework as well as the mission statement leads to a specific culture on the SNS. The culture is the unwritten code of conduct, i.e. the accepted way of behaving on the SNS (Preece, 2000). It is learned through experience and reflects the attitude

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[9]http://www.xing.com

and values of the members (Preece, 2004). Because the culture also influences the use of the SNS, not all SNSs can be clearly categorized as business or leisure focused SNSs. Thus, although the mission statement defines the focus, some SNSs integrate, because of their culture, both functions to a degree (Schaefer, 2008b) as will be shown in Section 3.2.3. The culture could also influence the information on the profiles as well as the interaction among the users, e.g. if and how new relationships are established. Thus, it might be common on a SNS to request a link from an unknown person if his profile is interesting while on another, the interaction would be initiated first with a personal message before posing a link request. The different SNSs can be distinguished with these general factors which also influence the social networks developing on the SNSs. Their influence will be analyzed in Chapter 3.

2.2.3   Clarification on terminology

For the purposes of clarification and disambiguation, the terminology used to describe the social networks of SNSs is briefly introduced. On the side of the SNS, (mostly) each person is represented by his profile which is connected by hyperlinks (abbrev. links) to other profiles. In SNA, the investigated units of a network are termed actors and the connections among them ties. Hence, for SNSs, the profiles and therefore indirectly their owners are the actors and the links among them the ties. In the field of graph theory which also contributes to the analysis of primarily large networks the actors are commonly called nodes, and the ties edges of the graph of a social network. Thus, the profiles and their owners are referred to as actors or nodes interchangeably. Similarily, the terms tie, edge, hyperlink and link are used synonymously whereas connection refers to a real-life relationship between persons. Furthermore, the connected others will be generally referred to as contacts.

2.2.4   Literature overview

While social interaction has been researched in various online environments (for a review see di Gennaro and Dutton, 2007), SNSs, in particular, have only started to attract scientific attention. Thus, the majority of research articles about them have been published in the last year. Also recently, a debate about the term of SNS as well as about the future research agenda concerning them ensued (Beer, 2008; boyd and Ellison, 2007). Beer (2008) amended the suggested research agenda which focused on the users (boyd and Ellison, 2007) with the perspective of the SNSs as commercial spaces with the objective to maximize their business value. In the next paragraphs, first, the main research topics on the individual level will be briefly illustrated, followed by research on the level of the entire network and the possible uses of SNSs data.

On the individual level, early articles discussed the function of the "public display of connections" (Donath and boyd, 2004) and data privacy concerns (Gross et al., 2005). The issue of data privacy has increasing relevance as SNS use is becoming more and more a mainstream phenomenon and therefore, more data are available. Nowadays, 55% of teenagers and 90% or more of college students in the U.S. maintain a profile on at least one SNS (Ellison et al., 2007; Gross et al., 2005; Lenhart and Madden, 2007a,b; Hargittai, 2008). It should be noted that all studies up to date have investigated these

two demographic groups. On their profiles, SNS users provide willingly a great deal of information about themselves, such as contact details, sociodemographic information, attitudes, and preferences although they report being concerned about privacy (Acquisti and Gross, 2006; Ellison et al., 2007). Thus, Acquisti and Gross (2006) found no correlation between privacy attitudes and behavior, e.g. withholding information. They could furthermore show that the majority of users falsely assume that the SNS companies don't collect and exploit the data. This belief might be shared by some researchers as questions about the expected audience for profiles don't include categories such as firms who might be interested out of employment as well as marketing purposes (Ellison et al., 2006) although such cases are known (Acquisti and Gross, 2006). The included categories of law enforcement, administration, and "total strangers" were, however, seen by college students as a rather unlikely audience for their profiles (Ellison et al., 2006). The ubiquitous use of SNSs almost inhibits studies on the differences between users and non-users because non-users are comparatively rare. Nevertheless, an impact of Internet access and context of living on SNS use, as well as systematic sociodemographic differences between the users of different SNSs was found (Hargittai, 2008): Students who can access the Internet autonomously as well as those who live on campus or on their own are more likely to use SNSs. Furthermore, the educational degree of parents' as well as ethnicity predicted differential adoption of SNSs, e.g. students with a lower educational background rather maintained a profile on MySpace whereas those whose parents also held an university degree chose Facebook. Finally, a very recent study has taken up the issue of the function of the display showing that exceedingly large contact lists displayed result in the impression of lower social attractiveness than an average or slightly above-average size of the contact list (Tom Tong et al., 2008).

Concerning the individual benefits, the results of self-report measures point to people using SNSs almost exclusively to deepen as well as to stay in touch with existing contacts, thereby enhancing their social capital[10] (Ellison et al., 2007). Using a more sophisticated design, Acquisti and Gross (2006) cast that into doubt by asking users about the activities of other members which then resulted in equal shares for all activities of staying in touch, deepening contact, self-promotion, and flirting. Finally, Lampe et al. (2007) find that the more profile fields a user has completed the more contacts he lists on his contact list. For a further review see boyd and Ellison (2007).

On the network level, the topological characteristics of the networks of various SNSs were investigated establishing their small-world and scale free properties (Fu et al., 2007, 2008; Mislove et al., 2007). In small-world networks all actors are connected via few intermediaries (Watts, 2003). The scale-free characteristic denotes that there is no node in the network that can be said to be characteristic of all nodes because a few actors, the hubs, are highly connected while the vast majority of actors have only a few links. This characteristic derives from the power law distribution which most social networks have (Barabasi, 2003).

The flip side of privacy concerns are deliberations on the possible use and usefulness of the data on SNSs. As Acquisti and Gross (2006) have noted, "information provided even on ostensible private social networks is, effectively, public data". Therefore, it is not surprising that SNSs (as reservoir of personal data) also attract the attention of non-users (Acquisti and Gross, 2006; Beer, 2008), among others, of marketers (e.g. Stroud, 2008).

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[10]Social capital refers to the resources of a person accumulated through his connections to others

The relational data of SNSs can be used to identify persons who have connections with many other persons, thus, for example, those who are potentially able to influence many others. On this basis, a "customer network value" can be calculated which refers to the expected increase in sales to third persons resulting from marketing efforts directed to a specific customer (Staab et al., 2005).

Even the protection of one's own personal information, e.g. by restricting visibility of the profile or by withholding information altogether, cannot prevent "indirect disclosure", i.e. the inference of information based on the combination of different disclosed information (He et al., 2006). First studies show the feasibility of inferences based on profile information of one's contacts and also test their accuracy (He et al., 2006; MacKinnon and Warren, 2006; Liu et al., 2006), e.g. estimating age and geographic location of a user based on his contacts' specifications (MacKinnon and Warren, 2006).

2.2.5   Summary

As the use of SNSs is becoming common, they are increasingly interesting as a research object, both as a sociological observation platform and as a rich source of relational data. This chapter described basic processes and facilities of SNSs and differentiated them from other web applications. The factors of the technical and regulatory framework as well as the mission statement and culture were introduced as characterizing differences between SNSs as technical enviroments for social interaction. As the overview of the existing literature showed, research on SNSs can be categorizd into the individual and network level. On the individual level, primarily sociological studies focused on the benefits and potential dangers for the user, e.g. of privacy breaches. On the side of the entire network, previous research of the field of information sytems established the topological comparability of the social networks on SNSs with offline social networks while also probing into the potential applications.

2.3   The relational data on SNSs

The significance of the meaning of data can be illustrated with a simple example: turning out as the central actor in a social network leads to opposite conclusions depending on whether the tie semantic is *likes* or *dislikes*. Regarding social networks and SNSs in particular, research is aimed at conclusions about individual benefits, e.g social capital, as well as about economic interests, identifying hubs or opinion leaders who may speed up the process of information dissemination.

These connections are illustrated in figure 2.7 which depicts the components of social network data in the middle being influenced by the features of the SNSs on the left side (in grey) while being related to exemplary theoretical concepts (in black). As shown in the middle of the figure, SNA provides abstract concepts, such as actors and ties, which can be applied to concrete instances of social networks, e.g. the social networks of SNSs in which the actors are the profile owners. In order to derive inferences or insights, the concepts of SNA are associated with concepts from other theories. This is illustrated with two examples in the right side of the figure. The first concept is an example of the research areas of innovation diffusion and marketing: the multiplier which is also called connector or opinion leader (Carl, 2006). The term multiplier refers to persons who know
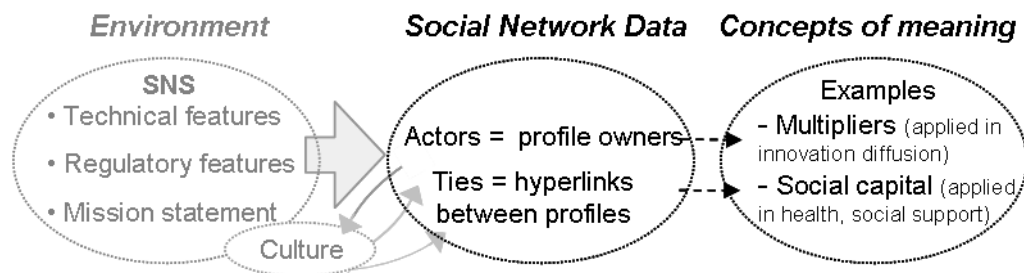
Figure 2.7: The relationship of SNA data and concepts of meaning

many other persons and may thus be able to more efficiently spread information than other persons with fewer contacts. Hence, the concept of centrality in a social network may be used as an index for the concept of multipliership, i.e. actors with many ties in a social networsk may be considered as a multiplier. The second depicted term of social capital constitutes an example of an association of concepts of SNA with other theories which mainly relates to the differences between various relationships, i.e. tie strength. In the research areas of e.g. leadership and health, relationships which may support or influence persons are distinguished from other relationships because often solely the former account for a positive impact. For instance, weak ties have been argued to be nowadays more beneficial for the success in a leadership position than strong ties (Brass and Krackhardt, 1999) whereas concerning health, obesity appears to spread through friends and family ties but not through weaker ties, like neighbors (Christakis and Fowler, 2007). In these cases, the concept of SNS of tie strength is employed as a measure to distinguish between relationships.

However, as figure 2.7 portrays, the validity of the employment of these concepts in other theories depends not only on the theory of SNA, but also on the original context, i.e. on the meaning assigned to actors and ties in the modeled social network. This influence is depicted by the grey left side of figure 2.7 and will be treated in detail in chapter 3.

Inferences concerning concepts such as multipliers rest on a specific interpretation of the data, e.g. that the multiplier actor is in touch with many others. Thus, if the meaning of the original data is misinterpreted, the inferences are likely to be wrong. Therefore, in this section, the validity of SNSs data as well as previous research in this regard are discussed and it is shown that the validity of SNSs data has not yet been established conclusively.

The interpretation of empirical results as well as inferences based upon them are only useful if the measurement was correct, i.e. if the empirical data represents what it is intended to. This property of an inference is called its validity (Zeller and Carmines, 1980). Conversely, this means that validity can only be established if it is known what the data represents because then the appropriateness of the measure concerning an inference can be evaluated. A prerequisite for validity is the reliablity of a measure which denotes the extent to which it captures the construct to be measured consistently and without errors. In the times before the diffusion of the Internet, relational data were collected using questionnaires and surveys. However, the answers of respondents are often inaccurate as a series of experiments demonstrated (BKS studies, for a review see Marsden, 1990). This casts doubt on their reliability.

Nowadays, the data of online interaction is often captured in log-files on servers and is therefore unaffected by measurement errors (as long as the system operates without

failures). Data of Internet behavior can be classified as historic data. An advantage of historic data in general, and Internet data in particular over survey data is the availability of data of thousands of persons at simultaneously lower costs than conducting surveys. The main advantage of historic data is its unobtrusive collection which avoids reactivity: a possible behavioral change of the studied subjects in reaction to the investigation. This is prevented because the subjects of study don't expect nor notice the data collection (Bouchard, 1976).

However, as it is not a priori established that Internet data embody the assumed meaning, they face a validity problem. For example, an approach to infer social communities through the hyperlinks between personal websites failed because, as the authors concluded, these hyperlinks "can represent anything from friendship to collaboration, to general interest" (Adamic and Adar, 2003, p. 211). Similarily, networks modelled on the basis of email correspondence are often used as an indicator of social networks (e.g. Kautz et al., 1997; Kossinets and Watts, 2006). However, a recent verification study showed that this assumption is invalid because only part of the communication is conducted over email and the amount of email communication is dependent on the geographic distance between the parties (Grippa et al., 2006). Thus, data of online interactions should not be evaluated by their face validity[11], but their meaning should be ascertained.

The information on SNSs can be categorized into two categories: the individual information of the profiles and the relational information of the links between the profiles. Concerning the information on the profiles, the issues of completeness (in the case of predetermined profile fields) and of accuracy of the given information determine its validity. A first study reported that 59% of profile fields are completed on average by students (Lampe et al., 2007). The accuracy of the stated information appears to vary by age: while almost half of the teens provide false information on their profiles (Lenhart and Madden, 2007b), college students provide accurate information or withhold it: over half withhold personal contact details (Acquisti and Gross, 2006). Furthermore, depending on the culture of the SNS, creativity concerning the information on one's profile might be valued more highly than honesty (Donath and boyd, 2004).

The focus of this work lies on the relational information contained in SNSs. It has been commonly assumed that the networks displayed on the contact lists represent at least part of the real personal networks of the users (Ellison et al., 2007, 2006; Lampe et al., 2007, 2006; Lenhart and Madden, 2007a,b). However, the picture is inconclusive, so far. Some studies report that people focus their SNSs use on their existing offline friends (Lenhart and Madden, 2007a) and therefore operationalized the number of contacts as a measure of social capital (Lampe et al., 2006; Ellison et al., 2007), while others show that seeking new friends is also a widespread intent (Acquisti and Gross, 2006; Lenhart and Madden, 2007b). Even maximizing the sheer number of contacts listed on the profile appears to be a goal in itself (Donath and boyd, 2004). This issue has also been taken up by journalistic accounts which point out the frequent meaninglessness of SNS links (Jump, 2005; Slotnik, 2007). Others regard the online world as disconnected to one's real life and postulate therefore no overlap in contact circles (boyd, 2006). Very recently, the issue of the uncertain meaning of links on SNSs has been recognized by Tom Tong et al. (2008) who showed that extremely high numbers of contacts displayed loose their meaning for others. However, they have not investigated the meaning of ties in the average

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[11]A measure has face validity if it appears to be valid (Sireci, 1998)

range. Up to now, there exists no empirical research resolving the prevalence or relative frequencies of the different usage intentions and consequently, the informational content of the displayed contact lists.

Thus, the relational information of SNSs and therefore its validity have not been established yet. As has been demonstrated above, ascertaining the inherent meaning of Internet and, in particular, SNS data is the necessary basis for further inferences, e.g. for marketing purposes. As a first step towards that, a conceptual model of the personal networks on SNSs has been developed which is detailed in the next section.

2.4   The research model

The personal networks consist of all the links users have added to their contact lists, i.e. all connected profiles. However, the links a user has chosen are not independent from each other and therefore, the personal networks are the primary unit of the further discussion and analysis. In order to systematically investigate them, a conceptual model of the descriptive elements as well as influencing factors is introduced in the following (see also figure 2.8). The main descriptive elements of personal networks are their size and their composition, i.e. the number and types of ties users have on their contact lists. As will be shown later, a relevant element of the composition is the inclusion of contacts met on the SNS.

The size of the personal network is the sum of contacts a user lists on his profile. It varies greatly, i.e. between zero and tens of thousands. Secondly, personal networks differ in the types of links users add, respectively manage on the SNS. The size is not independent of the composition as a user who is more selective concerning the links he establishes probably has less links than a less selective user. On a business-focused SNS for example, some members might add only current colleagues while others include also friends or potential business partners.

Regarding the composition of displayed networks, the different information comprised on the links cannot be established easily because each link can assume a different meaning. As discussed in Section 2.1.3., ties can vary regarding the strength of the relationship as well as with respect to the relationship context. The latter is used as the main distinguishing feature for online ties: they are primarily differentiated whether the contact is known in real life or only via the Internet. As hyperlinks between profiles can be set without much effort on SNSs and diverse motivations of seeking links to others have been shown , the tie-strength of the pure Internet ties is frequently questioned. Therefore, whether or not users include persons whom they have not met in person is a relevant factor of personal networks on SNSs.

The personal network on a SNS is a result of its use and can therefore be subsumed under the general term of Internet use. Several paradigms on Internet use and its results have been developed since the beginnings of the Internet. First approaches assumed a technological determinism while the subsequent perspective of social constructivism saw personal needs and goals as the sole determinants of Internet use and its results (Mesch and Talmud, 2007). Recently, a perspective on interpersonal use of the Internet integrating the interaction between the features of technology on the one hand, and, on the other, the person's needs and goals has come into focus (Bargh and McKenna, 2004; Boase and Wellman, 2006; Mesch and Talmud, 2007). Against the background of this perspec-

tive, the technologically produced opportunities and constraints on SNSs as well as the influence of personal motivations are integrated into the conceptual model. Thus, the development of the personal networks is influenced by the environment and by individual differences as depicted in the model shown in figure 2.8. The features of the technical environment depicted on the left side include the technical and regulatory framework of SNSs, the mission statement, and culture (see Section 2.2.2). On the side of the individual differences (right side of the figure), the personality and motivation influence SNSs use and therefore one's personal network.
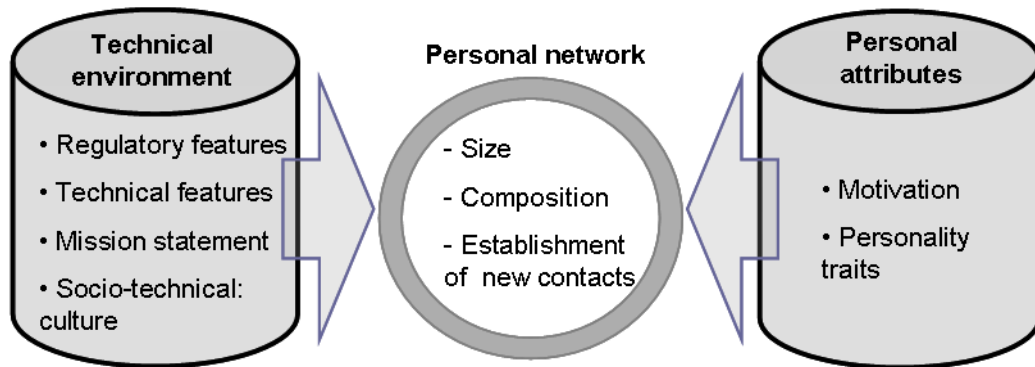
Figure 2.8: The research model showing the influence of the environment and of individual attributes on the characteristics of the individual network.

In the following, both sides are analyzed in detail. In Chapter 3, potential influences of the technical environment are conceptually evaluated and selected sources of influence investigated with empirical studies. Furthermore in that chapter, the features of the individual networks of one SNS as depicted in the middle of figure 2.8 are investigated in detail. Chapter 4 then explores the impact of individual attributes on the personal network.

2.5   Summary

In this chapter, the field of social network analysis along with the concept of a social network were introduced. Subsequently, different centrality conceptions distinguishing the actors of a social network and the notion of tie-strength differentiating relationships were discussed. Social network sites were presented as online environments for managing one's personal networks as well as for social interaction. After describing the basic processes of SNSs, their characteristic features were illustrated. The discussion of previous research demonstrated that, until now, it has not been established what information SNSs display and therefore, the validity of inferences based on SNSs data is uncertain. In the last section, the information on SNSs has been divided into the personal and relational information. As the latter is the focus of this work, a conceptual model of the personal networks and factors influencing them was introduced which sets the framework for the following chapters.

Chapter 3

Influence of the environment on SNSs

Social network sites have become a mainstream application in the span of a few years and attract millions of users today. SNSs visualize people's personal networks and have thus sparked the public interest in the relevance of social networks. This has led to all kinds of research on them, for instance, active users have been claimed to be more attractive as measured by the number of incoming first communications on the SNS than less active users (Ghoshal and Holme, 2006). However, the meaning of these communications has not been evaluated and thus the inference of attractivity may not be valid. In the same vein, the meaning of the links on SNSs which may vary between friends and status symbol has not been assessed empirically. Even circumstantial findings concerning the same SNS have been inconsistent. Acquisti and Gross (2006) could show that students on Facebook engage equally in activities to stay in touch with friends than in browsing profiles of strangers and flirting. In contrast, Ellison et al. (2007) concluded that students' use of Facebook is first and foremost directed at existing contacts while other activities such as browsing profiles plays a subordinate role. Concerning the meaning of ties of persons with many ties, a recent approach has found that an extremely large size of the personal network appears phony to other users of the SNS (Tom Tong et al., 2008). Furthermore, the effects of the SNS itself on the user behavior have not been considered yet, although they affect the relational data of the single SNS as well as the comparability between SNSs. In order to fill this gap, first, a conceptual analysis of expected effects due to the SNS as environment for the social interaction and of the expected meaning of the links on SNSs is performed. In a second step, selected effects are empirically investigated in several field studies and the meaning users allocate to SNS links is explored.

The chapter is divided into a theoretical and an empirical part. In section 3.1, potential effects of each of the features of SNSs on the elements of social networks are conceptually developed. The analysis is structured according to the elements of social networks, discussing the influences on actors and links in turn. In the second part of the chapter, studies on three selected issues are reported. In the first study described in section 3.2.1, the influence of an unduly strong hypernode, termed fake hub, on the network structure is explored. Second in 3.2.2, the influence of different costs for the link establishment on the size of the personal networks is investigated. Finally, the informational content of the data of one SNS is assessed in a case study (3.2.3). Lastly, the main points of the chapter are reviewed in the summary.
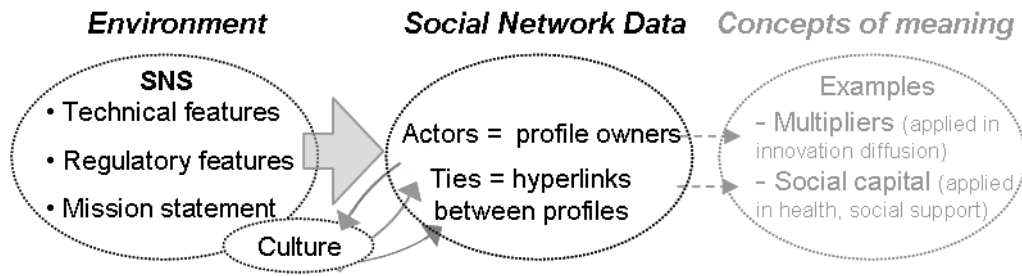
Figure 3.1: Conceptual model of the environmental influences on the social network data of SNSs

3.1 Conceptual analysis

With the rise of SNSs, all sorts of further Internet applications have integrated functionality which permits creating profiles and linking these to other profiles. As discussed in the second chapter, this has led to a confusion of the term "social network sites" and an ensuing debate of its definition (boyd and Ellison, 2007; Beer, 2008). However, even limiting the definition of SNSs to webpages with the main aim of social networking between persons, the differences between the thus identified SNSs are still considerable. As can be readily seen, it would be misleading to consider them as a homogeneous group of applications suggesting similar user behavior. They can be distinguished by the different features that form the technical environment for the social interaction taking place on them. On this basis, a framework for differentiating SNSs and the implications of their features on the behavior of their users is developed.

In the following, the influences of the features of SNSs on the evolution of the social networks in them are explored and their impact assessed. Furthermore, these influences are discussed as potential sources of bias in the data. The environmental features of SNSs as identified in Section 2.2.2 comprise the technical framework of SNSs defining possible actions, the regulatory framework stating allowed and forbidden actions, and the mission statement. The interaction of the features of the SNSs with their users leads to the fourth feature: the dynamics of the evolving group itself result in a kind of culture on the SNS. Figure 3.1 models the assumed influences depicting the SNS as the environment on the left side which influences the social network data shown in the middle. To recapitulate the connection to concepts of meaning, they are shown in light grey on the right side of figure 3.1. Table 3.1 summarizes the proposed effects of the features of SNSs on the elements of a social network, namely on the types and the homogeneity of the nodes as well as on the number and the meaning of the realized ties. The cells of table 3.1 show all potential effects which are discussed in detail throughout this section while the "x" denote where effects are proposed.

A social network is affected both by the influence on the persons constituting it as well as by the influence on the number and meaning of the ties the persons establish. The following sections are structured according to this distinction addressing first the contextual impacts on the user composition of SNSs and second, effects on the hyperlinks between the profiles. Subsequently, the meaning of the hyperlinks is discussed in detail.

| Social network elements | Nodes (subsection 3.1.1) | | Ties (subsection 3.1.2) | |
Features of SNSs	Types	Homogeneity	Number	Meaning
Technical framework		x	**X**	x
Regulatory framework	**X**			
Mission statement		x	x	x
Culture		x	x	

Table 3.1: Potential influences of the different features of SNSs on the elements of the resulting social networks are denoted with an x in the cell. The "**X**" indicate the effects which are investigated by field studies in sections 3.2.1 and 3.2.2.

3.1.1   Influences on the composition of the user population

The characteristics of a SNS have the main impact on its user population which make up the entirety of actors of the social network. Knowing the composition of the user population is vital for inferences to obtain external validity, i.e. answering the question regarding the generalizability of the results from one sample to the general intended population. With respect to business concerns, investigating the mixture of different customer groups in the user population is essential for the market segmentation process which in turn is the basis for successfully marketing the SNSs (Wedel and Kamakura, 2001). For instance, a recent survey has reportedly shown that gay, lesbian and bisexual persons use SNSs more often than straight persons and also feel more positively about advertisement on blogs (Cashmore, 2007). Thus, these might be a suitable target group for SNS advertising.

3.1.1.1   The technical framework

On the side of the technical restrictions, the decision who is admitted into the SNS determines the configuration of the population. SNSs can be differentiated into "open" and "closed" sites. Open SNSs let any person register while others, termed "closed" networks for easy differentiation, restrict access in a specified way. For example, Facebook[1] allowed only persons with a valid university email address to register (until September 2006, Abram, 2006). This resulted in a network made up entirely of students and university employees. Thus, restricting the registration to a certain group of persons increases the homogeneity of the user population. Another form of closed SNSs are those that require an invitation from an already existing member for a new registration, e.g. aSmall-World[2]. This restriction will also alter the composition of the population towards homogeneity since, in the physical world, people have friends who are in some respect similar to them (e.g. McPherson et al., 2001). Therefore, it can be concluded that a closed SNS which restricts access in a certain way will have a more homogeneous user population than an open SNS.

3.1.1.2   The regulatory framework

The most important regulatory instance as a new profile is being created is the admission of the profile. In the written rules it is stated who is permitted to create a profile and

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[1]http://www.facebook.com
[2] http://www.asmallworld.net/publicpages/about_us.html (retrieved 6.3.2008)

what information the profile should contain, e.g. if the correct name is to be given or if further statements should be truthful. In most SNSs, only real persons (as opposed to legal entities and artificial characters) are allowed to create a profile and all other profiles are deleted by the administration. On the other hand, the SNS MySpace allows profiles of all kinds, e.g. of organizations, music bands, or also fictitious characters[3]. For example, the US Marine Corps[4] maintains a very popular profile for representational and recruitment purposes. Similarly, profiles of the school or university mascot can be found on Facebook (Lampe et al., 2007).

From a network analysis point of view, this practice implies different types of actors where some actors could be part of others, such as the members of the Marine Corps. SNA differentiates two basic types of social networks (cf. Section 2.1). In a one-mode network, actors have a direct connection to each other, e.g. by seeking advice, and all actors are of the same kind, e.g. individuals or groups. Whereas in a two-mode network, actors are connected by a commonality, e.g. being part of the same association. Therefore, two-mode networks consist of two types of nodes, the actors and the commonalities. The existence of corporate or fictitious profiles leads to a mixture of one-mode and two-mode networks: on the one hand, natural persons link to one another, on the other hand, people establish contacts to a group they belong to or to character(s) they admire. It is to be expected that e.g. associations, celebrities, or music groups attract much more links than individual actors and that these links embody a different meaning which implies a two-mode network, e.g. *being a fan of* or *being a member of* instead of *knowing* or *liking*. With regard to the common assumption that the social networks on SNSs represent a one-mode network with the ties meaning *knowing*, the implicit two-mode network ties could be considered undue because of their different meaning. In the following, the actors which attract many ties with differing meanings are termed "fake hubs".

As fake hubs can unduly collect many ties in a social network, they can thereby take centrality from other actors (Everett and Borgatti, 2008). They could therefore turn out as the central actors in the network and, depending on their strength, could systematically alter the network structure. However, due to the different meaning of their ties, they are not central in the sense of the rest of the ties, e.g. *knowing other persons on SNSs*. Therefore, their impact can be seen as biasing the network structure.

3.1.1.3 The mission statement

Another obvious and important aspect influencing the user population is the motivation for being a member or active in a SNS. Besides the rules, the mission statement shapes the expectations of potential users. Of the multitude of SNSs continuously springing up everywhere, most have stated more or less explicit goals for their service. The intended aim of service expressed in the mission statement is the most obvious difference among them concerning the attracted user population and it varies from pursuing common interests to pet networking (Meskill, 2005). Some SNSs are open to all, but address only a certain group of people. Facebook and StudiVZ[5] for example, have been explicitly designed for students.

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[3]e.g. http://www.myspace.com/lonelygurl15 (retrieved 3/6/2008)
[4]http://www.myspace.com/themarinecorps(retrieved 3/6/2008)
[5]www.studivz.de (retrieved 3/6/2008)

As was stated in Section 2.2.1, the most relevant differentiation between SNSs concerning the userbase is the focus on business or leisure networking. The focus attracts different user populations for several reasons. For instance, SNSs focusing on business goals assumably intend persons to be truthful about themselves whereas, in other sites, creative and self-presentational aspects can be more important (cf. Donath and boyd, 2004). Furthermore, considering business and leisure networking, the expected benefit of joining the SNS should obviously differ. Networking for business or career purposes focuses on new career or project opportunities (Robert & Horst, 2006), while leisure networking is about the private network.

Thus, it is to be expected that different missions of SNSs attract different user populations which in turn differ in their motivation to use the site. Supporting the hypothesis of differing attracted user populations, clear age and ethnic differences with regard to the endorsed SNS have been revealed (ComScore, 2006; Hargittai, 2008). On the motivational side, a recent survey among the German working population demonstrated that the majority is mainly interested in new business contacts and is not looking for new friends or dating opportunities (Robert & Horst, 2006). It is further conceivable that the business driven networks are more homogeneous than leisure networks since people there look mainly for helpful or advantageous contacts from the same industry. To conclude, depending on the mission statement of SNSs, the user populations may differ in terms of sociodemographic attributes and motivations of use.

3.1.1.4   The culture

The role of existing members of a SNS and their culture also has an effect on future members similar to online communities in general (Preece, 2000). First, the SNS is made known by word-of-mouth marketing and invitations. Here, the homophily effect (McPherson et al., 2001) skews the actors of the networks towards homogeneity as people know and therefore, tell and invite others who are similar to them. Second, the decision about becoming an active member could depend on whether one finds similar people on the SNS. A recent study provides first support for this research proposition revealing that different ethnic and educational groups show a clear preference for different SNS, e.g. Asians are mostly members of Friendster (Hargittai, 2008). Lastly, the culture can probably be a decisive factor in case of a clash between the person and the perceived SNS culture, e.g. if women feel bothered by contact requests or electronic emotional messages of unknown men. The last example happened on StudiVZ which has been first pointed out in a blog (DonAlphonso, 2006) and later taken up by the news (Fritzsche, 2007; Rühle, 2007). Therefore, similar to the mission statement, the culture of SNSs may influence the user population in terms of sociodemographic attributes and motivations of use.

3.1.2   Factors influencing the hyperlinks between profiles

The two aspects characterizing the ties in a social nework are the number of ties realized within it and their meaning. The number of links realized indicates the connectivity in the social network and constitutes, with regard to the single actor, a status measure. The semantic or meaning of the links determines the interpretation of the results as becomes obvious when considering the difference in the interpretation of a central actor with the ties denoting *party together* or *confiding in each other*. Furthermore, it could be shown

that different characteristics of ties will lead to different outcomes, i.e. strong ties offer more support while weak ties provide new information (Granovetter, 1973, 1982)(see also Section 2.1.3). Thus, knowing the meaning of links is crucial for drawing conclusions. The following sections will explore how these two aspects of the links, their number and their meaning, can be affected by the features of SNSs. However, as no specific influences of the regulatory framework can be conceived which are not enforced technically, they will not be discussed.

3.1.2.1 The technical framework

The technical setup determines the process of contacting others and therefore also the costs of establishing a hyperlink to another profile on the SNS. The aggregation of the single instances of link creations is the network development. Hence, the number of resulting links in the whole network, the network density, is influenced by the technical framework as well.

The different processes of link establishment employed by SNSs entail different costs. In most SNSs, a member is allowed to contact or propose a link to anybody with or without a short personal message, e.g. MySpace, Facebook, or StudiVZ. Others restrict the contacting possibilities, such as LinkedIn which employs a "gated-access-approach"[6]. This term denotes that, for linking purposes, a user can directly contact any member he already knows, proving that by stating the other's email address. In order to establish a link to a yet unknown member, he has to be introduced by someone of his own social network to that member. If no one in one's own social network (consisting of direct contacts, their contacts and again their contacts, i.e. all persons up to the 3rd degree) knows the aimed-for person directly, the introduction may be passed on through direct contacts until it reaches its destination. Thus, the request for contact travels through the network like Milgram's parcels (Milgram, 1967)[7]. Furthermore, each user possesses only a limited number of allowed pending introductions and messages to send to other users depending on the subscribed usage package[8] rendering this restraint actually a regulatory one which is technically enforced.

The first described process, e.g. as employed by MySpace, does not imply much effort for a user to contact another member, hence the costs for establishing a contact, i.e. the linking costs, are comparatively low. Whereas in a technically more restricted environment like LinkedIn, the linking costs, particularly to an unknown person, are higher because one has to ask the favor of one's other contacts to pass on the request. In the field of sociology, the notion that people behave cost-conscious in social encounters is not new (Blau, 1967). The social exchange theory states that people seek to minimize the costs while maximizing their benefit while pursuing their interests (Blau, 1967; Molm and Cook, 1995). With specific regard to network formation, a game-theoretical experiment has shown that with increasing linking costs fewer links will be established (Bala

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[6]http://www.linkedin.com/static?key=company_info_more (retrieved 03/21/2007)

[7]In his original experiment, Milgram gave subjecs a parcel together with the name and city of the target persons. Subjects could only send the parces to persons they knew. The parcel that reached their target needed on average six steps to arrive. Thus, Milgram established the small-world effect showing that on average persons are connected with any other person by six intermediary steps.

[8]Introductions range from 10 for the free account to 40 for the premium account, messages from 0 to 50.

and Goyal, 2000). Furthermore, the linking costs can be considered as a part of the transaction costs for the link establishment which also leads to the conclusion that with higher linking costs, the expected benefits also have to be higher for the link to be established. Assuming that there are less links which imply high benefits than there are links implying low benefits, fewer links will be requested. Thus, it is to be expected that this cost effect leads to fewer links on the SNSs with higher linking costs.

Furthermore, if linking costs are higher and members restricted in whom they link to, members may select their contacts more carefully. In the view of the transaction cost perspective, they will choose contacts with higher expected benefits and skip those when the incured costs of the link establishment does not excede the expected benefits. The deliberate selection of contacts leads to a different, assumably more meaningful semantic of the links. For example on LinkedIn, a link signifies either that the two persons know each other or that they have accepted higher costs of getting to know each other. This inference would not be valid with regard to SNSs on which every user can contact any other user. Therefore, it can be concluded that the linking costs of a SNS influence the meaning of realized links.

3.1.2.2   The mission statement

The two anchors of the intended usage dimension, leisure and career, have been described in section 2.2.2. Independent of the mission, keeping one's contacts on a SNS requires very little maintenance costs. One should keep an updated profile and, depending on the SNS, leave comments on others' message boards or redesign one's own profile periodically (Lenhart and Madden, 2007a). Since keeping contacts requires relatively little time and effort, and more contacts hardly imply more effort, more contacts lead to more benefit, or in economic terms, greater utility independent of the context.

However, the benefit sought and therefore, aim of establishing a contact should obviously differ depending on the intended use. Business-focused networking seeks new career or project opportunities (Robert & Horst, 2006) while leisure networking is rather about meeting interesting persons, finding people with common interests or keeping track of faint acquaintances (Lenhart and Madden, 2007a; Donath and boyd, 2004; Ellison et al., 2006; Lampe et al., 2006). On this ground, on a SNS focusing on professional goals, links are selected more purposefully, i.e. for a user to seek a link, its benefit has to be clear. As probably less links fit the criterion of discernible benefit, less links may be realized on business-focused SNSs. With respect to the meaning of the links realized, more serious and purposeful links are to be expected. Thus, the mission statement of a SNS may influence both the number of links established and their meaning.

3.1.2.3   The culture

Finally, similar to online communities (Preece, 2004), the culture evolved on the SNS acts as another influencing factor on the social interaction on it. Consequently, it impacts the amount of links realized. For example, although a SNS has a technically easy way of establishing contacts, requesting links from unknown others could be "frowned upon" or the contact requests ignored. This way, although the possibility is given, it might not be used because of cultural reasons. Conversely, it could be that the rejection of a contact request is considered rude and therefore avoided. This could explain why a

third of 250'000 persons accepted the link request sent by a stranger who was actually
a computer script (Jump, 2005). Therefore, the evolved culture of a SNS influences the
amount of ties realized on it.

3.1.3 Discussion of the meaning inherent in a hyperlink between profiles

Through the process of linking to others a web of links, i.e. a network, develops. The
network data can be subjected to the methods of social network analysis, but for the inter-
pretation of the results the meaning of the ties has to be known. Therefore, the inherent
meaning of the links is of central importance for all further inferences. However, not all
connections are equal as social networks consist of friends, neighbors, colleagues, etc.
Thus, the question arises which types of ties are on the contact lists of SNSs. Approaches
to answer this question are discussed in the following.

The most popular classification of network ties is the concept of tie strength of Gra-
novetter (1973) which was described in Section 2.1.3. He distinguished relationships
primarily into weak and strong ties using the dimensions of time invested, emotional in-
tensity, intimacy and reciprocity. As could be shown by later research, strong ties provide
e.g. emotional or financial support while weak ties are a source for novel information
(Granovetter, 1982; Ellison et al., 2006).

Real-life personal networks could serve as a first indicator for the prevalent type of
ties on SNSs. For instance, Wellman (2000) speculated that a typical westerner has up
to 1000 weak ties, but only 3-6 intimate friends. The question about the size of the
personal network has been answered with estimates ranging from 150 to 5000 (Hill and
Dunbar, 2003; Killworth et al., 1984, 1990; Pool and Kochen, 1979). Concerning social
networks in the virtual world, Donath and boyd (2004) hypothesized that the number of
strong ties may not be significantly increased by communication technology whereas the
maintenance of weak ties is supported and the number of weak ties could therefore rise.
This suggests that hyperlinks between profiles on SNSs represent mostly weak ties.

However, several instances raise scepticism about this hypothesis. Firstly, it is as-
sumed in general that the characteristics of a tie are the same in an offline as in an online
environment (Haythornthwaite, 2002; Holme et al., 2004). Offline, acquaintances drop
out of one's social circle (Pool and Kochen, 1979) if the tie-strength becomes too weak.
However, online ties don't decay. Different from the offline world, it requires the con-
scious decision to delete a contact off one's friends list on a SNS. This involves effort as
well as the risk to offend the other, thus assumably, it is not common and there is good
reason to expect a significant number of links of a profile to be really decayed. Secondly,
with personal profiles featuring several thousand links[9] , it is unreasonable to suppose that
they're all even distantly known personal acquaintances. Also, due to human cognitive
constraints, the number of possible acquaintances of one person is assumed to be finite
(Hill and Dunbar, 2003; Pool and Kochen, 1979). Furthermore, services that provide fake
friends to enlarge and embellish one's contact list (Slotnik, 2007) as well as the 30%

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[9]E.g.   http://profile.myspace.com/index.cfm?fuseaction=user.viewprofile&friendid=18220067
(retrieved   3/7/2008,   10497   friends),   http://profile.myspace.com/index.cfm?fuseaction=user.view-
profile&friendid=160778191 (retrieved 3/7/2008, 7487 friends)

success rate of an automated script asking 250'000 facebook users for a friendshiplink (Jump, 2005) cast serious doubts on the weak tie hypothesis of SNSs links.

In his paper, Granovetter defined a third "state" of a tie: the absent tie which includes "both the lack of any relationship and ties without substantial significance" (Granovetter, 1973, p. 1361). He elaborates that even knowing the other person by name doesn't necessarily constitute a weak tie "if their interaction is negligible." Likewise, Donath and boyd (2004) noted that, at some point of weakness, the ties loose their function to distinguish between a present or absent connection. Consequently, one might ask which interaction can be considered negligible, respectively, how weak a tie strength is insignificant? Furthermore, how many ties on a SNS friends list (of several thousands) are not remembered and should therefore be considered insignificant?

In order to answer these questions, users of SNSs can, of course, be surveyed, e.g. using the scale for Internet social networks by Petróczi et al. (2007). However, the costs for surveying millions of SNSs users are very high. Therefore, the advantage of the availability of the large data-sets is lost as well as the advantage of avoiding reactivity. Alternatively, the concept of sociability which is based on the flow of exchanges between persons (Licoppe and Smoreda, 2005) could serve as an unobtrusive approach of measuring online tie-strength. Although the authors refer the flow of exchanges to all kinds of mediated or unmediated exchanges, the concept could be applied to online exchanges, i.e. online social networks. Applied to SNSs in particular, exchanges can be private messages, entries in others' guestbooks, or emotional messages. The rate of the exchanges between two persons on the SNS might thus serve as an indicator if the tie is weak or absent. Assuming no other exchanges, a first conclusion could be that the tie is insignificant once the exchanges on the SNS stop for a specified or prolonged period of time. An analogous example of ties that could thus be categorized as insignificant are the weak ties that scientists acquired on Internet discussion groups which failed to lead to actual benefits (Matzat, 2004).

Another way to categorize different ties could be accomplished by considering the motivations of establishing the links. The meaning of a link depends on the different individual motivations to establish contacts and, as pointed out above, on the costs of establishing a link. More precisely, it depends on who a person links to and why he seeks or accepts a contact. It has been assumed that online interaction follows the same needs as face-to-face interactions (Holme et al., 2004). Consequently, one would expect that links are established between similar profiles, i.e. similar persons (McPherson et al., 2001). It can also be expected that people link to their current friends and acquaintances or even look for profiles of former friends of the offline world. Furthermore, it is reasonable to expect that people add persons they meet in different face-to-face situations as contacts. But, as Donath and boyd (2004) discussed, the motivations can be even more diverse, such as being fascinated by the interesting profile of a stranger, or simply seeking "more links" because one is new to the site, or collecting links. Also, the above-mentioned paid service which provides attractive persons to add to one's contact list points at self-presentational motivations for establishing links. Thus, the motivations for requesting and accepting links also seem heterogeneous at first glance.

In conclusion, neither the approach of tie strength nor the analysis of the underlying motivations provide a consistent picture of the tie semantics. Thus, further research about the goals and motivations of people and the connection to the meaning of the links they

acquire is necessary. Specifically, the issue of potentially absent ties is important because these ties can be considered as error. For example, for the marketing concept of an opinion leader, this issue is fundamental because the word of mouth process relies on the existing connections between persons (Rogers, 2003; Krackhardt, 1996).

3.1.4 Summary

In this section, the environmental features that influence the development of a social network on SNSs have been discussed and their potential influence on the data from SNSs investigated. The drawn conclusions show that the technical and regulatory features of SNSs as well as the mission statement and the evolved culture all influence the composition of the users and the resulting network structure.

The inherent meaning of the ties plays a central role for the interpretation of the results of social network analysis methods. On SNSs, they appear to be heterogenous with regard to tie-strength as well as to the motivation of their existence. First approaches to determine tie-strength suggest that a significant proportion of displayed ties could also be considered absent or insignificant and might be seen as a source of error concerning the number of ties. The motivations of establishing links with others seem to be more diverse on SNSs than in the offline world. These issues complicate the description of SNSs as well as the interpretation of quantitative results. Thus, in the analysis of SNSs one should rather concentrate on the actual exchanges between people than focus only on peoples' contact lists. Alternatively, additional data about the kinds of ties represented in a contact list can be gathered. All these findings show that the new abundance of personal data comes with many pitfalls which could quickly mislead conclusions.

3.2 Empirical studies

3.2.1 Field study on the effects of a fake hub in a social network

In this section, a field study investigating the influence of fake hubs on the structure of a social network is portrayed. Fake hubs have been defined as unduly central nodes in a social network (Section 3.1.1.2). Several social networks modeled from an online discussion forum using an analogous case of a fake hub are studied. In order to investigate their influence on the network structure, first, the strength of a fake hub, i.e. its degree centrality, relative to the remaining actors is examined. Then, the group structure of the social network with and without the guest account is compared on the basis of the respective eigensystems. Furthermore, the characteristics of the social networks that are thus found to be influenced are explored.

In the following, discussion fora in general and the occurence of fake hubs in them are described leading to the hypotheses. Then, the investigated discussion forum is briefly portrayed and the modeled social networks are described. Next, the results of the analyses of degree centrality and of the eigensystems are reported as well as the further results on the attributes of the influenced social networks. The section closes with a discussion of the results and a summary.

3.2.1.1   Discussion fora as social networks

Discussion fora are online applications which provide persons the possibility to exchange information and opinions among other things. They are mostly focused on a broad principal topic or specific group of people, e.g. www.latex-community.org or www.foruni.de (the community of students of the university of Constance). In order to display all current and former discussions in a clearly arranged fashion, discussion fora are organized by subtopics into so-called "boards", e.g. the university politics board.

A discussion is started by a user posting a contribution, also called a post, as a new discussion thread. In general, contributions are displayed with the author's name, his seniority status[10] as a user of that forum, as well as the date and time of the contribution. Next to simple text, pictures, hyperlinks, and files can often be integrated into the contribution. When a new discussion thread is started, other users can also post to this discussion thread. Their contributions appear in the temporal order of their sending below the first, i.e. the temporally second post underneath the first, the third underneath the second, and so forth. In this way, the discussion threads are continued until there are no new replies or until they are closed by a moderator. Moderators are members of a discussion forum who are endowed with special rights to watch over the compliance to the rules of the discussion forum. For instance, they can warn other users verbally and can ban disobedient users. The discussion threads vary considerably in their length, i.e. the number of contributions they contain.

It becomes apparent that the construction of the web pages and the underlying database reflect the temporal order of the posts, but do not map the relation of the posts by content. Thus, although the content of a post may be a response to the e.g. fourth to last contribution, it appears underneath the post temporally sent last. Also, it is possible that one post contains comments or replies to more than one previous post. This issue is important for the following modeling of the discussion board as a social network.

The interactions on a discussion forum can be modeled as a social network in several ways. Regarding the modeling approach, the social network can be built with the contributions "answering" the posts before them, as has been employed with newsgroups (Chang et al., 2002). This way, the second contribution replies to the first and the third replies to the second, and so on. However, with this method, the contribution starting a thread is not assigned as a tie in the social network. Furthermore, as has been illustrated, the temporal order of the posts does not necessarily reflect the content-wise relation of the posts. These issues reduce the accuracy of the thus established social network. A potentially more accurate, but also more costly modeling technique is the use of content analysis on the posts in order to determine the flow and directionality of the posts in a discussion thread.

In this study, a third alternative has been employed which avoids both the assumptions of the first approach as well as the costs of the second. The social network is modeled as an affiliation network (see also Section 2.1) in which the actors, i.e. users, are connected indirectly by their common activity in the same events, i.e. the different discussion threads. The social network consists thus of two types of nodes, contributors and threads. The more an actor posts to a thread, the stronger his tie to it. Although this approach avoids assumptions regarding direct relations between the users, e.g. responding to oth-

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[10]Seniority refers to the length of time a user has been member of the discussion forum.

ers, it does not integrate any information of the direct interaction between the users. As this can only be captured accurately by an elaborated text analysis, the interaction between the users is modeled indirectly by their common activity in the same discussion threads.

With respect to the scope of the social network, on the one hand, the discussion forum can be regarded as one social network and modeled as such. On the other hand, however, an existing thematical classification into the boards facilitates the modeling of a social network for each board separately which permits a more detailed perspective. Therefore, each board is constructed as a separated affiliation network in this study.

3.2.1.2   Hypotheses

As has been described with regard to SNSs (Section 3.1), the technical and regulatory framework, here of the discussion forum, influence the resulting social network. As an example of the regulatory framework of a discussion forum, moderators of a forum could become central actors without contributing to the content because they often intervene due to their moderator's role. With respect to the technical framework, the reading and writing rights may have an impact. Each reading and writing right can be set to allow all persons to participate or restrict access to registered and (at that moment) logged in members. Most fora allow all persons to read the discussions, but only members to write contributions. This might lead to an incomplete social network because passive readers are not captured in the logs of the server and therefore neglected. As a consequence, the social network could appear more densely connected as it is and the sphere of influence of particular users or of the forum itself could be underestimated. On the other hand, permitting all persons to contribute posts on the discussion forum might also affect the resulting social network. This case is investigated in this field study.

In order to comprehensively display the developing discussions with every page reproduction, each post is written into a database associated with an identification of the author, time stamp and assignment to a particular discussion thread. The contributions of authors who are not logged in are not identified as originating from a known user and have therefore no author identification, initially. A common solution for this problem is to use a collective identification for all anonymous contributors, i.e. all authors who are not logged in at the time of posting their contribution (due to a lacking account or due to not having logged into one's account). The node in the social network resulting of this practice is termed here the guest account and is considered as a fake hub. Fake hubs have been defined as unduly central nodes in a social network. The centrality of the guest account is undue primarily because many authors add up to its activity and therefore centrality.

Furthermore, also registered members may use the option of writing without logging in, e.g. to save time. On the discussion board investigated here, this practice is common as is readily apparent when reading discussion threads of it. In order to identify their authorship, the registered members write their online name, i.e. nickname, on the top of their post. This way, the readers recognize the author, but in the database, and thus the raw data for the social network, the authorship is not registered and the post therefore assigned to the guest account instead of to the actual (known) author. Thus, the activity of the guest account consists of activities of a multitude of unknown and known persons. In sum, the guest account not only constitutes a collection of the contributions of many users,

but it also contains the posts from known members. These false attributions increase the activity of the guest account while at the same time reducing the activity of that member's account. As these attributions are also undue, this further contributes to the consideration of the guest account as a fake hub.

On SNSs, in contrast, fake hubs occur when a node in the social network attracts many ties with a different meaning from the ties among the remaining actors (Section 3.1.1.2). The profiles of celebrities or fictitious characters whose ties imply *being fan of* rather than *personally known* were thus characterized as fake hubs. Thus, on SNSs, the centrality of fake hubs is undue because of their differing meaning. It has been proposed that fake hubs collect many ties and may therefore be overly central in the social network and thus, alter the network structure. Because the centrality of fake hubs is unjustified, this effect can be considered as bias. Although on discussion fora and SNSs, the centrality of the fake hub is undue because of different reasons their effect on the structure of the social networks can be assumed to be analogous. The relevance of the guest account and its impact can be assessed by its relative activity and its influence, i.e. its capacity to alter the network structure. In summary, due to the accumulation of posts of many users, the guest account of a discussion forum is considered as a potential fake hub. As fake hubs collect many ties, they should become central in terms of degree centrality in the modeled social network. The following hypothesis is thus posited:

H_1 : *The guest account turns out as the strongest node of all actors on the discussion forum in terms of degree centrality.*

The more central nodes have a greater effect on the network structure because they have many (and strong) ties, i.e. they control a proportionally bigger part of all ties in the social network. Therefore, for instance, a central node increases the structural feature of the density of a network more than a peripheral node. Also, it could interconnect different groups in the network and let it thus appear more connected. Thus, an overly central node has the potential to affect the structure of a network considerably. This is posed as hypothesis:

H_2 : *The guest account changes the structure of the social network of at least one of the investigated discussion boards.*

In addition, after classifying the social networks of the discussion boards into influenced networks and unaffected networks, these two groups are compared. On the basis of the explorative comparisons, specific characteristics of influenced networks are identified.

3.2.1.3   The investigated discussion forum and data

The investigated discussion forum, Foruni[11] (see figure 3.2), is for the students of the university of Constance, Germany, and was founded in 2003 by students of that university. On Foruni, discussion threads include university- and study-related topics as well as general and fun topics, e.g. guessing movie lines, and they are organized by topic into boards, such as the politics board. At the time of the study in February 2006, the discussion forum had 2019 registered users and contained more than 10'000 discussion threads in approximately 50 boards.

The discussion forum grants everybody writing rights: when members are logged in, all their contributions are saved in the database with the respective author identified by

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[11]www.foruni.de
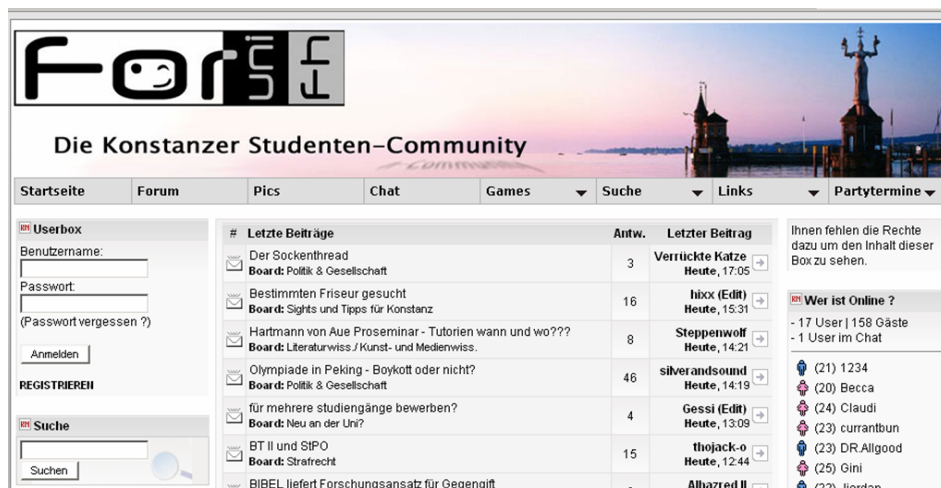
Figure 3.2: The main webpage of the investigated discussion forum.

his account number. Meanwhile, all unidentified contributions are stored using the guest account. However, next to unregistered persons contributing this way, members write quick remarks on the discussion forum without bothering to log in. Technically, these contributions are attributed to the guest account in the database.

For the study, the data of all discussion threads of a year, from February 2005 until February 2006, of seven selected boards was used because these cover the entire spectrum regarding both topical range and lengths of discussions. In order to ensure data privacy, the data was made anonymous before further processing. The boards "New at the university", "University politics", "University miscellaneous", "Politics and society", "Technics", "Fun forum", and "Off-topic" were selected because they differ in topic as well as in the average length of their discussion threads. New users can register themselves continuously on a discussion board and existing users accumulate their posts over time which leads to the temporal effect that "older" users have more contributions on the boards. This can be limited by defining time-frames and by investigating several time-frames. Hence, in order to avoid temporal effects, for each of the seven boards the activity of two consecutive periods of six months was investigated in a separate data set. This results in 14 data sets, two for each of the seven boards. Thus, in one data set, the contributions of all discussion threads of one board and of one of the two time periods are contained. The first period contains the activity from mid-February 2005 to mid-August 2005 and will be referred to further as the earlier period while the second period spans the subsequent six months until mid-February 2006 and constitutes here the later period. For each of the investigated data sets, the number of active users and discussed threads as well as the average thread length and the standard deviation thereof is depicted in tables 3.2 and 3.3 with table 3.2 describing the boards in the earlier time period and table 3.3 the board in the later time period.

For each data set, a directed affiliation network consisting of the *actors* contributing to the *threads* was constructed. The cells of the affiliation network contain the number of contributions a user (identified by his account ID) posted to a specific discussion thread. For reasons of clarity, all users who did not contribute a post to any of the discussion threads in a data set were eliminated from that affiliation network. The resulting affiliation

| | | | Thread length | |
Topic of the board	No. of users	No. of topics	Average	Std.
New at the university	81	21	23.52	32.92
University politics	93	34	46.85	52.1
University misc.	136	90	17.5	33.19
Politics and society	136	134	23.5	27.46
Technics	98	94	7.87	6.39
Fun Forum	140	63	32.46	126.6
Off-topic	178	210	17.5	18.92

Table 3.2: Descriptive statistics of the investigated boards on the discussion forum in the earlier period.

| | | | Thread length | |
Topic of the board	No. of users	No. of topics	Average	Std.
New at the university	90	27	13.96	10.02
University politics	82	30	39	54.6
University misc.	159	86	14.3	13.28
Politics and society	171	130	32.08	35.8
Technics	116	66	10.86	11.04
Fun Forum	145	70	29.51	95.64
Off-topic	214	234	18.77	21.77

Table 3.3: Descriptive statistics of the investigated boards on the discussion forum in the later period.

networks contained between 80 and 220 actors and between 20 and 225 discussion threads (see tables 3.2 and 3.3).

3.2.1.4 Analysis of degree centrality

In directed social networks, the outdegree of an actor is the count of the number of outgoing ties. The outdegree of an actor denotes the extent of his involvement in the social network (Jansen, 2003). In a discussion forum, the involvement is indicated by the actor's activity in terms of the number of posts he writes. The outdegree centrality of an actor shows his activity in a specific board, i.e. regarding this topic. With the use of outdegree centrality instead of degree centrality, only the authors are compared since the discussion threads have only incoming ties, i.e. indegree.

In order to test the first hypothesis, the outdegree centrality scores d_o for all actors n_j were computed for each network (equation 3.1) with $j = (1 \ldots J)$ denoting the rows, i.e. actors, and $k = (1 \ldots K)$ denoting the columns, i.e. discussion threads (see Wassermann and Faust, 1994).

$$d_o(n_j) = \sum_{k=1}^{K} x_{jk} \tag{3.1}$$

The 14 boards differ in the number of active users as well as in the number of discussion threads contained in them. In order to compare the outdegree centrality scores over all the boards, the actors were ranked in each board according to their outdegree centrality with the first rank denoting the most central actor.

Looking at the ranking of each of the boards separately, the guest account turned out as the most central node in four out of 14 data sets and, in twelve out of 14 data sets, ranked among the ten most central nodes. In the two remaining data sets, the guest account ranked 13th in the board "Fun forum" of the earlier period and 14th in the boards "Politics and society" of the later period. Since these two instances occur in different time periods, a chance effect is assumed. Figure 3.3 shows the frequency of the guest account occupying the first ten ranks in the 14 data sets of the investigated discussion boards.
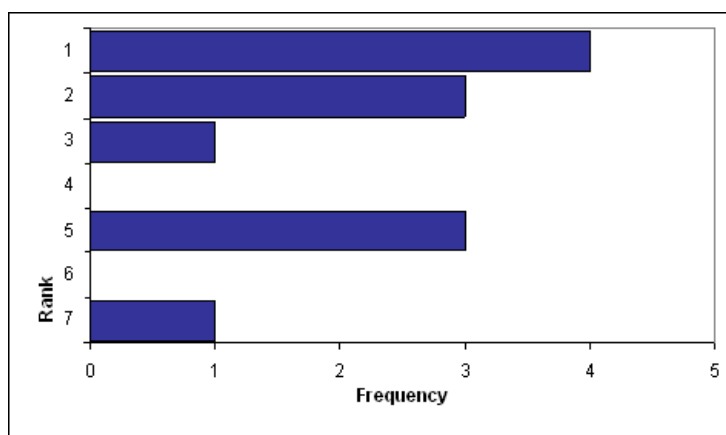
Figure 3.3: Frequency of the guest account occupying one of the first ten ranks of degree centrality in all discussion boards.

In addition, the influence of context factors, such as the number of members or discussion threads in a board, on the outdegree centrality of the guest account was considered. For this, the rank of the guest account in a board was correlated to the number of active users and to the number of discussion threads in the board, respectively. As a nonparametric method, Kendall's τ (Kendall, 1938) was used as a measure of the correlation. Both correlations proved insignificant: The correlation between the rank of the guest account and the number of active users is not significant, Kendall's $\tau = .095$, *ns*. Also, Kendall's $\tau = -.012$ did not reach significance for the correlation of the guest account rank and the number of discussed threads. Thus, it can be assumed that the guest account is generally a very active node irrespective of the amount of users or topics on a discussion board.

In a second step, the overall activity in all investigated boards and time periods is to be compared. However, as every data set contains a different amount of threads (see tables 3.2 and 3.3), the outdegree scores cannot be compared. Therefore, the comparison was based on the ranks of outdegree and the average rank of each actor over the 14 data sets was computed. For this, the sum of the ranks an actor has on the single data sets was divided by the number of ranks he has. In this way, the overall activity of the actors on the investigated seven discussion boards in both time periods can be compared. From the distribution of the averaged ranks over all boards, the guest account proved to be the most central node in the 14 investigated data sets of the discussion boards in general. The guest account has an average rank of outdegree centrality of 4.46 compared to the mean average

User ID	Average rank
0	4,46
273	5,29
122	5,71
1828	7,96
766	12,61
264	14,50
134	14,93
357	17,93
1299	18,75
2294	21,11

Table 3.4: Average rank of the ten highest ranked actors of the average outdegree centrality over all boards

rank of all users of 194. The average rank of the ten most central actors is shown in table 3.4. Thus, the first hypothesis H_1 is supported.

3.2.1.5   Analysis of the eigensystems

The second hypothesis predicted a change of the structure of the social network due to the guest account in at least one of the discussion boards. An approach to capture the influence of an actor on a social network is to compare the relevant measure computed with and without this actor in the social network (cf. Everett and Borgatti, 2008). Accordingly, the change is assessed by comparing the structure of the social networks of each discussion board with and without the guest account.

The structure of the social networks is conceptualized here as the main communication patterns. In order to detect the main communication patterns in the discussion boards, first, the eigensystem is computed for each data set following equation 3.2 after Hoser and Geyer-Schulz (2005). For the analysis of the eigensystem, the matrices of the original affiliation networks A with j rows and k columns were rebuilt as quadratic matrices of the dimension $j + k$ adding the complex-valued component i and transformed to hermitian matrices H by

$$H = \begin{pmatrix} 0_{j*j} & A_{j*k} \\ iA^t_{k*j} & 0_{k*k} \end{pmatrix} e^{-i\pi/4} \tag{3.2}$$

For the matrices H_n, the correspondings eigensystems were calculated (Hoser and Geyer-Schulz, 2005).

In a second step, nodes with similar behavior, i.e. actors contributing to the same threads, are identified and grouped through the clustering algorithm of Hoser and Schröder (2007). The thus established clusters can be seen as the principal communication groups in the network. Therefor, a matrix R is built with the positive eigenvalues $\lambda_1^+, \lambda_2^+, \ldots, \lambda_l^+$ and their corresponding normalized eigenvectors $x_1^+, x_2^+, \ldots, x_l^+$ as in equation 3.3.

$$R_{n \times l} = \begin{pmatrix} \lambda_1^+ x_{11}^+ & \ldots & \lambda_l^+ x_{l1}^+ \\ & \vdots & \\ \lambda_1^+ x_{1n}^+, & \ldots & \lambda_l^+ x_{ln}^+ \end{pmatrix} \tag{3.3}$$

By matrix multiplication with the corresponding complex conjugated transposed matrix results the inner product matrix $S_{n \times n} = RR^*$. This matrix conveys the similarity between every two actors in the l-dimensional subspace spanned by the eigenvectors of the positive eigenvalues. The subspaces can be seen as the communicational subpatterns in which the nodes show similar behavior. The cells convey the similarity between the node of the row and the node of the column. Thus, each row represents the similarity of one node a_i to all other nodes a_n, in turn. On this matrix the nodes are clustered according to their similarity in the following way: in each row representing the similarity of one node a_i to all other nodes, the maximum of the real part of all row values is selected and consequently, a_i is assigned to the node represented by the corresponding column. Thus, a cluster results from all the nodes with their maximum row value in the same column. If the maximum row value is the diagonal value, the node is assigned to itself and constitutes a cluster anchor.

In this way, the clustering procedure classifies every actor either as relating to another actor who is very similar in his behavior, but overall more relevant, or as dissimilar to all others and therefore building a cluster on its own without relation to other actors (for further details see Hoser and Schröder, 2007). With regard to the discussion boards, the group membership indicates actors which were involved in similar discussion threads, respectively, threads which attracted the same actors. Because the algorithm relates all similar nodes to the most central node of the group, the node anchoring a cluster denotes the most influential node, either actor or thread, of that group.

In order to detect a change due to the guest account, the eigensystems and subsequently the clustering procedure are computed twice for each network, once including and once excluding the guest account. The structure is compared on the basis of the resulting clusters. The comparison includes two features, namely the rank order of the first five clusters which results from the general relevance of the cluster anchor and the size of the first cluster, i.e. the amount of nodes it contains. The analysis was limited in this way in order to conduct a rather conservative test which considers only the main communication groups in the networks represented by the first clusters. All pairs of networks were compared on both features.

Regarding each feature, a criterium for determining change was established. A substantial change is assumed if one of the two following criteria is met: the rank of at least one of the first five clusters changes at least three positions or the size of the first cluster changes at least in the magnitude of 35%. For the networks that are thus found to be influenced, the resulting changes after removing the guest account are depicted in table 3.5 while the results for the unaffected networks are reported in table 3.6.

Table 3.5 shows the changes in rank order of the first five clusters and in the size of the first cluster after removing the guest account. Changes which meet the criteria are written in bold. The data sets of the earlier period are labeled with the Roman numeral **I** and respectively those of the later period with **II**. The table shows the cluster rank order without the guest account using the ranks of the network with the guest account, i.e. in the network with the guest account the clusters are ranked and then the ranks are ordered

Network	Rank order	Rank GA	Size of 1st cluster
New at the University I	1, new, 4, new, 5	2	**53%**
New at the University II	**3, 5, 4, 2, 7**	1	100%
Politics and Society I	**1, 3, 4, 6, 8**	2	93%
Technics I	**3, 4, 5, 1, 6**	2	109%
Off-Topic I	1, 3, 4, 5, 6	2	**45%**
Off-Topic II	1, 3, 4, 5, 6	2	**61%**

Table 3.5: The differences in the rank order of the first five clusters and in the size of the first cluster after removing the guest account. Rank GA: rank of the guest account.

in the ranking order of the network without the guest account. Thus, a change is seen by unsorted numbering. If new clusters are established in the network without the guest account, they are labeled as "new" instead of a rank, e.g. in the network "New at the University I", 70% of all cluster anchors change after removing the guest account. If the guest account anchors a cluster, the rank of this cluster is shown in the column guest account. The right-most column reports the change in the size of the first cluster as the percentage of the same cluster in the network with the guest account.

Network	Rank order	Rank GA	Size of 1st cluster
University politics I	1, 2, 3, new, 4	6	115%
University politics II	1, new, new, new, 5	2	102%
University misc.I	1, 2, 3, 4, 5	–	99%
University misc.II	1, 2, 3, 4, 6	5	108%
Politics and society II	1, 2, 3, 4, 5	16	103%
Technics II	1, 2, 3, 4, 5	8	106%
Fun Forum I	1, 2, 3, 4, 6	–	95%
Fun Forum II	1, 2, 3, new, new	–	98%

Table 3.6: The differences in the rank order of the first five clusters and in the size of the first cluster after removing the guest account. "Rank order" depicts the cluster rank order without the guest account using the ranks of the network with the guest account. "Rank GA" states the rank of the cluster which the guest account anchors, if applicable. The cluster size of the first cluster is listed as the percentage of the same cluster in the network with the guest account.

In the comparison of the network structure of all 14 data sets of the discussion boards, the rank order of the clusters or the cluster size of the first cluster changes according to the established criteria after removing the guest account in six of the 14 networks. Specifically, changes are found in the following data sets of the discussion boards: in the boards "New at the university" and "Off-topic" in both of the investigated time periods and also in the board "politics and society" and "Technics" in the earlier time period. The remaining eight boards were found unaffected according to the criteria. These were both time periods of the boards "University politics", "Fun forum", and "University miscellaneous" as well as the board "Politics and Society" and the board "Technics" in the later period. The formation of three new clusters in the board "University politics II" may point to an influence of the guest account as well. Thus, the guest account changes the structure of the social network of six discussion boards and, consequently, H_2 is supported.

3.2.1.6   Discussion

In this field study, the influence of a fake hub on the structure of social networks was investigated on the example of the guest account in a discussion forum. The guest account on the discussion forum is regarded as a fake hub due to an effect of the technical framework allowing all persons to contribute without logging in on the website. In contrast, on SNSs fake hubs may occur when the creation of a profile is not restricted to natural persons which is an instance of the regulatory framework. Although, the centralities of fake hubs are undue because of different reasons on discussion fora and SNSs, their effect on the structure of the social networks can be assumed to be analogous. As effects, it was hypothesized that the guest account is the most central node in the social networks and, furthermore, that its node can potentially alter the network structure.

Regarding the first hypothesis, the guest account was posited to be the most active user in the discussion forum because a multitude of persons contribute to its activity. This hypothesis was supported in the investigated discussion boards since the guest account occupied the highest average rank of outdegree centrality over all investigated discussion boards and is therefore shown to be the most active node. This effect proved to be independent of the size of the social network, i.e. the number of actors involved and the number of threads. The continuing and widespread activity of the guest account is the basis for its potential to influence the network structure.

The second hypothesis assumed that the guest account can alter the structure of the social network. This was determined by comparing the structure of the clusters of the social networks with and without the guest account. As structural features, the rank order of the first five clusters as well as the size of the first cluster representing the main communication groups were compared. Changes meeting the established criteria were found on six of the 14 investigated social networks which supported the second hypothesis. As eigenvector centrality which is derived from the eigensystems is a recursive algorithm, the strength of a node is dependent on the strength of its connected nodes. The undue excessive strength of the fake hub which was here the guest account exaggerates the strength of those connected with it and thus introduces bias in the network structure. This biasing effect of a fake hub can be assumed for SNSs analogously.

Almost half of the studied social networks have been found to be affected by the influence of the fake hub. This suggests that the effect is not a single or chance incident, but indicates rather a systematic influence which may occur in a wide range of networks. A limit to this conclusion lies in the size of the social networks investigated here because they are rather small compared to common data sets of Internet applications with millions of nodes. However, it may be assumed that also the fake hubs are accordingly more central.

However, in eight of the networks no influence could be detected which raises the question if there are structural attributes such as centralization of the network which make networks more robust against the influence of a fake hub than others or on the other hand, influence factors which could predict a probable influence. Next to validating the effect concerning SNSs, further research could thus explore which structural or also sociological factors moderate the influence of the fake hub on the social network.

3.2.1.7   Summary

In this section, a field study investigating the effects of a fake hub on the structure of a social network was described. The field study was conducted on a discussion forum studying its guest account as an instance of a fake hub. Because the guest account allows many persons to contribute to the ongoing discussions on the forum and these contributions are all written into the database using one user account, the guest account collects unduly many contributions which were modeled as ties in the social network. Therefore, it is considered as a fake hub.

It was shown that the fake hub turns out to be the most central node in the network and, furthermore, changes the structure of six of the social networks as investigated by analyzing the rank order and sizes of the clusters in the social networks. This effect can lead to a bias in the results of a social network analysis.

3.2.2   Field study on the effect of linking costs on the number of realized links

While in the last section, the influence of the technical framework on the composition of actors was investigated, this section deals with the technical impact on the links. The influence of the technical feature of the required effort for the link creation, termed linking costs, on the establishment of ties is studied. The effect of linking costs is investigated by comparing the sizes of the personal networks on two SNSs with different processes for the link creation. Although the structure of different SNSs has been studied (e.g. Fu et al., 2008) and also compared to that of the network of the Internet in general (Mislove et al., 2007), the various SNSs have not been compared to each other on aspects which impact on the structure of their social networks.

In the next part, the process of establishing a link on SNSs and differences therein is briefly recapitulated. The investigated SNSs and the link creation on them are explained in particular and the hypothesis derived. Next, the sampling procedure as well as the result of the analysis are described. Lastly, the results are discussed and the section summarized.

3.2.2.1   The effect of linking costs

The basic procedure to establish a new tie on a SNSs involves the request of one actor to another to be added as a contact and subsequently, the acceptance of the recipient (see also Section 2.2.1). On the SNS, the request can be initiated by clicking on a corresponding button of the profile to be added and confirming the action in a next step, possibly with a message to the recipient. The link request is delivered by the SNS to the recipient who then decides on accepting or declining the request. In case of an acceptance, both users are added to each other's contact list.

The technical framework of SNSs determines the process of the link establishment, i.e. whom a user can contact and what actions are required for it. Therefore, it also defines the differences between them in the implied linking costs. Next to SNSs employing the basic procedure described above, others restrict the contacting possibilities or make it more difficult in several ways, e.g. to protect users from unsolicited or dubious link requests. The access to others may be restricted only for the function of requesting links or also for other communication channels on the SNS, such as the message function, since

on these channels the user can be contacted as well. For instance, on the university focused Facebook[12], users can only see other users in the same university which they stated themselves. Other SNS require users to enter the email address of the recipient of the link request. As an alternative to full restriction, the SNS can limit the number of pending requests, i.e. sent link requests which have not been answered, yet. Also a required message in which the requesting user should state his motivation for the link request implies more effort than simply clicking on a button and may therefore act slightly restrictive.

Compared to the basic process of clicking on the corresponding button, all the presented alternatives involve more effort for sending a link request. This effort for establishing a link on a SNSs is called the linking costs which vary depending on the requirements on the SNSs. The linking costs represent communication costs for the contact initiation and can thus be regarded as transaction costs. According to transaction cost theory, persons seek to minimize transaction costs (Coase, 1960; Williamson, 1981; Picot et al., 1999) as they reduce their utility, and persons therefore behave cost-sensitive. Thus, on SNSs with higher linking costs, such as a limit on pending introductions, users will assumably choose their links or requests for links more carefully than otherwise. Thus, due to the difference in linking costs, it is expected that people maintain smaller personal networks, i.e. have less links to others, on SNSs with higher linking costs.

H_1 : *The size of personal networks on a SNS with higher linking costs is smaller than on one with lower linking costs.*

3.2.2.2   The investigated social networks sites

In the conducted field study, two SNSs with differing linking costs are compared with respect to the size of the personal networks that their users accumulate.

As an example of a SNS with high linking costs, the business focused SNS Linkedin[13] was selected. Linkedin employs a "gated-access-approach" denoting that, for linking purposes, a user can directly contact any member he already knows, proving that by stating the other's email address. In order to establish a link to a yet unknown member, he has to be introduced by someone of his own personal network to that member. If no one in his own social network (consisting of direct contacts, their contacts and again their contacts, i.e. all persons up to the 3rd degree) knows the aimed-for person directly, the introduction may be passed on through direct contacts until it reaches its destination. Thus, the process mirrors the relationship establishment in the real world. Furthermore, each user possesses only a limited number of allowed pending introductions as well as messages to send to other users depending on the subscribed usage package. Although this restraint is actually a regulatory one, it is technically enforced. Consequently, the linking costs are rather high on Linkedin.

In contrast, the linking costs on the leisure oriented SNS Friendster[14] are lower. Similar to Linkedin, adding a profile to one's friends list on Friendster requires the email address or last name of that contact, however, every member can be contacted via the messaging facilities. Hence, the linking costs on Friendster are comparatively lower.

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[12]www.facebook.com
[13]www.linkedin.com
[14]www.friendster.com

Both SNSs originate in the US. Thus, althoug they have a different focus regarding their mission statement, effects due to different national cultures are not expected.

Sampling procedure. The number of links in the contact list constitutes the size of the personal network of that user. In order to compare the number of links that profiles list on average, 50 profiles of each site were randomly sampled and the number of links listed on each was saved to a database. Because both sites originate in the U.S., the sample was limited to persons living there. Of both sites, 25 profiles of male and female subjects each were sampled. Because the search algorithms of the SNSs could differ, and therefore introduce bias, all profiles were collected using Google. The profiles were sampled by first name using the distribution of the most frequent first names from the last US-census (U.S. Census Bureau, 2005). Thus, a google search of the form "site:www.(friendster/linkedin).com profile firstname" was conducted for each name to be sampled and a profile randomly chosen among the first 200 hyperlinks returned. If the sampled hyperlink did not lead to a profile or led to a non-american profile, the next link was taken. Since, except for the number of personal contacts, no variables of the generic profiles on LinkedIn and Friendster match, no further analysis of comparability of the two groups could be undertaken.

3.2.2.3   Results

The average number of contacts of members of Linkedin is 15.46 (std. = 39.98) while members of Friendster list on average 81.96 contacts (std. = 146.58, see figure reflinks). As in the last section, the nonparametric Mann-Whitney U statistic was used to test the difference because the number of links is not normally distributed. The difference is highly significant with a Mann-Whitney of $U = 456$, *.000*. Thus, the hypothesis is supported indicating that the size of personal networks is smaller on SNSs with higher linking costs than on those with lower linking costs.
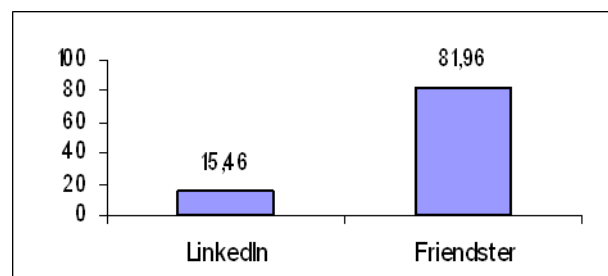
Figure 3.4: The average size of personal networks of profiles on the respective SNS.

3.2.2.4   Discussion

The result supports the assumption that the linking costs have a limiting effect on the development of ties in a social network. It is tentatively concluded that with higher linking costs fewer network ties are established. It remains to be seen if there is also a qualitative difference between the established links, e.g. if on SNSs with higher linking costs, rather stronger or personally known contacts are displayed. However, this field study has several limitations: the sample size was rather small and the SNSs compared also differ in their

focus which might lead to a different culture (Hargittai, 2008). The culture on a SNS may also influence the linking costs. When stating one's motivation for the link request is a common behavior and therefore expected, for example. Although these limitations may restrict the validity of the interpretation, the difference found in the size of the personal network warrants further research. In conclusion, the technical framework of SNSs may influence the density of the network.

3.2.2.5   Summary

In summary, after detailing the processes of link creation on various SNSs, the different linking costs that they entail have been shown. Since linking costs can be considered as transaction costs for the establishment of a link, it was posited that persons behave cost-sensitive and consequently seek fewer links on SNS with higher linking costs. This hypothesis was investigated in a small field study.

The field study supports the assumption that the linking costs influence the number of ties that people establish on SNSs and thus also the density of the resulting social network. Although the conclusion can only be drawn tentatively due to the limitations, e.g. in sample size, the empirical results confirm the theoretical predictions (see also Section 3.1.2.1). Therefore, they warrant further research of the effects of the technical framework of SNSs on the characteristics of the resulting social network before personal networks can be compared across different SNSs.

3.2.3   Survey study on the meaning of SNS data

The explicit intent of SNSs is to support both the meeting of new persons and the maintenance of relationships (see Section 2.2). Due to their growing popularity, SNSs increasingly attract academic as well as commercial interests. As has been detailed in Section 3.1.3, the accounts of the experiences and benefits of SNSs have been inconsistent. Up to now, the semantics of the data which constitutes the necessary basis for further inferences (Section 2.3) have not been established. The diverse accounts raise several questions as to what the data of SNSs essentially represents. In particular, the questions regarding the tie strength and the underlying motivations as well as potentially absent ties have been raised. In order to answer them, various indicators such as the size of the personal networks on the SNS and their composition, the motivations for the establishment of new links and the development of these new ties were examined in a survey study on one SNS, namely Xing. This section provides the results of this study.

In the following, SNSs are classified as a form of computer-mediated communication and related work is introduced. Subsequently, the research questions are developed on the basis of the existing literature. The studied SNS is introduced in the next part followed by the description of the questionnaire, sampling procedure and sample. Finally, the results are presented and discussed taking up the initially raised issue of the meaning of ties.

3.2.3.1   SNSs as form of computer-mediated communication

SNS can be classified as applications of the Web 2.0 (O'Reilly, 2005). In more general terms, they are a form of computer-mediated communication (cmc). The social use of cmc has been studied from the very beginning of computer use (Hiltz and Turoff, 1978;

Rice and Love, 1987) and since then a large body of research has accumulated (for a review see Parks and Floyd, 1996; Bargh and McKenna, 2004). Early theories compared computer-mediated to face-to-face communication and focused on the deficits (Sproull and Kiesler, 1986), but studies showing social content soon rebutted them (Rice and Love, 1987, e.g). Consequently, newer approaches have turned their attention to how the Internet has changed our live and differentiated between different online services. In general, the widespread Internet use has led to more communication with all and, specifically, with distant ties as well as to an overall larger number of ties maintained. However, the use of most communication channels is influenced by distance (Mok and Wellman, 2007). The distance effect does not affect instant messaging (IM)[15] which is by now the most common communication tool of university students who use it more frequently than offline communication (ftf and telephone) and email (Quan-Haase, 2007). Contrary to the assumed generation gap regarding Internet use, the students use IM with both friends and relatives. In a different vein, di Gennaro and Dutton (2007) investigated how different online contexts affect the formation of relationships. In some contexts, finding new friends seems to be the norm (e.g. on MOOs, Parks and Roberts, 1998) whereas in others, e.g. newsgroups, the occurrence is not as ubiquitous (Parks and Floyd, 1996).

SNS, in particular, have only very recently received the attention of scientists (see discussion in section 2.2). They make the process of data collection of social networks very easy by posing "rich sources of naturalistic behavioral data" (boyd and Ellison, 2007). Recent studies show that the maintenance of a profile on a SNS is very popular among college students (Ellison et al., 2007; Gross et al., 2005; Lenhart and Madden, 2007a,b; Hargittai, 2008). With regard to the interaction on SNSs and the motivations of its use, the findings vary: while some studies point out that the use of SNSs is directed toward existing relationships (Ellison et al., 2007; Lenhart and Madden, 2007a), other accounts show that meeting new people or "browsing" profiles is common as well (Acquisti and Gross, 2006). This ambiguity is mirrored on the motivational side as well: while some members of SNSs simply want to stay in contact with friends, others collect as many links as possible (Donath and boyd, 2004), e.g. in order to gain status (see in detail Section 2.2.4).

Although all links are listed equally on the contact lists of the profiles, not all ties are alike. This becomes apparent by comparing a user who links to his friends on the SNS to keep in contact with a user who collects ties (indifferently) as a status symbol. In the former case, the ties represented by the links can be assumed to be stronger than in the latter case. Also in real life, some of our contacts are close to us or we spend a lot of time with them while others we see less frequently. This difference was conceptualized in the field of SNA as the strength of a tie (Granovetter, 1973) consisting of the dimensions of time, emotional intensity, intimacy and reciprocity. To recapitulate, strong ties are usually assumed between friends and relatives as well as for ties of mutual choice (Petróczi et al., 2007). Work colleagues, acquaintances, and friends of friends, are seen as weak ties. Granovetter (1973) also defined a third "state" of a tie, the absent tie representing the lack of a relationship, but also ties lacking significance.

The above mentioned studies provide a first insight, however, a consistent picture is lacking. Using the concept of tie strength, the links displayed on SNSs can be described more specifically. In order to gain a comprehensive understanding, the motivations and

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[15]IM is a form of real-time communication between two or more people based on the exchange of text messages online through a software application.

usage patterns of members of a SNS are investigated. Therefor, several research questions are developed in the following.

3.2.3.2   Research questions

What is displayed on SNS? This question targets the composition and size of the personal networks displayed in the contact lists. The composition refers to the types of ties constituting the personal network on the SNS and can be compared to the composition of the real life personal network. Conceivably, the contact lists on SNSs are a complete image of the real life social networks of persons or they contain little overlap. The different types of ties are also a measure of the strength of these ties as they are an indicator for the dimension of closeness, e.g. family and friends can thus be considered as strong ties while aquaintances or reactivated contacts may rather point to weak ties. Regarding the number of links, the size of complete personal networks in real life has been estimated ranging from 150 up to 5000 (cf. Hill and Dunbar, 2003).

However, social networks in the virtual world have properties of their own which affect the size as well as the composition. For example, one cannot lose contact on a SNS because the system preserves all relationship links until the user actively deletes them. Hence, the natural decay process of a connection which can take place in real life is not operative on SNSs. This assumably leads to monotonously growing personal networks. Consistently, contact lists of several thousands can be observed easily on SNS. Hence, it could be expected that the size of the social networks is at the high end of the estimated range.

The absent decay process may also affect the composition of the personal networks resulting in ties which are very weak or actually absent when compared to real life because in real life personal networks these ties would have decayed and dropped out. Furthermore, a complete overlap with the real life social networks is not to be expected because people meet new persons online, and also because presumably not all of one's contacts maintain a profile. According to the assumed generation gap (cf. Quan-Haase, 2007), especially older generations may not be members of SNSs. Thus, the types of connections, e.g. friends, family, work colleagues, acquaintances, making up the contact lists are investigated.

How do users perceive links between other persons? This question captures the informational content of the connections displayed. If users add others indiscriminately to their contact list as described in the press, a link would not indicate a meaningful relationship and would lose its function to discriminate between a connection and none (Donath and boyd, 2004). Drawing from the concepts of tie strength, the perceived information of a link includes the dimensions of closeness and relationship context because established links are already reciprocal by process of link generation. On the first dimension, different degrees of closeness, e.g. *knowing each other via cmc*, *having met*, or *having frequent contact*, could be inferred. Contexts of the relationship include work, university, leisure, or loose acquaintances without shared context. The cost of establishing a link influences its reliability (Donath, 2007). On the SNS investigated here, a link request is posed by clicking on a button on the other's profile. Although the receiver's confirmation is necessary for the link creation, the costs of its establishment can be considered low. Hence, the information the bidirectional, yet "cheap" links contain for the users is examined.

How often do people establish new relationships on SNS? Whether and under what conditions people form new relationships online has been intensely debated since the start of Internet adoption. With new online applications arising constantly, this issue still receives widespread attention (di Gennaro and Dutton, 2007; boyd and Ellison, 2007). Previously, forming new relationships online has not been regarded as common. Theories of cmc, e.g. 'cues filtered out' theory (Sproull and Kiesler, 1986) or social presence theory (Rice and Love, 1987), focused on the perceived deficiences such as anonymity and the lack of non-verbal cues. For these reasons, as well as missing physical propinquity, severe doubts as to the social affordance of the Internet and its potential for forming new relationships were raised. Yet, studies consistently showed the usage of diverse online services to maintain and establish social relationships (Bargh and McKenna, 2004; Boase and Wellman, 2006; McKenna et al., 2002; Parks and Floyd, 1996; Parks and Roberts, 1998; Rice and Love, 1987) demonstrating that "cyberspace is just another place to meet" (Parks and Roberts, 1998, p. 94). Research from various online contexts provides frequencies ranging from 20% of people establishing new relationships to almost 94% of MOO-users[16] (di Gennaro and Dutton, 2007; Parks and Roberts, 1998). In comparison to other applications, SNSs can be regarded as rich online contexts: the profiles of SNS include information about a person's social context, depending on the focus of the SNS pastimes or professional position. Furthermore, on most SNS, a personal picture is to be included which portrays the physical appearance. Thus, relationship formation could be expected to be common.

Why are links to unknown persons sought and accepted and by whom? In contrast to other online environments where relationships develop gradually and are subject to definition of both sides, on SNS establishing a link is an explicit gesture. After the affirmation, the link is by default publicly visible on the contact lists of both profiles linked. With regard to creating links to unknown others, i.e. establishing new relationships, the question about intent arises. In most SNSs, this is a two-sided process consisting of a request and the confirmation thereto, consequently, motivations on each side are explored.

On the requesting side, for some persons accumulating "friends" seems to be an end in itself (Donath and boyd, 2004). SNS also introduce members randomly on the entry pages, therefore seeing a profile by chance could motivate a contact request. More traditionally, requesting a link originates in an interesting clue about a person. Such clues could be:

- Searching for somebody with specific attributes, e.g. same interests.

- Searching for that person specifically because of having read or heard something about him/her.

- Having had cmc contact in a social function on the SNS, e.g. on a discussion forum or guestbook.

- Having seen the other in a contact's contact list.

- Being virtually introduced to one another by a third person.

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[16]abbrev. for Multi-User Dimensions, Object Oriented, which are real-time text-based virtual environments for entertainment purposes.

The receiving side can confirm or decline the request. The link is only established in the first case and consequently only reciprocated links are shown in SNSs. Therefore, only this case is included in the survey. Previous research has shown that complying with a request may be caused by the wish to avoid to offend the other with a refusal (boyd, 2006; Fono and Raynes-Goldie, 2006). Also, complying could be due to an appealing phrasing of the request or an interesting profile. Furthermore, a sense of carelessness is conceivable as is uncertainty about knowing the other. The different reasons for seeking and accepting links may also indicate the strength of the new ties, e.g. accepting links out of compliance or carelessness may be considered as a sign of an established tie which is rather absent whereas the interest sparked by the request or the profile suggests a weak tie strength.

Finally, the **continuation of new relationships** is of interest. Two lines of research have been explored: migration of relationships to other communication channels and the developed tie strength. The use of other communication channels has been consistently observed indicating a natural development (Boase and Wellman, 2006; di Gennaro and Dutton, 2007; McKenna et al., 2002; Parks and Floyd, 1996; Parks and Roberts, 1998). Therefore, we focus on the strength of the relationship. Most relationships formed online are weak ties according to subjective appraisals (Parks and Floyd, 1996; Petróczi et al., 2007) which can be assumed for SNSs analogously. Furthermore, when asked about contact frequency, newsgroup users reported communicating weekly for over half of the new relationships and more than weekly for almost a third (Parks and Floyd, 1996). The tie strength developed in SNS relationships with previously unknown persons is investigated here using the contact frequency as indicator.

3.2.3.3   The studied SNS

Xing is a German business focused SNS founded in 2003 and, until the end of 2006, known as openBC. It's mission is to "bring people together" (Hinrichs, 2005) by facilitating the meeting of new persons and supporting the management of one's social network. As of September 2007, it counted 2.65 million users (Heise, 2007). The Internet platform offers a free basic service and a premium service for a (small) monthly fee which provides users more functions mostly for searching and contacting others. To become a member, users create a personal profile stating their occupation and current as well as former companies. Further details include what is sought and offered on the SNS (e.g. knowledge sharing), interests, attended universities, and languages spoken. Including a personal picture is encouraged. By default, this information along with the number and list of all contacts, affiliations in discussion groups, and activity meter is shown in the public profile (an exemplary profile is shown in section 2.2.1, figure 2.2). The display can be regulated with the privacy settings. Further personal data, e.g. business and private contact information as well as birthday, can be stated in the contact section. The personal data is only visible to direct contacts after the permission given when adding someone as a contact. The users can decide for each established contact which personal information to display, e.g. business address, private address, phone, email, etc.

The users establish links to others by sending and receiving requests to add the other to the contact list which forms the social network. To assist in expanding the online social network, Xing offers to compare users' address books of other applications with its

database. Alternatively, the search options include parameters for all public profile data. There are also defined searches, e.g. all persons viewing the own profile or all contacts of one's current organization or former university. Xing visualizes all possible network paths from the own profile to that of unconnected persons on the other profile. A very detailed description and sociological discussion of the various features of openBC, the predecessor of Xing, can be found in Renz (2007).

Several functions support the management of the network. Users can "tag" their contacts and order them by the tags. Further functions include a birthday reminder and a message service. Regarding the more distant social network, it is possible to display or search within all second step contacts, i.e. contacts of contacts. Supporting the core function of managing and expanding the social network, there are groups of discussion fora for communication and information exchange and the possibility to announce public events and job offers.

Using the features of SNSs as technical environment (see Section 2.2.2), Xing can be characterized as follows. With respect to the technical framework, Xing is an open SNS on which every person can create a profile. The design as well as information categories of the profiles are fixed while the visibility can be finely tuned by the user. The linking process is simple without restriction: using a button on the profile of another, the link request can be sent together with an optional message. After the confirmation of the request, the link is established. Hence the linking costs implied by the technical framework are rather low. As to the regulatory framework, profiles are restricted to natural persons which is enforced by the administration. Also, the seriousness of the profile information, e.g. the personal picture, is monitored as has been demonstrated by the example of the upload of a cartoon picture to a profile (Section 3.1.1). As another instance of the regulatory framework regarding the use of the Xing, marketing campaigns via the message function are forbidden. The mission statement classifies Xing as a business focused SNS. Lastly, in light of the business focus, the reliable protrayal of one's professional background is to be expected, culturally. In line with this, interviews showed that persons with too many links are seen as dubious (Renz, 2007).

3.2.3.4   Questionnaire and sample description

The empirical data was collected in fall 2007. Invitations to the online survey were sent out to the second step network of one seed profile in Xing. Because there are few very highly connected nodes in a network, these might be underrepresented or not sampled at all in a random sampling design for the social network. Therefore, this form of a snowball design was chosen. It is to be noted that many problems previously associated with snowball samples are not inherent in data collected from the Internet, such as bias towards cooperative subjects, nonresponse, or response bias, e.g. forgetting weak ties (Erickson, 1979; Johnson et al., 1989), because all available data is collected and does not rely on the cooperation respectively on the report of individuals. Due to technical restraints on Xing, sampling was two-fold: an email was sent to all of 11% of the second step network (referred to as "full sample") while a random sample was drawn from the remaining network and invited via a message on the SNS ("random sample"). The basic population from which the sample was drawn, i.e. the second step network, is shown in figure 3.5. The figure further depicts the sizes of the first and second step network of the
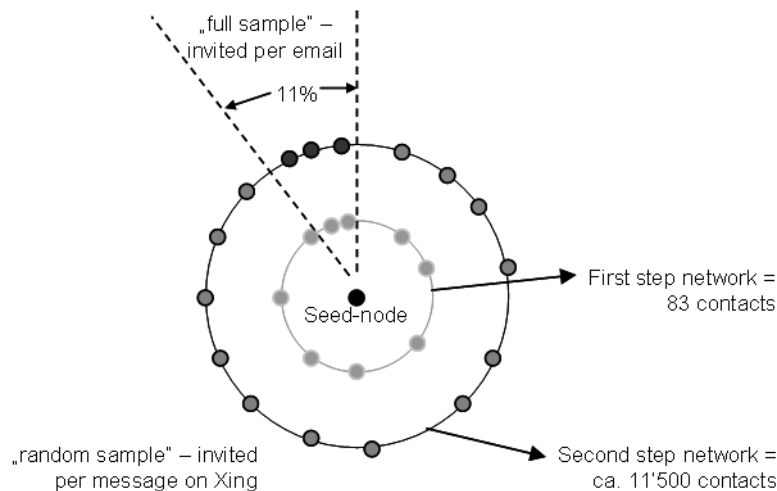
Figure 3.5: Diagram of the 1st and 2nd step network of the seed node with the approximate number of contacts and the proportions of the "random" and the "full" sample.

	Sequence: starts with …	
Sampling	Xing part	Personality part
Full sample		
Random sample		

Table 3.7: The components of the sample of the questionnaire study.

seed node and illustrates the proportions of the two samples drawn by email invitation and message via Xing.

The questionnaire contained also a part on personality attributes. Besides the two sampling procedures, the invitations to the survey were sent with two randomly varying orders of the questionnaire parts concerning SNS use and personal characteristics to avoid ordering effects. On the one hand, the possibility of an ordering effect in the original order starting with the part on the use of Xing seemed likely considering comments of participants of the pilot study. There, participants reported answering the personality items with their contacts listed on Xing in mind. On the other hand however, starting with the part on personality attributes maximizes the time to the individual feedback on personality. It was assumed that this ordering might lead to a higher drop-out rate. As a solution, a random design of both orders was chosen. Thus, the final sample consists of the four subsamples as depicted in table 3.7.

Since the questionnaire included the part on personality attributes, the display of the individual results and feedback concerning these parts was announced in the invitations as incentive. The individual results were displayed for the participants directly following the survey. Participants received their individual score as well as a short interpretation on a range of personality traits[17]. As an example, the feedback concerning the trait of "openness to actions" is depicted exemplarily in figures 3.6 and 3.7 for a person scoring high, respectively low on this trait.

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[17]Further details about the personality part are explained in chapter 4.

Openness to actions

Persons with high scores on this trait report a strong need and willingness to try new activities and behaviors. They prefer new ways and variety over known ways and routine. For instance, they explore more frequently different situations and places, try exotic foods and may test several different hobbies over the years.

Figure 3.6: An example of the feedback for persons scoring higher than average on the personality trait of "openness to actions" which was displayed after the completion of the questionnaire. The point in the bar depicts the relative position of the participant compared to the distribution of the norming sample and the text gives a short explanation.

Openness to actions

Persons with low scores on this trait don't continuously attend new ways, but rather prefer to keep with established ways.
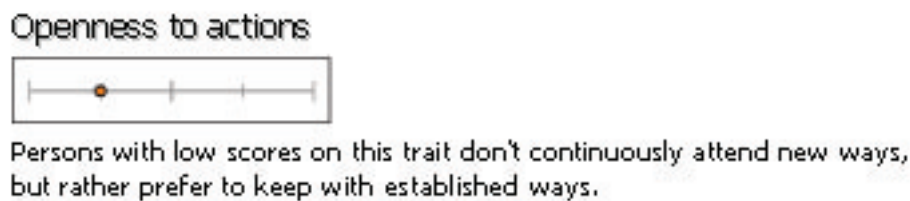
Figure 3.7: An example of the feedback for persons scoring lower than average on the personality trait of "openness to actions" which was displayed after the completion of the questionnaire. The point in the bar depicts the relative position of the participant compared to the distribution of the norming sample and the text gives a short explanation.

The questionnaire   The questionnaire was posed in German because the majority of Xing users are German. It assessed the use of the SNS and was part of a larger online survey including further parts covering motivational and personality attributes which will be described in detail in Section 4.3. In this part covering the use of Xing, participants answered between 15 and 20 questions depending on the applicability of the questions to their use.

Participants were asked to categorize the size of their personal network on the SNS and estimate the respective portions of friends, acquaintances, relatives, colleagues (former and current), reactivated contacts, and those persons they have met only once before. Several questions concerned the perception of the semantics of links regarding closeness of the contact and context. A special part focused on the frequency, reasons for, and outcome of the creation of links to yet unknown persons. After filtering for the addition of contacts personally unknown at the time of establishing the link, 237 (59.55%) participants remained which were asked if they had sent or accepted a contact request before. In case of a positive answer, multiple response items inquired about the reasons which are referred to colloquially as motivations in the questionnaire. Also, the number of connected persons not yet met and the frequency of contact with those were covered. Demographic variables included age, gender, level of education, employment status, Internet experience and affinity. The questionnaire and the online survey application were

tested in a pilot study after which minor changes to the wording of some of the questions were made. The answering option of "others" was omitted because the questions covered either all technical possibilities or the main answering options as none of the participant of the pilot group reported that he missed an answering option that he would have liked. The final questionnaire is shown in appendix A.

Sample characteristics   The sample consists of 409 responses from 1267 invitations sent which corresponds to a response rate of 32.28%. For an Internet questionnaire this response rate can be considered very satisfactory (cf. Deutskens et al., 2004; Kaplowitz et al., 2004). From the responses, eleven were removed because of inconsistencies in their answers resulting in a final sample size of $N = 398$. The responses were tested concerning whether zero personally unknown persons were reported, but inconsistently, the later questions concerning seeking and accepting contact links to unknown others were answered. Due to different drop-out rates in the course of the questionnaire, the sample size may vary between statistical tests and is therefore, reported for each.

Concerning possible differences between the groups of sampling procedures as well as between the groups of questionnaire order, the demographic and individual variables as well as the quantitative variables concerning SNS use were analyzed. Participants of the random sample had a higher amount of unknown persons in their contact lists and posed more contact requests than those of the full sample. With regard to the questionnaire order, it was found that the portion of employed persons was higher in the subsample starting with the personality part of the questionnaire. As these were the only differences, chance effects due to the multiple testing are assumed. The tests of differences in sociodemographic as well as relational variables between the groups of sampling as well as between the questionnaire order groups are listed in appendix B.1.

However, the order of presenting the questionnaire parts showed a significant effect on the drop-out rate from the questionnaire: Participants in the groups being presented the SNS part first dropped out significantly more often with a drop-out rate of 13.33% than those being presented the personality part, initially (4.02%). The descriptive data as well as statistics are also reported in table B.5 in appendix B.2. Thus, the drop-out effect observed is opposite to the one expected. This may be due to the focus on personality in the invitation text. Participants expecting a personality questionnaire might have been disappointed by the questions on the SNS use. As there were no significant differences between the groups regarding any answers of the questionnaire or demographical characteristics, further effects in the data are not assumed.

In the sample, women were slightly underrepresented (25.3%) in comparison to the SNS (26%, Xing AG, 2006). The mean age (31.08 years, std. = 5.3) was slightly lower than on Xing (34 years, Xing AG, 2006). Since these figures are close, the sample can be considered representative in this respect with regard to the users of Xing. Further sociodemographic factors showed a concentration concerning education and employment status. The majority of the participants consisted of people being employed (75.5%). Another 12.9% were freelancers and 11.3% were students. The distribution of the highest professional degree achieved was similarly sloped: 74.4% reported a master degree or diploma (the German equivalent) and an additional 10.3% held a PhD title. Only 12.6% stated high-school graduation as their highest degree and 2.8% the Bachelor degree which is still rather uncommon in Germany. No comparable figures for Xing could be found. An

appraisal of the congruence with statistics of Internet users in Germany in general showed that the distribution with regard to age and education is comparable (Arbeitsgemeinschaft Online-Forschung e.V. (AGOF), 2007; TNS Infratest, 2006). Regarding both, Internet experience and affinity, a ceiling effect occured and participants evaluated themselves very experienced and very interested in the Internet. On the scale ranging from 1 to 5, the mean of Internet experience reached 4.8 (std. = 0.420) and the mean of Internet affinity was 4.56 (std. = .565).

3.2.3.5 Results

The research questions raised before concerning the meaning of the displayed networks as well as concerning the manner of use of the SNS are now addressed in turn.

Composition and size of networks displayed. The composition of the networks results from estimates of the proportions of the respective link categories. The categories are not mutually exclusive, therefore, on average the sum of estimated percentages exceeds 100% and adds up to 144.42% (std.=46,35). Adapted to 100%, networks are composed as shown in figure 3.8. The networks consist mainly of acquaintances (38.04%) and work colleagues (26.45%) as well as, to a lesser extent, of friends (16.48%), and reactivated contacts (11.58%). Persons one has met only once (6.26%) and relatives (1.19%) are negligible.

The composition of the networks is balanced with a focus on weak ties and work connections. The portion of friends is considerable bearing in mind that most people have far fewer friends than acquaintances. The marginal portion of one-time contacts rebuts the preconception that people add others indiscriminately. Acquaintances, colleagues, and friends cover over 80% of the networks.
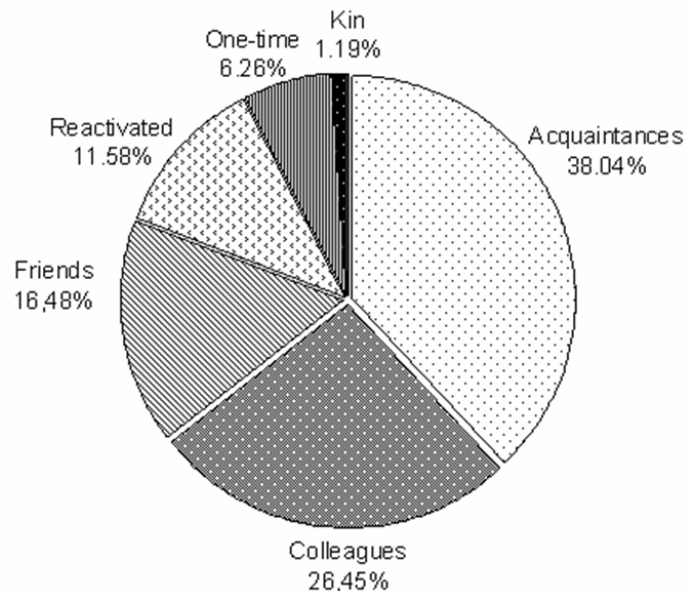
Figure 3.8: Average proportions of tie categories in the networks.

The size of the individual networks follows the common power-law distribution ranging from 5 to 15'874 contacts. On average the contact list includes 180 persons (179.64,

std.=800.26) with the median at 110.5 contacts. Ignoring the far outlier with 15'874 contacts, the amount of contacts ranges to 1194 contacts with a mean of 139.91 contacts and a much lower standard variance of 123.68. Because of the bias, this extreme outlier has been removed in the remaining descriptive statistics. Only 5% have contact lists of more than 350. The distribution of the size of personal networks is depicted in figure 3.9 without the four upper outliers.
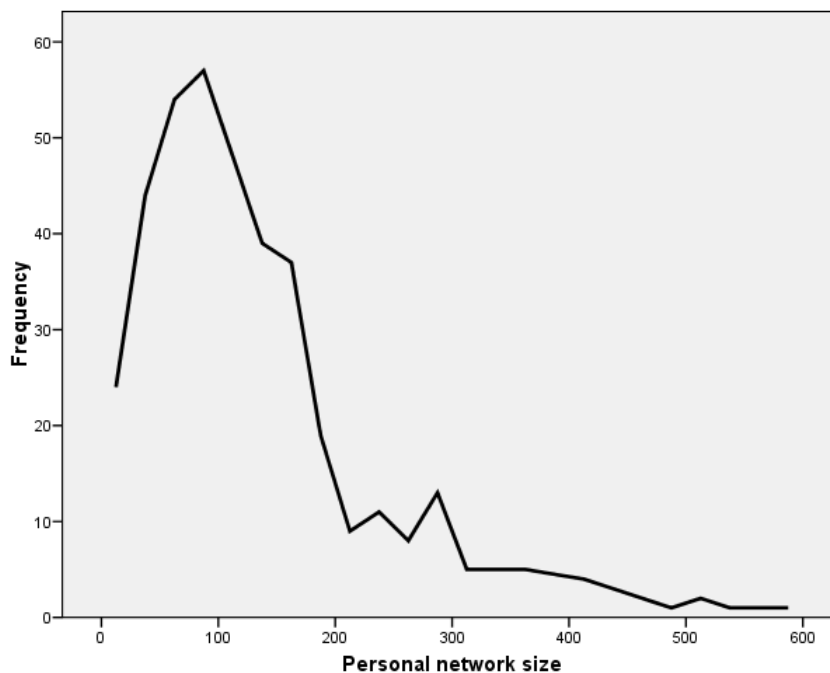
Figure 3.9: Distribution of personal network sizes. For reasons of clarity, the four upper outliers were not included. These had personal network sizes of 699, 888, 1194, and 15'874.

The network sizes found on the leisure-oriented SNS Facebook averaged in two studies at 246 and 272 contacts in the personal network (Tom Tong et al., 2008). Compared to that, the size of the personal network is this study seems small. Furthermore, the network size is compared with estimates of the size of real life personal networks. The median of 110 contacts as well as the average of 140 contacts (corrected for the outlier) are even lower than the average network size of 150 stated by Hill and Dunbar (2003) and far below other estimates of several thousand contacts. Contact lists counting more than 350 can be seen as the exception on SNS. Thus, the expectation of contact numbers in the upper segment of existing estimates of thousands is refuted. Nor does the result support the view that SNS members maintain in general more ties than people in real life (Donath and boyd, 2004). The emphasis on known or even well-known contacts in the composition of personal networks together with the rather small network sizes, suggests a large overlap with peoples' real life network.

User perceptions of displayed links. Users' ratings of the relationship context of profile links between unknown others reveal a clear focus on business related links. Almost half (43.8%) say they expect that the linked persons know each other professionally. A relationship from other contexts is assumed less frequently with nearly equal propor-

tions: private acquaintance (15.1%), former acquaintance (12.1%), acquaintance met only once (11%), fellow (former) students (8.7%). Only the extremes, wanting to get to know the other (5.1%) and friends (4.1%), are assumed as an unlikely background for a link (see also figure 3.10).
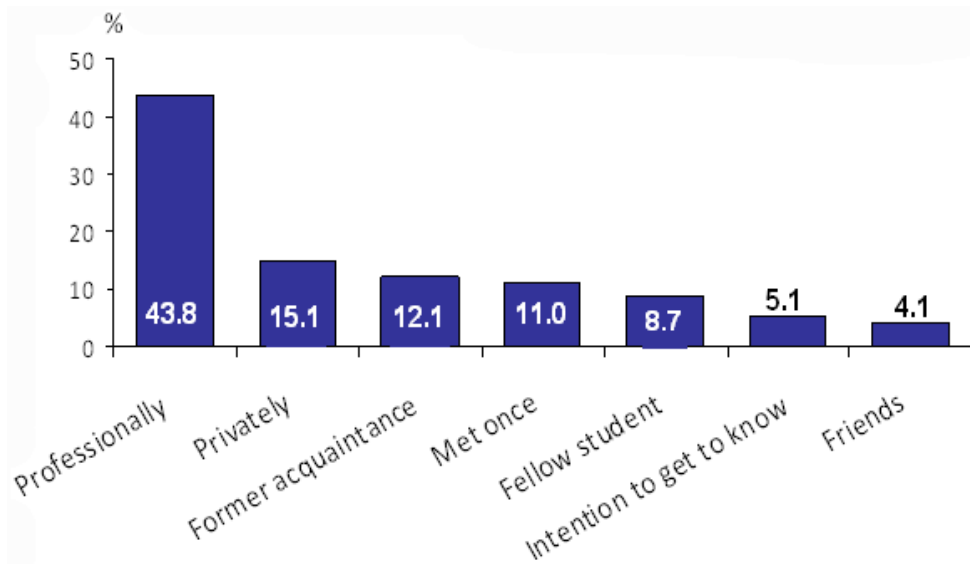
Figure 3.10: Estimations of tie background in percent.

These results are mirrored on the closeness dimension (figure 3.11). Here, users assume that the linked persons have met face to face at least once (41.8%) with a slight tendency towards the weaker end: 36.1% expect a weaker connection, i.e. either cmc-only relationship (32.3%) or none (3.8%), versus 22.1% expecting a stronger relationship, i.e. infrequent (20.3%) or frequent (1.8%) communication. Users clearly perceive a link to imply a face to face acquaintanceship.

Although establishing a link implies low linking costs on this SNS, the information carried on the links consists of a professional, face to face acquaintanceship, however loose. Both extremes, i.e. no relationship at all and a very close relationship as in friendship, are assumed highly unlikely.

Frequency, motivations for, and continuation of new relationships. Over half of the questionnaire participants (59.55%) have added at least one person to their contact list who was personally unknown at the time of the addition. These have added between one and 300 unknown contacts with an average of 12.44 (std. = 26.77)[18]. The median of 5 shows that, for the majority, adding someone unknown is rather the exception than the norm.

For the following tests differentiating between seeking and accepting link requests as well as continuing the contact, only those who have added unknown persons were considered (n = 236). Of these, 101 persons or 42.8% have ever sent a link request to an unknown person. Looking at the motivations (figure 3.12), it is striking that the two most commonly stated reasons for posing a link request point to persons in the requester's second step network, i.e. friends of friends (22.9%) and being introduced (16.5%). Searching for persons, specifically as well as generally, is also a frequently stated motivation:

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[18]Also here, the outlier of 15'874 contacts was omitted in all analyses.
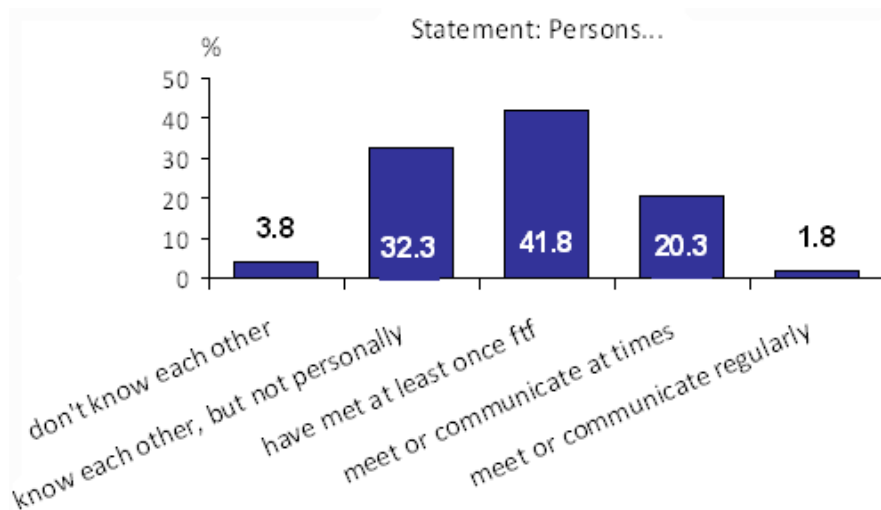
Figure 3.11: Estimation of tie closeness in percent.

searching for a specific person was stated by 15.2% and 14.7% send a link request after a general search. Requesting a link after seeing a profile somewhere appears to occur less frequently according to the agreement rates of the participants: after seeing a profile by chance (11.3%), seeing a profile in a group (9.1%), or in a discussion forum (8.7%). Only the guestbook has almost no effect (1.7%).

Thus, almost 40% of new relationships originate in the extended network while slightly less than 30% start after a search. The remaining categories mirror real life: people "meet" by chance or are drawn together by homophily, e.g. being in the same group or discussing the same topics. The guestbook is shown to have no role in networking.
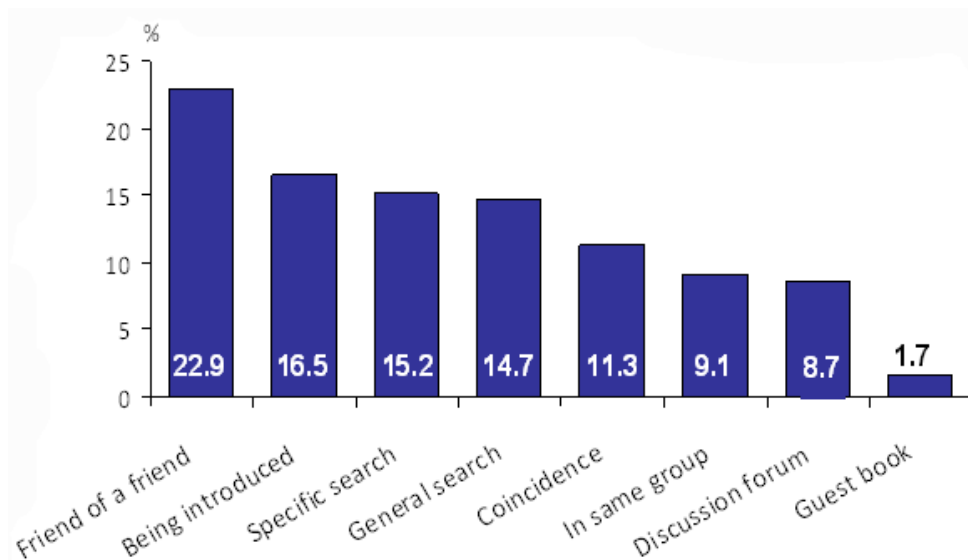
Figure 3.12: Percentages of agreement with different motivations to request a contact link.

While only a moderate portion of users sends requests, nearly all requests are accepted (95.8%) mostly on grounds of an interesting profile (36%) or an appeallingly phrased

request (33.3%). However, one third of participants confirm the request out of reasons unrelated to the requester: a sixth accepts without a reason ("Why not?", 16.5%) and 13% acquiesce in order to avoid a refusal of the request. Uncertainty about knowing the requester is a negligible reason (1.2%, see also figure 3.13). Hence, it appears to be a good investment to maintain an attractive profile and write the request carefully.
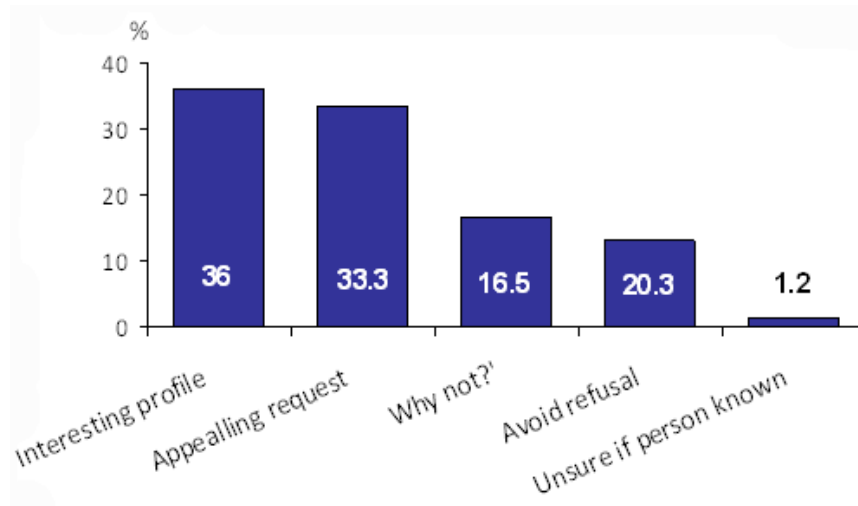
Figure 3.13: Percentages of agreement with different motivations to accept a contact link from an unknown person.

In comparison to the number of unknown persons added, the average of persons personally unknown at the time of the survey is the same with an average of 12.60 (std. = 28.44), again, with a median of 5. The slightly higher average than the average of added unknown persons is due to missing answers. This suggests that most of the online contacts stay in the virtual world and do not lead to face to face meetings. Regarding the frequency of communication over phone, the SNS, or other cmc channels with these contacts, only 4% report communicating monthly or more often. Half of the respondents (51.6%) communicate sometimes with the new contacts while the rest, 44.4%, never communicated with these contacts again. These results are depicted in figure 3.14. Unfortunately, over 40% of the positively answered link requests fail to develop into an even loose relationship, i.e. weak tie, and might also be considered as an absent tie.

3.2.3.6 Discussion

A survey study was conducted in order to examine the inherent meaning of the links on SNSs and therefor identify the intentions and the manner in which people use SNS. For the description of the meaning of ties, two concepts were reviewed in Section 3.1.3, namely tie strength and the motivation to establish the tie. In this survey study, these concepts were operationalized with several questions and are now discussed in light of the results.

Several of the studied research questions target the strength of the ties displayed in the contact lists on this SNS, the composition of the personal networks, the perception of links between others as well as the development of new ties. Regarding the composition of the social networks displayed, several conclusions can be derived. The tie strength of friends and family is commonly regarded as strong (Petróczi et al., 2007), consequently
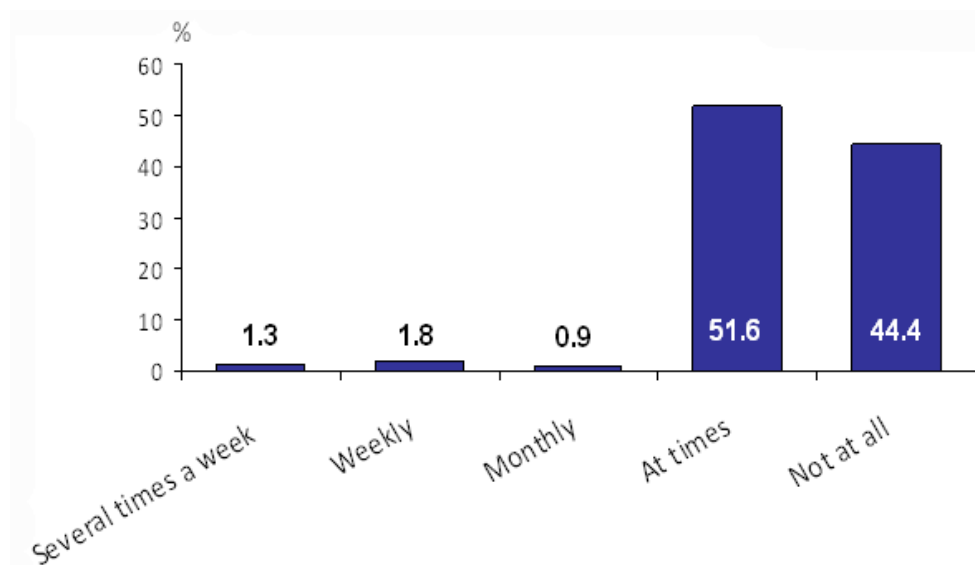
Figure 3.14: Percentages of contact frequency with personally unknown contacts.

almost 18% of the displayed contacts can be considered as strong ties. The categories of acquaintances, work colleagues and reactivated contacts are classified as weak ties (Petróczi et al., 2007) and cover 76% of the displayed networks indicating that the vast majority of contacts maintained on this SNS consists of weak contacts. The contacts one has seen once before may indicate rather weaker ties, however, this category makes up for 6% of the network. The overwhelming majority of personally known contacts indicates that people add others with consideration invalidating the picture sometimes painted in the press (Jump, 2005). Consequently, the composition of the personal networks on SNSs tends to show predominantly weak ties from diverse backgrounds. However, as the SNS studied has a business focus, this conclusion may not apply to SNSs with a focus on leisure.

Furthermore, the considerable portion of friends next to acquaintances and work colleagues points to a mixed working-private composition of the networks displayed. These categories cover over 80% of the networks suggesting a considerable overlap with offline social networks. It should be noted that no conclusion about the closeness or intimacy with contacts can be derived as personal definitions of friendship and acquaintanceship vary. Also, the categories are not mutually exclusive which could limit the validity of the findings. However, the average sum of all categories above 100% might as well be considered as an indicator of the overlap with the real life social networks since most relationships are multiplex, i.e. spanning several contexts.

The network sizes found are small compared to estimates of offline network sizes (Hill and Dunbar, 2003) as well as to expectations about SNSs (Donath and boyd, 2004; Ellison et al., 2007) and first findings of a leisure-oriented SNS (Tom Tong et al., 2008). This further supports the conclusion that the ties displayed point to contacts which exist also in real life. Consequently, an estimated network size of several thousands appears to be overrated. On business-focused SNSs, people might link only to others they perceive as professionally relevant resulting in the work-related part of ones' network being represented. This view is challenged by the large proportion of friends in relation to that

of colleagues. Also, non-SNS-users might constitute a large part of peoples' networks. Although the findings indicate primarily the display of existent weak ties, further research could determine the portion of their complete personal networks, qualitative and quantitative, people represent on SNSs.

Another approach for the evaluation of the tie strength is the perceived tie strength of links between others which was measured here using the indicators of perceived closeness and context. The information on the links plays a crucial role for the value of the display. If the relationships denoted are too weak, the displayed links lose their function to distinguish between present and absent connections (Donath, 2007). For the users of this SNS, the (cheap) links denote most likely a professional if loose connection between persons who have met at least once. Furthermore, this information is perceived rather homogeneously which further underlines the the conclusion that on the majority weak ties are displayed.

However, looking at ties established with formerly unknown persons paints a different picture. Almost 60% of participants have added previously unknown persons as contacts. This number is comparable to relationship formation in newsgroups (Parks and Floyd, 1996). On average, 13 personally unknown contacts were added and this number persisted until the time of this survey indicating that link creation does not lead to meeting the other face to face. Moreover, with approximately 45% of the newly established contacts no further communication ensued. The number of persons establishing relationships thus decreases from almost 60% to an actual 32.9% mirroring rather the results of Internet in general (di Gennaro and Dutton, 2007). Further, as these contacts run aground, they could be considered as absent ties. As the average network consisted of 140 contacts, 13 unknown contacts account for a portion of almost 10%. Half of these may be regarded as very weak ties as communication happens "at times" while with almost the other half no further exchange occured resulting in a tentative estimate of 4–5% of absent ties.

The motivations of establishing links have only been examined with regard to links to unknown others. Only a quarter of users, 25.6% of all, requests links from unknown persons while virtually all users who have at least one unknown contact accept them. Of the requests to unknown persons, 40% of the requests are directed to persons within one's extended network, either to contacts of contacts or an introduced contact. Further 30% are posed after a search which indicates a certain consideration regarding the addition of contacts. These categories of motivations imply purpose related to that persons rather than a self-presentational motive (cf. Section 3.1.3). The categories of meeting in a group or discussion forum suggest a certain similarity between the actors pointing to homophily as motivation of the link request. All these motivations entail a sound basis for the tie and corroborate the above assumption of weak ties. Also on the side of accepting the link request, 70% of the stated reasons relate to the requester, e.g. concerning an interesting profile or an appealing request, indicating purpose in the decisison. However, a minority of 30% confirmed the request due to a lack of counter-arguments or due to an avoidance of refusal which rather questions the meaning of the thus established tie. In sum, the appraisal of the underlying motivations of establishing links to unknown persons supports the conclusions derived from the perspective of tie strength in that the new ties are rather very weak ties. While most motivations point to a purpose to the request or acceptance, a minority suggests an indifference which might lead to the tie running aground, i.e. to an absent tie.

Altogether, the results show that the majority of users display mainly weak ties in their contact lists on the SNS with the extremes to both sides of the dimension of tie strength, i.e. strong ties and absent ties, constituting comparatively small portions of the displayed network.

Several factors may limit the derived conclusions. First, as only one SNS was investigated here, the results might have only limited applicability for other SNSs, especially to those with a different focus or linking process because these factors may have an effect (see Section 3.1). Second, considering the representativity with respect to this SNS may be limited by the sampling procedure. On the one hand, a form of a snowball sample was employed instead of random sampling and, on the other, a self-selectivity bias may be inherent as the survey was completed on a voluntary basis. Regarding the snowball sampling procedure, this might result in more homogenous sample characteristics as in a random sample. The two tested characteristics, age and portion of women showed very close correspondence with the overall parameters in the SNS. Unfortunately, no further information on the composition of users on this SNS could be found and therefore, the representativity not determined with respect to more attributes. In contrast, in a random sample, highly connected profiles may not have been sampled at all biasing the size of the personal network. Thus, the relational findings of the size of personal networks as well as the composition might be captured better in such a sample than in a random sample.

In the survey study, the question about the meaning inherent in the links of SNS has been answered descriptively with the empirical results. The motivations and behavioral patterns of SNS use have been studied as indicators for the meaning of the ties. With respect to the tie strength, an emphasis of weak ties is suggested by the composition of the displayed networks as well as by the perception of the information on the links. The perceived information of the links is a weak, but meaningful relationship. Thus, both suggest that the contact lists mirror the real life social networks to some extent. It can be concluded that the links on this SNS represent primarily weak ties.

The majority of SNS users try to form new relationships by adding someone unknown, but focus on existing connections in seeking relationships with persons in the extended network. The question arises whether this form of network closures produces an increase in social capital, e.g. in information benefit, because these persons were accessible before the creation of the link. Finally, it was found that many of the newly started relationships do not lead to further interaction which leads to absent ties in the contact lists and therefore, a kind of bias. However, the portion of absent ties is estimated to be rather small for the majority of users. The question if this portion may tend to be larger for those users with extremly large networks, e.g. the 5% with more than 350 contacts, should be determined in further research as these users are assumably targeted first in a marketing campaign for social networks hubs.

3.3   Summary

In this chapter, the environmental factors that influence the personal networks, and therefore the social network on SNSs have been analyzed. The possible influence of the features of the technical and regulatory framework, the mission statement, and the culture of a SNS on the relational data derived from them have been investigated. The conclusions as well as first studies show that the technical and regulatory features of SNSs influence

the composition of the users as well as the resulting network structure. On the example of a discussion forum, it could be shown that fake hubs of a different type than the other nodes in the network can become overly central and change the network structure. With regard to the process of building ties, the results of the second field study showed that the linking costs are an important factor which impact the development of the network.

The inherent meaning of the ties plays a central role for the interpretation of the results of social network analysis methods. The results of this survey study on one SNS showed that, contrary to the appearance that a considerable portion of the displayed ties could also be considered as absent ties, the majority of ties on the investigated SNS are weak, but serious, professional ties. The composition of the personal network showed that people link mostly to others whom they know somehow and this finding was also reflected in the perception of the informational value of links between third parties.

Chapter 4

The influence of individual attributes

Some persons maintain a vast circle of acquaintances and seem to know the whole world similar to hubs in networks. These human hubs often arouse academic interest because of their potential power to influence many others (Pool and Kochen, 1979). They are assumed to be potentially beneficial for a variety of processes. For instance, the so-called connectors accelerate or even enable in the first place the diffusion of ideas or innovations (Gladwell, 2000). Equally, the opinion leaders who are thought to influence others in the adoption of innovations are credited with having many contacts (Rogers, 2003). From a marketing perspective, persons with large networks are more attractive than those with smaller networks because indirectly more third persons can be reached through their personal networks (Domingos and Richardson, 2001; Krackhardt, 1996).

Because of this potential, the issue whether persons maintaining large personal networks may be differentiated from others arises frequently (Gladwell, 2000; Pool and Kochen, 1979; Rogers, 2003). In this vein, a relationship between the individual attributes of a person and his personal network is often assumed. For instance, opinion leaders are thought to be more "cosmopolite" and have a higher socio-economic status than others (Rogers, 2003, p. 317). Equally, maintaining a vast social circle as the connectors do has been theorized as originating in "something intrinsic to their personality" (Gladwell, 2000, p. 49).

In this respect, SNSs pose a convenient source of data which facilitates the inexpensive collection of relational data needed for measuring the above introduced concepts. Previous studies investigating the relationship between individual attributes and the personal network have mostly relied on self-reports of persons concerning both the assessment of attributes and of the personal network (Kilduff and Day, 1994; McCarty and Green, 2005; Noelle-Neumann, 1985). However, this method may be biased due to several reasons. First, it has been shown that persons cannot reliably report their personal network mostly due to memory effects (Marsden, 1990). Second, further effects are conceivable, e.g. a person thinking of himself as popular might report more persons as contacts as a person with a self-perception of an outsider. Thus, another advantage of the use of SNSs lies in the employment of a second source of data next to self-reports which raises the reliability of the results. In sum, SNSs provide a good opportunity to study the effects of individual attributes on the personal networks provided the meaning of ties is principally known.

Consequently, the question whether the human hubs have different characteristics than persons with fewer contacts is explored in this chapter using self-reports and the contact lists displayed on SNSs as sources of data. More precisely, the relationship between individual characteristics such as different motivations and personality traits, and the size of personal networks displayed is investigated. A second research question focuses on persons who use the SNS especially to establish new contacts and studies whether these Internet networkers can be distinguished by certain individual characteristics, as well. Finally, it is compared whether the same attributes characterize human hubs and Internet networkers.

In order to provide the theoretical basis for the following study, the chapter starts with a portrayal of the concepts of motivation and personality (section 4.1). Section 4.2 places the study in the context of related work on the impacts of individual attributes and develops the hypotheses. Since the personal characteristics were surveyed in the same study which was reported in Section 3.2.3, the sample procedure and sample characteristics are only briefly recapitulated in the section 4.3 before describing the questionnaire parts covering the motivation and personality attributes in detail. Fourth, the results regarding the size of social networks and the establishment of new ties are presented in turn (section 4.4), and discussed thereafter in section 4.5. Lastly, the main findings are reviewed in the summary (section 4.6).

4.1   Individual attributes

SNSs as online applications constitute a form of computer-mediated communication which implies a different context for the social interaction from real life. Although this may limit the applicability of previous theories concerned with real life, they provide a well-researched approach to the relationship between individual attributes and personal networks. Theories within the framework of social network analysis have seldom been brought together with theories of personality psychology (Borgatti and Foster, 2003; Kalish and Robins, 2006). This gap is commonly explained by the strong structuralist heritage of SNA prohibiting the investigation of individual variables (Borgatti and Foster, 2003) and it is quite wide: "there seems to be a structural hole between those who focus on social networks and those who focus on the attributes of individuals" (Kilduff and Tsai, 2003, p. 10). However, in the research of human behavior and its outcomes, various theories assume an interaction between individual characteristics and features of the context and thus an influence of personal characteristics. A brief overview of these related research theories is given in order to derive the relationship between individual variables and features of personal networks for real life.

Social exchange theory (Blau, 1967; Molm and Cook, 1995) presumes that persons actively pursue their interests and that some of these interests may be satisfied through social interaction. Equally, interactionist theories assume a similar active role of the person stating that people select their environment congruent with their dispositions, preferences or attitudes, meanwhile the environment reciprocally reinforces and shapes the individual and his behavior (Ickes et al., 1997; Bowers, 1973). For instance, personality attributes were shown to predict work experiences eight years later while reciprocally being influenced by these experiences (Roberts et al., 2003). Extensive research has shown that the situational choices of persons vary as a function of their dispositional factors, e.g.

outgoing (extraverted) persons seek out active as well as social leisure situations, while introverts prefer more passive and solitary recreations like reading (Furnham, 1981; Diener et al., 1984; Ickes et al., 1997). Consequently, an actor's interests or dispositions may direct social interactions and therefore, can be considered to affect his social network.

Also current studies in the field of game theory show that personal attributes influence individual choice behavior. For instance, (Berninghaus et al., 2005a) demonstrated in two different experiments the effects of the individual attribute "inequity aversion" on network formation. In the experiments, subjects could initiate contacts to others which resulted in information benefits, but also involved costs. Meanwhile the recipient of the contact paid nothing, akin to receiving a telephone call. The results showed that many subject teams deviated minimally from the optimal communication structure in which one player would have had a higher payoff than the others. This deviation is explained with inequity aversion which seems to prevent persons from maximizing their own benefits. Instead, subjects tend to behave in ways that level the benefits of the group. This result was even more salient when the inequality between the different positions in the network was more pronounced (Berninghaus et al., 2005b). Thus, in these experiments as well, an effect of an individual attribute on social behavior, i.e. leveling group benefit rather than maximizing one's own benefit, could be shown.

With regard to the offline world, an influence of individual attributes on social behavior and, in the consequence, on features of the personal network can be derived from these theories. Although the effects may not be directly transfered to computer-mediated social interaction, it can be concluded that in general, individual attributes affect behavior online, as well. Hence, the influence of personal attributes on the size of the personal networks as well as on the establishment of new ties on SNSs are investigated in this chapter. In the following, the concepts of motivations and personality attributes are introduced.

4.1.1 Motivation

The psychological term of *motivation* can be defined as the cause of a behavior, or more precisely, the "*needs or desires that activate and direct behavior.*" (Myers, 2007, p. 471). Theories of motivation address basic motivations which control general behavior, e.g. hunger, as well as specific motivations that cause differences in behavioral patterns, e.g. working behavior and performance (Myers, 2007). Motivations drive and direct actions. Thus, different motivations for the same behavior may cause varying results.

This assumption has also been applied to media use in general, and, in particular, to Internet use. In the interaction with media in general, the uses and gratification model of Katz et al. (1973) has become established after the early theories of technological determinism. It assumes that personal goals and needs direct individual media use and have an impact on the outcome (Katz et al., 1973). Concerning Internet use, an interaction between the features of the Internet context and personal goals (Spears et al., 2002) with respect to the effects is often postulated (Bargh and McKenna, 2004; Boase and Wellman, 2006; Mesch and Talmud, 2007). Consequently, the motivations of SNSs use can be expected to affect the personal networks on SNSs.

Regarding SNS use, not much is known about peoples' motivations and goals for maintaining a profile on a SNS. First surveys show that highschool and university students use SNSs mainly to communicate with and find out more about existing offline friends

than to meet new persons online (Lampe et al., 2006; Lenhart and Madden, 2007a). Concerning existing ties, several specific motivations can be distinguished, such as managing one's personal network, e.g. keeping track of birthdays. Furthermore, communicating and keeping in contact with others are possible motivations as is the reactivation of lost contacts. Apart from the dimension of existing vs. new ties, other conceivable goals include entertainment or representational purposes. In the same vein, a relevant motivation especially on business-focused SNSs may be to search for a job, or respectively, for a suitable candidate (Renz, 2007). Finally, a reason may be the availability of a continuously updated address book.

4.1.2   Personality

Personality is commonly thought of as the sum of psychological characteristics which make persons distinct and predictable for others, e.g. the friends and colleagues of a person can mostly roughly estimate his behavior. In the field of personality psychology, many definitions of the scientific term of *personality* have been written which all integrate the aspects of uniqueness and characteristic behavior. Based on an early definition of Allport (1961), Carver and Scheier (2000, p. 5) give the following contemporary definition: *"Personality is a dynamic organisation, inside the person, of psychophysical systems that create a person's characteristic patterns of behaviour, thoughts, and feelings."*

Classes of personality conceptions comprise different paradigms, e.g. the behavioristic, psychoanalytic, humanistic, and trait paradigms (Funder, 2001; Myers, 2007). One prominent class of personality conceptions is the trait perspective which is employed in this work. The trait perspective attempts to capture personality in terms of consistent and enduring personality characteristics, the *traits*[1]. In dependence of Allport's first definition (1961), a trait is conceptualized as *a stable personality disposition which influences feeling and acting* (Myers, 2007). For instance, honesty may be seen as a trait causing a person to return a found wallet as well as to forgo cheating. As the temporal stability of a trait is a core feature of the theoretical concept, the stability or change of traits is often investigated in longitudinal studies. A recent meta-analytic study of 152 longitudinal studies showed an impressive constancy of traits over seven years which increases with the age of persons (Roberts and DelVecchio, 2000). Even over a time span of 45 years, the significant stability of personality traits could still be shown (Soldz and Vaillant, 1999).

In the framework of the trait perspective, next to taxonomies attempting to describe personality as a whole, there exist a multitude of specific constructs which focus on a particular aspect of personality, e.g. networking behavior (Wolff and Moser, 2006). Of the general models on personality, the theory of the Big Five has become widely accepted (Funder, 2001). As parts of the Big Five are employed in this study, the model is portrayed in the following. Also, in order to integrate further potentially relevant aspects, two specific constructs, namely the concept of the strength of personality (Noelle-Neumann, 1985) and the behavioral concept of networking (Wolff and Moser, 2006), are integrated in the survey. These will be described subsequently.

The **five factor model of personality**, also called "**Big Five**", is a taxonomy describing personality with the five trait dimensions of *extraversion, agreeableness, neuroticism, openness to experience*, and *conscientiousness*. These five factors have been found con-

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[1]For a recent overview of the research field of personality psychology refer to Funder (2001)

sistently using different assessments in different languages and cultures which shows the structural robustness of the model (for a review see Hogan and Ones, 1997; McCrae and Costa, 1999). The Big Five organization of personality traits has become so prevalent that nowadays, it is seen as the "common currency for personality psychology" (Funder, 2001, p. 200). As the five factors constitute very broad personality traits, an underlying hierarchical structure of the factors is assumed. Thus, each factor consists of six more specific facets. In this study, only those facets which relate to social relationships in a broad way were included. An overview over all factors with their respective facets is given in table 4.1, in which each facet is characterized by a pair of adjectives denoting both extreme poles of the theoretical dimension. The facets printed in bold in the table are employed in this study.

Before describing the factors in detail, two aspects should be pointed out. First, although the factors are commonly described on the basis of their extremes, they represent continua on which most people occupy middle values. Second, as the five factor model is a taxonomy, it does not constitute an exhaustive or all-encompassing description of personality. Although specific constructs focusing on a particular personality attribute may be mapped onto the Big Five dimensions, they cannot be completely explained by the five factors (Funder, 2001).

The five factors and the employed facets are portrayed below mainly following Ostendorf and Angleitner (2004). Because the Big Five attempt to describe the whole of one's personality, many facets cover characteristics which focus on attributes without direct concern to social interaction. For instance, the facet of openness to fantasy characterizes persons as imaginative or on the opposite, realistic. In this study, the facets which relate directly to social interaction are selected from a conceptual viewpoint while the remaining facets are not considered further. The latter are not described in detail and are listed solely in table 4.1.

The characteristic of **Extraversion** is one of the oldest and most widely studied traits (De Raad, 2000). Extraverted persons are consistently described as sociable, talkative, cheerful, confident and enjoying excitement while at the other extreme, introverted persons are perceived to be rather quiet, reserved and socially aloof. The contemporary concept of extraversion includes a social component, e.g. seeking company, and a positive emotional aspect, e.g. being optimistic (Watson and Clark, 1997). The factor extraversion consists of the facets of warmth, gregariousness, assertiveness, activity, excitement-seeking, and positive emotions. The facets of warmth, gregariousness, and assertiveness cover the social component of extraversion. *Warm* persons are thought to be cordial and friendly to others while "cold" persons are rather formal and more distanced. The attribute of *gregariousness* refers to the preference of being in the company of others and, at its opposite, to a liking of being alone. The last facet, *positive emotions* denotes the tendency to experience and express positive feelings, such as happiness and elatedness, which may have a socially attractive effect. However, persons low on this characteristic are not less happy, they simply do not express themselves as exuberantly.

The factor of **agreeableness** is the most concerned with interpersonal relations of the five factors as it represents attitudes and behavioral patterns concerning social interactions (Graziano and Tobin, 2002). The factor can be described with the terms cooperativeness, empathy, selflessness, and altruism. As is apparent by this characterization, the concept of agreeableness implies an evaluative aspect which may lead to a higher susceptibility

to social desirability. Nonetheless, the factor has been found consistently in the various approaches to the structure of personality (De Raad, 2000). Agreeableness includes as facets the dimensions of trust, straightforwardness, altruism, compliance, modesty, and tender-mindedness. With the exception of *straightforwardness*[2], all facets are included in the study as they describe important individual attributes regarding the interaction with others. *Trust* describes the continuum of one's inner belief from assuming good intentions of others to being doubtful or suspicious. Persons showing an active concern for the welfare of others are said to be *altruistic* while, on the other extreme, egoistic persons rather think about their own benefit. *Compliant* persons tend to relent while non-compliant persons are more aggressive in response to a conflict. The dimension of *modesty* refers at its high end to the tendency to be humble, however, not necessarily out of a lacking self-confidence. Low modesty denotes the expression of superiority and arrogance. Lastly, the intensity of an attitude of sympathy for others is captured in the facet of tough to *tender mindedness*.

The third of the Big Five, **neuroticism** deals with the tendency to experience psychological stress, e.g. anxiety or helplessness. Nowadays, it is mostly labeled by its positive extreme, **emotional stability**. Of this factor, only one facet relates to interpersonal relations and is therefore included in the further study. The concept of *self-consciousness* includes feelings of awkwardness in social situations as well as shyness which may affect social relationships negatively.

Conscientiousness represents the drive and capability to accomplish goals, e.g. to be organized and show persistence. This factor is primarily applied in working contexts as it is the most relevant for it (De Raad, 2000; Hogan and Ones, 1997). Although the traits subsumed in this factor do not relate directly to social interaction, two were selected for the study because they may have indirect social implications. *Competence* describes decisive, and informed persons who believe in their own efficacy. The second included facet, *dutifulness*, marks reliable persons who fulfill their obligations and are punctual. Both these personal characteristics may increase the persons social attractivity to others. Therefore, persons with these attributes may be preferred as social contacts.

The last of the five factors is **openness to experience** which reflects the "recurring need to enlarge and examine experience" (McCrae and Costa, 1997, p. 826). This trait describes persons who seek out all kinds of new experiences and are flexible and reflective rather than conventional. The included facet of *openness to actions* refers to the willingness to try out new activities in contrast to prefering routine. Thus, it may play a role in exploring new internet applications, such as SNSs.

In addition to the selected Big Five facets, two further personality aspects were included in the study, the concept of strength of personality (Noelle-Neumann, 1985) and the behavioral construct of networking (Wolff and Moser, 2006).

The questionnaire capturing the **strength of personality** was developed in order to identify opinion leaders (Noelle-Neumann, 1985). The notion of opinion leaders refers to persons who are able to influence the attitudes and behavior of others in an informal way (Rogers, 2003). As opinion leaders might influence their social surrounding also regarding consumer decisions, the concept as well as further characterization of opin-

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[2]Straightforwardness is not included because of the restrictions of an online survey and furthermore because of this factor it is assumed to be the least related to social interactions, in particular in an online context.

Extraversion	
Warmth	**amiable — reserved**
Gregariousness	**sociable — solitary**
Assertiveness	dominant — recessive
Activity	fast-paced — laid-back
Excitement-seeking	adventurous — deliberate
Positive emotions	**cheerful — tranquil**

Agreeableness	
Trust	**trusting — suspicious**
Straightforwardness	sincere — calculating
Altruism	**selfless — egoistic**
Compliance	**indulgent — contentious**
Modesty	**humble — overbearing**
Tender-Mindedness	**soft-hearted — ruthless**

Neuroticism - Emotional Stability	
Anxiety	afraid — composed
Angry-Hostility	touchy — even-tempered
Depression	dispirited — carefree
Self-Consciousness	**timid — at ease**
Impulsivity	uncontrolled — self-possessed
Vulnerability	frail — resilient

Conscientiousness	
Competence	**efficient — thoughtless**
Order	methodical — negligent
Dutifulness	**diligent — careless**
Achievement striving	hard-working — lethargic
Self-discipline	persevering — erratic
Deliberation	observant — rash

Openness for experience	
Openness to fantasy	imaginative — realistic
Openness to aesthetics	artistic — not impressed by art
Openness to feelings	sensitive — sober
Openness to actions	**flexible — steadfast**
Openness to ideas	analytic — pragmatic
Openness to values	liberal — conventional

Table 4.1: The five factors and their facets of the Big Five model of personality.

ion leaders in order to better locate them has received particular attention in the fields of marketing and the related field of innovation diffusion (Rogers, 2003, cf.). The unidimensional attribute of the strength of personality attempts to measure a type of opinion leadership which is independent of a specific topic as well as independent of social status (Noelle-Neumann, 1985). Opinion leadership as well as the strength of personality is also associated with larger personal networks (Noelle-Neumann, 1985; Rogers, 2003). Thus, the concept is integrated in this study to explore if a strong personality predicts large personal networks on SNSs which is a relevant issue for the potential marketing use of SNSs.

The construct of **networking** describes individual behavior which aims at developing and maintaining informal connections with others in order to gain a potential benefit. This includes using events or official trips to make new contacts or doing honorary, but business-related work. Thus, networking behavior is assumed to lead to useful relationships and a more advantageous position in a social network (Wolff and Moser, 2006) and can hence be seen as an individual antecedent of social capital. The networking questionnaire of Wolff and Moser (2006) was designed for the working context and differentiates along the two facets of organizational membership and function of the behavior. The first facet distinguishes between the behavior aimed at contacts within or outside one's organization. The second facet represents the functional aspect and includes the establishment, maintenance, and making use of contacts. A sample question concerning the establishment of contacts asks whether the participant purposefully attempts to deepen the relationship with new persons. The aspect of the maintenance of contacts includes questions inquiring about being informed about others' current work task. Finally, using contacts consists mainly of getting information, e.g. of planned changes within one's organization or for the salary negotiation of a new job. In the validation study, persons practicing networking to a high degree were shown to be more extraverted and specifically scoring higher on the subfacets of extraversion, gregariousness and warmth.

The networking concept is included as a further predictor for the characteristics of personal networks on SNSs in order to investigate if a measurement focused on real-life behavior can also predict outcomes in the Internet. This would suggest an overlap of behavioral patterns and therefore, outcomes in real life as online which would in consequence permit inferences from one context to the other. In this study, the original questionnaire is adapted to a more general focus on networking behavior which is more suited for the application on SNSs. The adaptation is explained further in the following part on methods (Section 4.3).

4.1.3   Measurement of individual attributes

Personality attributes are latent structures which cannot be observed or assessed directly. This poses special demands on their measurement. Therefore, an overview is given of the main approaches which are applied to ensure the reliability, i.e. the accuracy and repeatability, and validity, i.e. the legitimacy, of the measures. The measurement of personality attributes is mostly achieved using questionnaires. For the assessment of each attribute, a series of questions or statements to which the participant indicates his agreement is posed. These are labeled items and all items together form a scale of the attribute. The items capture different facets or nuances of the attribute which are considered as indicators of the

latent attribute. Also, posing a series of items raises the reliability of the scale as it levels error effects, e.g. random errors or errors due to different understandings of the wording.

Concerning the reliability of trait measures, the intercorrelation of the items of a scale as well as the temporal stability of a measure are examined. The intercorrelation between the items is called internal consistency of the scale and should be high because all items are supposed to be influenced to a degree by the same latent attribute (West and Finch, 1997). The internal consistency of a scale can be assessed by dividing the scale in two halves, e.g. even and odd items, and correlating the score of both halves. Commonly, it is evaluated with the coeffecient Cronbach's α which is equal to the mean of the correlations between all possible split halves of a scale (Cronbach, 1951; West and Finch, 1997). The coefficient Cronbach's α can take values between zero and one; higher values indicate higher internal consistency which in turn denotes higher reliability. Also, the temporal stability of a trait measure gives evidence about the reliability and is in general assessed by repeated tests. The validity of a measure is evaluated on the one hand by investigating the congruence between the theoretical structure of the construct and its empirical structures and, on the other, by studying if predicted patterns of relationships with other constructs are found empirically (West and Finch, 1997).

In this study, the reliability is assessed using Cronbach's α to show the internal consistency of the employed scales. In addition, the structural properties of the concepts are checked with factor analyses. The results of the scale properties are reported in the method section (4.3).

4.2 Hypotheses and related work

Few studies on the relationship between individual characteristics and social behavior in the context of the Internet have been published so far. Existing studies have investigated online relationship formation in various Internet applications, such as newsgroups, chats, as well as online virtual reality systems and have mostly considered sociodemographic differences such as marital status or sex as explanatory variables. It was found that generally sociodemographic attributes are weak predictors of establishing online relationships (di Gennaro and Dutton, 2007). Moreover, the effects have been inconsistent across the studies (di Gennaro and Dutton, 2007; McKenna et al., 2002; Parks and Floyd, 1996; Parks and Roberts, 1998). In consequence, sociodemographic attributes are included as control variables in this study.

The few previous studies (Burt et al., 1998; Kanfer and Tanaka, 1993; Klein et al., 2004; McCarty and Green, 2005) integrating social network analysis and personality have investigated only a small number of psychological variables and also used "non-standard psychological instrument(s) with unknown psychometric properties" (Kalish and Robins, 2006, p. 58). Yet, the extensive study of Kalish and Robins (2006) consisted of a sample of college freshman and employed only self-report measures which may be subject to memory and self-presentational effects. The present study avoids these pitfalls by employing standard personality measures as well as the unobtrusive measure of the personal network on the SNS on a sample of the working population.

This study combines several concepts in a novel way which requires a wide range of related literature: First, the influence of personality characteristics on online behavior has been subject of few studies of which none has investigated SNSs in particular.

Therefore, also results of studies of real life are considered. Second, studies combining social network analysis with personality are few. Thus in addition, related literature of the fields of research of computer-mediated communication, social network analysis, and personality psychology is reviewed. Third, research on personality and behavior in general has often investigated the five factors of personality without considering the individual facets although the facets have been shown to better predict behavior because of their greater specificity (Paunonen and Ashton, 2001). Because of this, the basis to posit specific hypotheses for the different facets is mostly lacking. As a consequence, the same relationship to the features of the personal network is specified for all facets of a factor. However in the analysis, they are treated separately in order to explore the more specific connections of the facets. The hypotheses concerning the dependent variables, size of the personal network and the inclusion of previously unknown persons, are developed consecutively.

4.2.1 Personal network size

This study was part of the survey study conducted on the SNS Xing. The hypotheses were developed based on the assumption that the majority of the displayed links refer to personally known contacts. Thus, an overlap with offline personal networks was assumed and in consequence, the transferability of effects shown in real life studies was taken for granted. With regard to the size of the personal networks, special effects due to the online environment are therefore not elaborated. The assumption of personally known ties in the majority was supported by the descriptive results reported in section 3.2.3.

Different **motivations** of SNSs' use have been identified, e.g. using SNSs to keep in contact with friends, learning more about new contacts, or browsing the profiles of unknown persons purposefully as well as for entertainment (Lampe et al., 2006; Lenhart and Madden, 2007a; Acquisti and Gross, 2006). However, the connection of motivations to the size of the personal networks displayed has not been investigated. Within organizations, the structure of personal networks was found to vary with differing motivations, e.g. looking for a position of authority was shown to be related to more extensive personal networks (Burt et al., 1998). This suggests that rather goal-oriented motivations, such as searching for a job, are associated with larger network sizes in contrast to other motivations such as entertainment. Furthermore, it is conceivable that persons who use the SNS mainly to reactivate contacts accumulate more contacts than those looking to manage their existing network. In sum, depending on the motivations of use differences in size of the displayed network are predicted.

H_1: *The size of the personal networks displayed on the SNS varies depending on the different motivations of SNS use.*

Of the **personality attributes**, extraversion is most often associated with large personal networks. For instance, Gladwell (2000) describes the connectors as gregarious, energetic, and highly sociable persons. Concerning the university context, several studies reported that extraverted first-year students established larger networks than more introverted students (Asendorpf and Wilpers, 1998; Kalish and Robins, 2006; Kanfer and Tanaka, 1993). On SNSs, persons with large networks are evaluated by others as more extraverted as a very recent study showed (Tom Tong et al., 2008). Also, drawing from the literature on social support, extraverted persons were shown to have more support-

ing contacts (Russel et al., 1997; Sarason et al., 1983). On the level of the facets, all three included facets, namely warmth, gregariousness, and positive emotions, are positively correlated with the behavioral measure of number of parties attended (Paunonen and Ashton, 2001). Of these, mainly gregariousness appears to be connected to knowing many persons as it also correlated positively with the number of different persons dated among students (Paunonen and Ashton, 2001) and with making new friends (Asendorpf and Wilpers, 1998). Thus also with respect to SNSs, for the factor extraversion and its facets a positive relationship with the size of the personal network is expected.

H_2: *The size of the personal networks displayed on the SNS displayed on the SNS correlates positively with extraversion and its included facets of warmth, gregariousness, and positive emotions.*

Agreeableness has been introduced as the factor most concerned with social interaction describing persons who rather avoid conflicts with others than assert themselves. Agreeable persons have been shown to be popular, i.e. receiving many friendship links, in academic as well as in work teams which constitute limited social networks (Kanfer and Tanaka, 1993; Klein et al., 2004). Also with respect to personal networks in general, agreeableness has been positively associated with the network size (McCarty and Green, 2005). Consequently, a positive relationship is also assumed for the personal networks displayed on SNSs. However, no study could be found regarding effects of the specific facets of agreeableness which leads to a general hypothesis for all facets.

H_3: *The size of the personal networks displayed on the SNS correlates positively with agreeableness and its included facets of trust, altruism, modesty, and tender-mindedness.*

The factor of neurotizism or emotional stability is included only with the facet of self-consciousness. This facet captures shyness and general insecurity in social situations which intuitively disagrees with having a large network. Accordingly in real life, shyness was often associated with making lesser friends or having less contact with others (Asendorpf and Wilpers, 1998; Kanfer and Tanaka, 1993; Wanberg et al., 2000). Also, neurotizism was found to be negatively associated with popularity (Klein et al., 2004). Thus, it is assumed that self-conscious persons rather tend to have smaller personal networks displayed on SNSs.

H_4: *The size of the personal networks displayed on the SNS correlates negatively with the facet of self-consciousness.*

The trait of conscientiousness refers to diligence and goal-oriented behavior. As facets, competence and dutifulness are included in the study because these characteristics may be socially attractive, in particular in a business context such as the investigated SNS Xing. Responsibility, an aspect of conscientiousness, was negatively associated with popularity among students (Kanfer and Tanaka, 1993). However, conscientious students reported more frequent contact with their family (Asendorpf and Wilpers, 1998) and conscientious persons in general were shown to have well-connected personal networks (McCarty and Green, 2005). With regard to SNSs, it is conceivable that conscientious persons may use SNSs to stay in contact or reactivate lost contacts more and therefore accumulate larger personal networks on SNSs. Thus, a positive relationship is expected.

H_5: *The size of the personal networks displayed on the SNS correlates positively with conscientiousness and the included facets of competence and dutifulness.*

The last of the five factors is openness to experience of which only the facet of openness to actions is included in the study. The factor was unexpectedly found to play a

negative role with regard to popularity in teams of student workers (Klein et al., 2004) which the authors interpreted as possible annoyance with non-conformity. With regard to behavioral measures, the facet of openness to actions showed a positive relationship to the dating variety of students (Paunonen and Ashton, 2001). In line with this, the facet of openness to actions is expected to correlate positively with the network size displayed on a SNS because open persons who like to experiment with new possibilities may explore the SNS more and thus probably search and find more persons they know which they will add to their contact list.

H_6: *The size of the personal networks displayed on the SNS correlates positively with openness to actions.*

Of the two included single measures, the scale of the strength of personality was developed with the goal of recognizing opinion leaders who are thought to be persons with large personal networks among other characteristics. In the original study of Noelle-Neumann (1985), persons with a "strong" personality also reported to have a large group of friends and acquaintances as well as to be interested in new experiences. A later study conducted in the rather limited community of a kibbutz corroborated that showing that strong personalities have more communication links in the network and also are more actively involved in the communication flows of the social network (Weimann, 1991). Accordingly, it is posited that persons with strong personalities in the sense of the concept also accumulate more contacts in their personal networks on the SNS.

H_7: *The size of the personal networks displayed on the SNS correlates positively with the strength of personality.*

The second single measure, the scale of networking, attempts to identify persons who actively pursue the extension of their personal network with the perspective of reaping the benefits thereof. Nowadays, one aspect of maintaining contact with others may lie in adding these persons to one's contact list on a SNS. Thus, in line with the concept, networking should show a strong positive relationship with the network size displayed on SNSs.

H_8: *The size of the personal networks displayed on the SNS correlates positively with the networking characteristic.*

4.2.2 Establishing new ties

A second angle of this research constitutes the question what kind of person actively use SNSs to extend their network, e.g. to get in contact with or to get to know persons who were previously unknown. This is further referred to as adding an unknown person or establishing a "new tie". Drawing on previous research of other Internet applications wherever possible, the following hypotheses attempt to identify whether the same individual characteristics affect relationship building online as offline or whether there exists a special type of Internet networker. This has significant implications for Internet marketing as Internet networkers may be especially helpful in disseminating information online.

On SNSs, possible **motivations** for maintaining a profile range from active networking with the objective of building new ties to managing one's existing personal network to entertainment. First evidence shows that those who use the Internet for the purposes of learning and communication meet more persons online and establish more relationships

(di Gennaro and Dutton, 2007). Thus, different motivations for SNS use are also expected to influence whether persons add unknown persons to their contact list.

H_9: *The frequency of adding unknown persons to one's contact list on the SNS varies depending on the different motivations of SNS use.*

With regard to **personality attributes**, only few studies have investigated their influence on online social behavior. Concerning extraversion, seeking company and being sociable seems to play a role in the Internet as well. As in real life, first studies have shown that sociable persons more frequently use the Internet for socializing, e.g. communicating in a discussion forum with persons whom they have never met face to face (Birnie and Horvath, 2002). Consequently, it is expected that extraverted persons also seek to get to know new contacts on the SNS and react positively to the link requests of others.

H_{10}: *Extraversion and the included subfacets, warmth, gregariousness, and positive emotions, correlate positively with the frequency of adding unknown persons to one's contact list on the SNS.*

In Internet studies, the aspects of shyness and social anxiety which are part of the factor emotional stability received the most interest of the personality attributes. This is due to the fact that the Internet and cmc in general possess special characteristics such as increased anonymity and asynchronicity. It has been argued that shy and insecure persons benefit especially from these characteristics because they help them to express themselves without restraint (McKenna and Bargh, 2000; Amichai-Hamburger et al., 2002) and first results support this view (McKenna et al., 2002). Contradictory evidence showed that shyness was negatively related to online socializing activity while implying higher online socializing intimacy (Birnie and Horvath, 2002). In light of these inconsistent findings, no specific hypothesis is formulated, but rather the influence of self-consciousness on establishing new ties on the SNS is exploratively investigated.

SNSs still represent a rather novel way to meet persons and establish new relationships or business contacts. Therefore, it might be that persons who are more open to new activities are more likely to try the opportunity the SNS offers. Accordingly, "open" persons may rather use the SNS to forge new links and initiate potentially valuable contacts. Also, they may be more open to link requests of unknown persons and thus, willing to confirm them. Hence, a positive correlation to adding previously unknown persons is expected.

H_{11}: *Openness to actions correlates positively with the frequency of adding unknown persons to one's contact list on the SNS.*

As was argued with respect to the size of the personal network, the concept of networking describes the purposeful extension of the personal network with the goal of establishing useful contacts and realizing potential advantages, e.g. having a source of information if needed. Thus, the networking persons should use the SNS in this way and establish new ties, i.e. links to as yet unknown others. Therefore, it is expected that networking is positively associated with adding unknown persons to one's contact list. With regard to its components, network building and network use, their conceptualization implies that only the network building component should show a positive association with the establishment of new ties.

H_{12}: *General networking and its component of network building correlates positively with the frequency of adding unknown persons to one's contact list on the SNS.*

Because there is no evidence of seeking to establish new ties on a SNS for the remaining personality attributes, no relations are assumed for them.

4.3 The questionnaire

The study was conducted on the SNS Xing and constituted the second part of the survey study described earlier (Section 3.2.3). Therefore, the description of the SNS, the sampling procedure and the sample itself are only shortly recapitulated before illustrating the questionnaire part of the individual attributes. Recall that Xing is a German business focused SNS with 2.65 million user. The SNS is open to all natural persons and offers a free basic membership. In line with its focus, the information on the profiles depicts mainly the professional information and violations of the regulations are monitored by the administration. The linking process has been illustrated as unrestricted involving low linking costs. The results of the descriptive study showed that the contact lists contained in the majority links to colleagues, acquaintances and friends suggesting a considerable overlap with a person's real life personal networks.

The survey participants were sampled from the second step network of one seed profile with a two-fold sampling procedure of invitation sent via email and via the messaging system of the SNS itself. The questionnaire was administered as an online survey to which invitations were sent in fall 2007. Next to the sampling procedure, also the order of the questionnaire parts was randomly varied starting with either the part on SNS use or with the personality part. There were no differences in the individual variables between the different sample subsets of sampling procedure and of questionnaire order. The corresponding tests of differences are included in appendix C.2.

The response rate to the survey invitation was 32.28%. The final sample consists of 398 participants of which 101 are women (25.3%). The mean age of participants is 31.08 years with a standard deviation of 5.3. With regard to the sociodemographic attributes, the majority of participants was employed at the time of the survey (75.5%). The rest consisted of freelancers (12.9%) and students (11.3%). Also with respect to the highest professional degree achieved, the sample was rather homogeneous consisting mostly of persons with a master degree or diploma (74.4%). Another 12.6% stated high-school graduation as their highest degree, 10.3% reported a PhD title, and 2.8% a Bachelor degree. The sample means of the individual variables are reported in the respective sections of the subsequent description of the questionnaire.

The survey consisted of five parts in total which were displayed in five consecutive webpages. The questions regarding the motivation of SNS use were part of the part concerning the general SNS use. The personality measures were displayed in three separated parts, one for the facets of the Big Five and one for each of the single construct scales, due to different response sets. The last part presented the sociodemographic questions.

At the beginning of the three parts concerning the individual attributes, participants read a special instruction on the personality items. It was pointed out that the answers are not evaluated, i.e. that there are not right or wrong answers to the personality questions. Moreover, participants were advised to answer the items swiftly and that some items may appear similar to others. Finally, it was indicated that the results will be displayed promptly after completing the entire survey. The complete questionnaire with the invitation and the instruction is shown in appendix A.

Motivations	Factors			
	1	2	3	4
Establish new contacts	**0.754**	0.060	-0.064	0.117
Job or applicants search	**0.627**	0.073	-0.089	-0.248
Be visible & represented on the Internet	**0.624**	-0.104	0.192	0.054
Keep in contact	-0.059	**0.835**	0.083	-0.017
Reactivate contacts	0.086	**0.810**	0.040	0.034
Online adress book	-0.072	-0.129	**0.833**	-0.086
Manage existing contacts	0.067	*0.311*	**0.599**	-0.030
Communicate with contacts	*0.405*	0.220	**0.437**	*0.361*
Entertainment	-0.033	-0.013	-0.098	**0.910**
Varimax rotated (after Kaiser normalisation)				
The rotation converged after 5 interations				

Table 4.2: Factor loadings of the different motivations for SNS use.

4.3.1 Motivation

Participants stated for each of nine included usage motivations if this motivation affects their SNS use or not. The most prevalent motivations are "keeping in contact" with an agreement level of 73.3%, "reactivating lost contacts" (67.2%) and "managing the existing network" (64.1%). Next in agreement rates are having an "online address book" (34.9%), "communicating with contacts" (34.6%), and using the SNS for "visibility and self-representation" (33.3%). A third of users, 32.8%, intend to establish new contacts. Lastly, the "job and applicant search" (25.9%) and entertainment (15.6%) receive less agreement. The degrees of agreement are presented in figure 4.1.
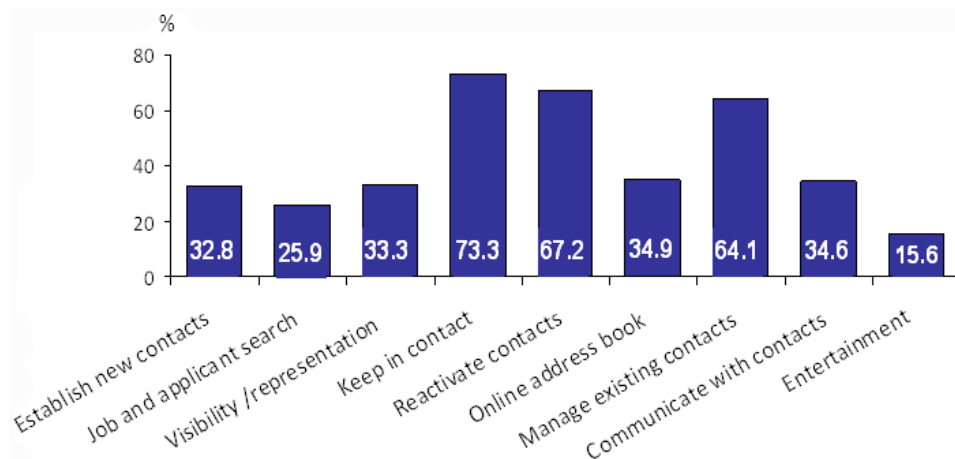
Figure 4.1: Frequencies of agreement with the different motivations of SNS use.

The nine items were subjected to a principal component analysis. After the rotation, four factors with an eigenvalue greater than one were extracted which explain 60.34% of the variance. The factor loadings of the items on the four factors are shown in table 4.2.

The first factor revolves around forming new relationships including the motivations to establish new contacts, job and applicant search, and self-representation while the second points to existing contacts with the items of keeping and reactivating contacts. The

Factor	Mean	Std
Keeping and Reactivating	0.70	0.390
Establishing new ties	0.30	0.316
Managing existing ties	0.45	0.323
Entertainment	0.16	0.364

Table 4.3: Mean scores and standard deviations of the motivational factors.

third represents the idea of an online address book including the management of and communication with contacts. The last factor consists solely of the entertainment aspect. All but one of the items load highly on one single factor. Only the item "communicating with contacts" loads almost as high on the management factor as on the factor of new relationship while also loading on the entertainment factor showing the motivational ambiguity of communicating to preserve, built or recreate.

Corresponding to the factors of the principal component analysis, four scales were built. The individual score of each factor is the sum of the answers of items of that factor averaged by the number of items of that factor. Table 4.3 presents the average scores of all participants for the four motivational factor and the respective standard deviations. The following analyses were computed using the scores of the motivational factors.

4.3.2 Personality

The model of the **Big Five** can be assessed with several instruments. The most prominent, the NEO PI-R^{TM}, is a proprietary instrument for the English as well as German version. Within the project of the International Personality Item Pool[3], an analogous public domain (English) version of this instrument was developed (Goldberg et al., 2006). Next to the full version of the public domain instrument, also a short version encompassing only half of the items exists (Johnson, 2006). Of this english short version, the items of the employed scales (see section 4.2) were translated into German in this work and the psychometric properties of the new German scales are shown. For the translation, the common method of back-translation was used: the translated items were re-translated into the english language by a native speaker in order to ensure the correct translation of the item meaning. Because long Internet questionnaires often have high drop-out rates, the short version of the employed facets was used consisting of four items for each facet instead of eight (see also Johnson, 2006). In addition, two more items were included in order to compensate for translation difficulties with other items, resulting in 50 items for the personality part concerning the five factors. The items were displayed in a mixed order.

All items of the Big Five are posed with the same five different answering options with which the participants can signal their agreement with the statement. An instance for an item is "I trust others." to which participants can check one of the following options: "strongly disagree", "disagree", "neutral", "agree", "strongly agree". The five options are translated into scores from one to five. Also, some items are reversely worded, i.e. denote the opposite of the scale anchor, e.g. the item "I mistrust others" as part of the facet of trust. The scoring of these items is reversed before any further analysis. The scores for

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[3]http://ipip.ori.org/ipip/

each facet are computed as the mean score of all items of that facet and likewise for the factors.

For the examination of the psychometric properties of the used facets, a confirmatory factor analysis forcing 5 factors was conducted with all Big Five items. The resulting factor loadings are displayed in appendix C.3 in table C.3. Although the five factors do not replicate the factors of the five factor model, the structure of the facet clearly emerges as the different facets load on single factors. The slightly different arrangement in comparison to the five factor model can be explained by two facts: First, only a partial model was employed as only the facets with a focus on socially relevant behavior were selected. Second, the items of the scales are not completely independent. Nevertheless, all facets of extraversion, warmth, gregariousness and positive emotions, fall on the first factor. However, also the facet openness to actions is represented by this factor and the items of self-consciousness mostly load negatively. The facet openness to actions is about approaching new possibilities and is similar to approaching other maybe unknown persons which is represented among other aspects by the facets of extraversion. Thus, it falls on the same factor. In contrast, self-conscious persons feel awkward in other's company and rather avoid approaching others which explains the negative connection. The third factor represents both competence and dutifulness, the facets of conscientiousness while the facets of agreeableness spread over the second, fourth, and fifth factor. On the second factor, only the trust dimension is represented. The items of altruism and tender mindedness load mostly on the fourth factor, while compliance and modesty are allocated on the fifth factor. Modesty is also defined by its differentiation, i.e. high negative loadings, from conscientiousness on the third factor. This structure can be explained primarily by the overbalance of the agreeableness facets in comparison to other factors. Two of the five factors, emotional stability and openness to experience, are only represented by one facet each in this study. Due to this fact, they may then turn out more similar to other personality factors while in contrast, the differences among the facets of agreeableness are more pronounced. As the facets are overall represented by single factors and the structure is in itself reasonable, the validity of the structure is assumed to be satisfactory.

In order to establish the reliability of the specific factors and their facets the internal consistency coefficient cronbach's α is computed for each scale. Table 4.4 depicts the number of finally included items, means, standard deviations as well as the cronbach' α for each included facet and the factors. For comparison, the corresponding cronbach's α of a larger online sample (N = 20'993) using the complete (english) short version of the International Personality Item Pool representation of the NEO PI-R™are depicted in the right most column of table 4.4 (Johnson, 2007). The factor scores are computed using all items which are included into the facets.

The factor of extraversion composed of the three included facets shows very good internal consistency. Two of its facets, namely warmth and gregariousness have fairly low values of cronbach's α which are however still acceptable. The facet of positive emotions also has good internal consistency. As the value of the coefficient α increases with the number of included items, it is higher for the overall factor with all twelve items.

In general, values of the coefficient $\alpha > .60$ are considered as acceptable for further analysis (West and Finch, 1997). With regard to agreeableness, the facet of compliance exhibits an unacceptable internal consistency with an α of 0.524 which suggests a lack of reliability of this scale. It was consequently omitted in the further analysis and therefore,

	Items	Mean	Std.	cronbach's α	comparative α
Extraversion	12	3.76	0.472	0.819	
Warmth	4	3.85	0.535	0.649	0.80
Gregariousness	4	3.58	0.635	0.635	0.78
Positive emotions	4	3.84	0.574	0.757	0.78
Agreeableness	15	3.54	0.357	0.763	
Trust	5	3.57	0.565	0.812	0.85
Altruism	4	4.01	0.462	0.59	0.74
Compliance	5	–	–	0.524	0.64
Modesty	2	2.32	0.674	0.818	0.75
Tender-Mindedness	4	3.66	0.572	0.697	0.70
Self-consciousness	4	–	–	0.31	0.73
Openness to actions	4	3.56	0.561	0.675	0.70
Conscientiousness	7	4.08	0.413	0.764	
Competence	4	3.91	0.501	0.739	0.60
Dutifulness	3	4.30	0.469	0.674	0.66

Table 4.4: The number of included items, means and standard deviation, and coefficient cronbach's α for the scales of facets of the Big Five. The available comparative reliability coefficients are shown. Of the scales with insuffiencient reliability, the descriptive statistics are omitted.

the mean and standard deviation are not reported. The low internal consistency may be due to the fact that almost all items of compliance are reversely worded which may reduce their distinctiveness. In fact, trait indicativity, i.e. the degree of obviousness of the item concerning the trait to be measured, contributes considerably to the reliability of an item (Johnson, 2004). Because the facet of altruism missed the treshold of .60 very slightly it was included in the further analysis and its results will be carefully interpreted. The remaining facets reached acceptable and good values of internal consistency. Regarding the facet of modesty, the two items of "I think I am better than others" and "I boast with my virtues" were removed in order to improve the internal consistency. Thus the factor of agreeableness was computed with the remaining four facets.

Unfortunately, the facet of self-consciousness also shows an unacceptable value of cronbach's α (0.310) and was therefore also omitted in the further analysis. The facet of openness shows a fairly low internal consistency which is however comparable to that of the much larger English speaking sample. With respect to the facets of conscientiousness, both possess higher internal consistency in this study than in the comparative sample. Of the items of dutifulness, the items "I break rules." was removed as it decreased the value of cronbach's α considerably.

Overall, it can be concluded that most of the facets of the Big Five show at least acceptable internal consistency since they contain only four items or less. Moreover, the values of cronbach's α are comparable to those of the English version. Therefore, the reliability of the included facets is considered as established.

The scale of the **strength of personality** scale (Noelle-Neumann, 1985) consists of ten binary items. In a validation study a split-half reliability of .78 and a two factor structure of internal and external sources of influenceability was demonstrated (Weimann,

	No. of items	Mean	Std.	cronbach's α
Strength of personality	10	7.89	1.835	*0.608*
Networking	19	2.66	0.408	0.851
Establishment	6	2.40	0.559	0.801
Use	7	2.79	0.473	0.754

Table 4.5: The number of included items, means and standard deviation, and coefficient cronbach's α for the scales of strength of personality and networking.

1991). In this study however, a principal component analysis of the ten items resulted in three factors with eigenvalues greater than one. The items and their factor loadings on each factor are listed in appendix C.3 in table C.4. The original items can be seen in the complete questionnaire in appendix A. The first factor seems to represent the notion of self-esteem and taking lead whereas the second and third factor relate to others. The second factor expresses the perceived view of others on oneself as well as the comparison to them while the third factor conveys the relation to others. Furthermore, the scale shows a barely acceptable reliability with a cronbach's α of 0.608. It is integrated in the further analysis, however, resulting inferences have to be interpreted carefully. The mean and standard deviation as well as the cronbach's α is included in table 4.5 which also includes these statistics for the networking scale.

Also, the properties of the **networking** scale were examined. The networking scale contains 19 statements of different behaviors. Participants specify the frequency of showing these behavior from the option of "never / very rarely", "sometimes", "often", "very often / always". A confirmatory principal component analysis was conducted in order to replicate the three-factorial structure delineating the functions of establishing, maintaining, and using contacts in one's personal network described in the original study of Wolff and Moser (2006). The factors of establishing and using contacts were represented by the data, however, the items of the maintenance aspect did not build a single factor, but instead spread over all three factors. Table C.5 in appendix C.3 shows factor loadings for all items of the networking scale. Next to a general networking score composed of all items, two facet scores were built following the factorial structure of the principal component analysis. Thus, the facet of establishing contacts contains all except one of the corresponding items and also one item of the designated maintenance facet, namely "I use events such as conferences to talk to acquaintances about personal issues." The facet of using the personal network consists of all its designated items. As the three resulting scales show satisfactory values of cronbach's α, their reliability is assumed.

4.4   Results

The size of the personal networks as well as the establishment of new ties are investigated as dependent variables. Personal network size is measured using the number of links to other profiles displayed on a profile. The degree of attempting to establish new contacts is assessed with the question: "How many person have you added to your contact lists who you did not know at the time of establishing the link?". The distributions of both dependent variables show the characteristic pattern of network variables with an accumu-

lation in the low range and a very long tail in the upper ranges (Barabasi, 2003). The size of personal networks ranges from 5 to 15'874 contacts with a mean of 180, but a much lower median of 111 contacts (see figure 3.9 in section 3.2.3.5). Similarly, the number of unknown contacts added ranges from 1 to 300 with a mean of 12 and a equally lower median of 5. Because the dependent variables are not distributed normally, nonparametric statistics such as Pearson's χ^2-test and Kendall's τ correlation coefficient are used.

As multiple hypotheses are tested concerning each of the dependent variables, the implications for the assumptions of significance have to be considered. The level of significance denotes the probability of a type 1 error, i.e. rejecting the null hypothesis although it is true. For any hypothesis tested the significance level could also be reached due to a however unlikely chance effect. When testing multiple hypotheses, for each hypothesis a chance effect may be at play and consequently the likelihood that one of the tested hypothesis reaches significance increases. In order to avoid a type 1 error in multiple hypotheses testing, the level of significance should be correspondingly lowered. A conservative correction method is the Bonferroni correction which requires dividing the level of significance α by the number of tests conducted. Therefore, the level of significance is corrected for each of the below tested classes of sociodemographic variable, motivation, and personality variables.

4.4.1 Personal network size

First, the relationship between the size of the personal networks in the SNS and the sociodemographic background was examined. This category included the six variables of age, sex, highest educational degree, profession, as well as experience with and affinity for the Internet. Consequently, the level of significance was divided by six resulting in an corrected $\alpha_{0.01}$ of 0.0016 and $\alpha_{0.05}$ of 0.0083. Of the sociodemographic variables, only sex and the highest educational degree show a small, but significant relationship with the size of personal networks. Men have larger personal networks in the SNS (Kendall-τ = 0.120, p = .0056). The educational degree relates positively to large networks, i.e. those who report a higher educational degree also have larger personal networks in the SNS (Kendall-τ = 0.124, p = .0028). The relations with age, profession, Internet experience and affinity, do not reach significance after correcting for multiple testing. The statistics are reported in appendix C.4 in tables C.6 and C.8.

4.4.1.1 Motivation

The first hypothesis (H_1) assumes differences in the size of personal networks depending on the various motivations of SNS use. As the correlations of the four factors are tested, the level of significance is corrected accordingly and is included in table 4.6. Of the four motivational factors, the factors of keeping and reactivating contacts (Kendall-τ = 0.163, p = .0000) and of managing the personal network (Kendall-τ = 0.242, p = .0000) correlate significantly with personal network size. Thus, persons who use the SNS in order to stay in contact with acquaintances accumulate larger personal networks on them. Also, aiming to manage one's social network relates to more links displayed. The causal direction of correlations is not established, thus, this may be due to a need to manage an extensive personal network in real life or due to the wish for a simple solution, i.e. assembling all contacts in one application. On the other hand, intending to establish new ties, e.g. for

job opportunities or representational reasons, does not lead to larger personal network in the SNS nor does looking for entertainment. Table 4.6 lists the correlation coefficients of Kendall's τ between the motivational factor and the size of the personal networks (denoted with "size") as well as with the number of unknown contacts in the personal network. Significant correlations are marked with an asterisk. It can be concluded that the hypothesis H_1 that size of the personal network in SNS is influenced by users' motivation for the SNS use is supported.

4.4.1.2 Personality

Concerning personality, a total of 17 variables was analyzed regarding personal network size and accordingly, the level of significance corrected by a factor of 17. In tables 4.7, 4.8, and 4.9 all correlation coefficients of Kendall's τ between the personal network size, the number of unknown persons in the contact lists, and the personality variables are depicted with significant correlations marked with asterisks.

For the factor of extraversion and its related facets, an overall positive relationship was predicted (H_2). The hypothesis is supported by the positive correlations which reach the corrected level of significance. Extraversion and the facets of warmth and gregariousness correlate highly significantly with the size of personal relationships ($\tau = 0.160$, p = .0000; $\tau = 0.150$, p = .0000; $\tau = 0.149$, p = .0000, respectively) and the facet of positive emotions correlates slightly lower, but still significant ($\tau = 0.114$, p = .0019). Thus, outgoing persons may also act sociable on the Internet and accumulate more persons on their contact lists.

The positive relationship between agreeableness and personal network size (H_3) could not be found as all correlations of agreeableness and its facets are not significant. This suggests that agreeableness denotes rather getting along than meeting or getting acquainted with persons. Thus, H_3 is rejected.

The next hypothesis (H_4) concerned the impact of self-consciousness on the number of displayed contacts in the SNS. Due to insufficient reliability of the scale it could not be tested .

Conscientiousness and its facets were assumed to have a positive impact on the size of personal networks in SNSs (H_5) because traits such as competence or dutifulness may be socially attractive. Of the three variables, only competence correlates significantly with the network size ($\tau = 0.118$, p = .0015) while dutifulness has no impact. Competent persons rather accumulate larger networks in SNS, however the effect is rather small. The factor conscientiousness shows a positive tendency concerning personal network size which is likely due to the influence of the facet competence. In sum, H_5 is partly supported indicating that competence is appealing to others.

Also the last of five factors, openness to actions, was expected to be positively associated with the size of personal networks (H_6). However, this facet does not correlate with the personal network size displayed in the SNS und consequently, H_6 is not supported.

Both of the included single constructs, strength of personality and networking, correlate positively with personal network size as was assumed in the corresponding hypotheses (H_7 and H_8). The impact of the strength of personality is rather weak with a Kendall's τ of 0.123 (p = .0011), but this effect might be underestimated due to the low reliability of the scale (West and Finch, 1997). The general networking concept shows the strongest

Correlations of Kendall τ_b		Size	Unknowns	Keeping	New ties	Management	Entertainment
Size	Correlation	1	0.237**	0.163**	0.027	0.242**	0.058
	Sig. (2-sided)	.	0.0000	0.0000	0.4857	0.0000	0.1625
	N		388	388	388	388	388
No.unknown contacts	Correlation		1	0.000	0.257**	0.101*	0.045
	Sig. (2-sided)		.	0.9964	0.0000	0.0141	0.3104
	N		390	390	390	390	390
Keeping and reactivating	Correlation			1	0.066	0.185**	0.020
	Sig. (2-sided)			.	0.1446	0.0000	0.6860
	N			390	390	390	390
New ties	Correlation				1	0.135**	-0.006
	Sig. (2-sided)				.	0.0020	0.8909
	N				390	390	390
Management	Correlation					1	-0.006
	Sig. (2-sided)					.	0.9016
	N					390	390
Entertainment	Correlation						1
	Sig. (2-sided)						.
	N						390

** The correlation is significant at the level of significance of 0.01 corrected for multiple test, i.e. $\alpha/4 = 0.0025$.

* The correlation is significant at the level of significance of 0.05 corrected for multiple test, i.e. $\alpha/4 = 0.0125$.

Table 4.6: The Kendall-τ correlations of personal network size and the number of unknown person in the contact list with the motivational factors. Abbreviations used: unknowns: number of unknown persons added, Keeping: keeping in contact and reactivating

τ	Size	Unknown	Extra	Warmth	Greg	Pos	Agree	Trust	Alt	Mod
Size	1	0.237**	0.160**	0.150**	0.149**	0.114*	-0.015	0.041	0.008	-0.067
	.	0.0000	0.0000	0.0000	0.0000	0.0019	0.6660	0.2638	0.8210	0.0806
	396	388	373	373	373	373	373	373	373	373
Unknown		1	0.144**	0.152**	0.097	0.113	0.018	0.015	-0.010	-0.042
		.	0.0002	0.0001	0.0147	0.0046	0.6333	0.7016	0.8134	0.3116
		390	367	367	367	367	367	367	367	367
Extra.			1	0.703**	0.676**	0.585**	0.207**	0.246**	0.149**	-0.166**
			.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
			375	375	375	375	375	375	375	375
Warmth				1	0.475**	0.351**	0.262**	0.241**	0.232**	-0.073
				.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0750
				375	375	375	375	375	375	375
Greg.					1	0.270**	0.112	0.135**	0.075	-0.116
					.	0.0000	0.0029	0.0004	0.0557	0.0041
					375	375	375	375	375	375
Pos.						1	0.143**	0.233**	0.118*	-0.253**
						.	0.0002	0.0000	0.0026	0.0000
						375	375	375	375	375
Agree							1	0.510**	0.586**	0.199**
							.	0.0000	0.0000	0.0000
							375	375	375	375
Trust								1	0.220**	-0.074
								.	0.0000	0.0682
								375	375	375
Alt.									1	0.096
									.	0.0207
									375	375
Mod.										1
										.
										375

** The correlation is significant at the level of significance of 0.01 corrected for multiple test, i.e. $\alpha/17 = 0.00059$.
* The correlation is significant at the level of significance of 0.05 corrected for multiple test, i.e. $\alpha/17 = 0.00294$.

Table 4.7: The Kendall-τ correlations of personal network size and the number of unknown persons in the contact list with the personality varibles. Each correlation is specified by the τ coefficient in the upper row, the p-value in the middle, and the sample size in the lower row. Abbreviations used: size: personal network size, unknowns: number of unknown persons added, extra: extraversion, greg: gregariousness, pos: positive emotions, agree: agreeableness, alt: altruism, mod: modesty.

Table 4.8: The Kendall-τ correlations of personal network size and the number of unknown persons in the contact list with the personality variables. Each correlation is specified by the τ coefficient in the upper row, the p-value in the middle, and the sample size in the lower row. Abbreviations used: size: personal network size, unknowns: number of unknown persons added, extra: extraversion, greg: gregariousness, pos: positive emotions, agree: agreeableness, alt: altruism, mod: modesty, tend: tender-mindedness, cons: conscientiousness, comp: competence, duti: dutifulness, actions: openness to actions, S o P: strength of personality, net: networking, build: network building, use: network use.

τ	Tend	Cons	Comp	Duti	Actions	S o P	Net	Build	Use
Size	-0.030	0.107	0.118*	0.071	0.030	0.123*	0.212**	0.179**	0.186**
	0.4199	0.0032	0.0015	0.0619	0.4173	0.0011	0.0000	0.0000	0.0000
	373	373	373	373	373	368	364	364	364
Unknown	0.052	-0.042	-0.013	-0.065	0.096	0.054	0.107	0.047	
	0.1977	0.2811	0.7562	0.1172	0.0155	0.1889	0.0054	0.2339	
	367	367	367	367	367	363	363	363	
Extra.	0.129**	0.151**	0.173**	0.087	0.265**	0.214**	0.349**	0.313**	0.311**
	0.0006	0.0000	0.0000	0.0253	0.0000	0.0000	0.0000	0.0000	0.0000
	367	367	367	367	367	363	363	363	363
Warmth	0.165**	0.121*	0.147**	0.059	0.213**	0.162**	0.309**	0.308**	0.237**
	0.0000	0.0016	0.0002	0.1431	0.0000	0.0001	0.0000	0.0000	0.0000
	375	375	375	375	375	370	366	366	366
Greg.	0.097	0.124*	0.159**	0.048	0.264**	0.160**	0.330**	0.320**	0.279**
	0.0126	0.0012	0.0000	0.2270	0.0000	0.0001	0.0000	0.0000	0.0000
	375	375	375	375	375	370	366	366	366
Pos.	0.073	0.145**	0.135**	0.125*	0.174**	0.223**	0.241**	0.226**	0.216**
	0.0613	0.0002	0.0006	0.0019	0.0000	0.0000	0.0000	0.0000	0.0000
	375	375	375	375	375	370	366	366	366
Agree	0.565**	0.070	0.022	0.097	0.028	-0.002	0.119*	0.005	0.135**
	0.0000	0.0597	0.5556	0.0132	0.4638	0.9548	0.0012	0.8959	0.0003
	375	375	375	375	375	370	366	366	366
Trust	0.136**	0.080	0.043	0.092	-0.010	0.065	0.089	0.057	0.101
	0.0005	0.0354	0.2758	0.0222	0.7991	0.1022	0.0177	0.1384	0.0082
	375	375	375	375	375	370	366	366	366
Alt.	0.372**	0.157**	0.137**	0.148**	0.077	0.026	0.170**	0.014	0.192**
	0.0000	0.0001	0.0006	0.0003	0.0502	0.5146	0.0000	0.7278	0.0000
	375	375	375	375	375	370	366	366	366
Mod.	0.048	-0.261**	-0.301**	-0.145**	-0.088	-0.310**	-0.123	-0.149**	-0.103
	0.2448	0.0000	0.0000	0.0006	0.0312	0.0000	0.0020	0.0002	0.0108
	375	375	375	375	375	370	366	366	366

** The correlation is significant at the level of significance of 0.01 corrected for multiple test, i.e. $\alpha/17 = 0.00059$.

* The correlation is significant at the level of significance of 0.05 corrected for multiple test, i.e. $\alpha/17 = 0.00294$.

τ	Tend	Cons	Comp	Duti	Actions	S o P	Net	Build	Use
Tend.	1	0.108	0.085	0.103	0.082	0.037	0.112	0.030	0.095
	.	0.0051	0.0321	0.0112	0.0346	0.3495	0.0033	0.4448	0.0145
	375	375	375	375	375	370	366	366	366
Cons.		1	0.776**	0.669**	0.088	0.229**	0.197**	0.109	0.175**
		.	0.0000	0.0000	0.0214	0.0000	0.0000	0.0041	0.0000
		375	375	375	375	370	366	366	366
Comp.			1	0.340**	0.104	0.279**	0.229**	0.156**	0.193**
			.	0.0000	0.0082	0.0000	0.0000	0.0001	0.0000
			375	375	375	370	366	366	366
Duti.				1	0.044	0.105	0.105	0.008	0.116
				.	0.2756	0.0115	0.0075	0.8413	0.0036
				375	375	370	366	366	366
Actions					1	0.148**	0.187**	0.202**	0.137**
					.	0.0002	0.0000	0.0000	0.0004
					375	370	366	366	366
S o P						1	0.236**	0.256**	0.179**
						.	0.0000	0.0000	0.0000
						370	366	366	366
Netw.							1	0.656**	0.709**
							.	0.0000	0.0000
							366	366	366
Build								1	0.405**
								.	0.0000
								366	366
Use									1
									.
									366

** The correlation is significant at the level of significance of 0.01 corrected for multiple test, i.e. α/17 = 0.00059.
* The correlation is significant at the level of significance of 0.05 corrected for multiple test, i.e. α/17 = 0.00294.

Table 4.9: The Kendall-τ correlations of personal network size and the number of unknown persons in the contact list with the personality varibles. Each correlation is specified by the τ coefficient in the upper row, the p-value in the middle, and the sample size in the lower row. Abbreviations used: tend: tender-mindedness, cons: conscientiousness, comp: competence, duti: dutifulness, actions: openness to actions, S o P: strength of personality, net: networking, build: network building, use: network use.

correlation with the size of the personal networks of all included variables (τ = 0.212, p = .0000). Its components, network building and network using, relate positively to network size as well (τ = 0.179, p = .0000, τ = 0.186, p = .0000, respectively). Thus, both H_7 and H_8 are accepted. Persons with a stronger personality display larger personal networks in SNSs as do those who customarily attend to their personal network, either in seeking to extend it or in keeping the potential benefits in mind.

4.4.2 Establishing new ties

Concerning the degree to which persons attempt to make contacts using the SNS, likewise the influence of the sociodemographic background is considered before examining the hypotheses of the effects of the motivational and personality variables. Also here, the level of significance is adapted accordingly for each category of variables. For the six sociodemographic variables, no significant influence is found when controlling for multiple testing. Thus, the addition of unknown others to the personal contact list is independent from the sociodemographic background. It appears that using the SNS to establish new contacts is attempted by users of all sociodemographic groups such as sex equally. The corresponding tests are reported in the tables C.7 and C.8 in appendix C.4.

4.4.2.1 Motivation

Differences in the motivation to use SNS were also expected to be differently associated with the establishment of new links, i.e. the addition of previously unknown persons to one's contact list (H_9). The correlations of all factors with the number of unknown contacts in the contact lists are included in table 4.6 of the previous section on the personal network size. Intuitively, the intention of establishing new ties should result in the corresponding behavior which is confirmed by the positive correlation (τ = 0.257, p = .0000). Rather surprisingly, also the motivation to manage one's personal network correlates significantly with the number of unknown persons added with a correlation coefficient of τ = 0.101 (p = .0141). This might be explained with the intention of persons of keeping an online address book. Conceivably, persons attempt to gather all sorts of contacts therein including contacts which might become relevant in the future. The remaining motivational factors of keeping and reactivating contacts and of entertainment did not correlate significantly with the number of unknown persons added. In conclusion, the hypothesis H_9 that the tendency to add unknown persons depends on users' motivations is supported.

4.4.2.2 Personality

With respect to the addition of unknown persons, hypotheses were posited only for some of the investigated personality variables where fitting. The results of the hypothesized associations are discussed below. The correlations of Kendall-τ for all personality variables with the number of unknown persons added are depicted in tables 4.7, 4.8, and 4.9 of the previous section on results.

The trait of extraversion together with its subfacets was assumed to influence approaching others online (H_{10}) as well as it does offline. For the factor extraversion, the hypothesis is confirmed by the data as extraversion correlates significantly with the number of unknown persons added (τ = 0.144, p = .0002). Of the subfacets, only warmth

shows a significant relationship ($\tau = 0.152$, p = .0001). However, the correlations of gregariousness and positive emotions with the number of unknown persons added show the same tendency ($\tau = 0.097$, p = .0147, and $\tau = 0.113$, p = .0046, respectively). Thus, it seems that in particular, amiable and warm persons extend their personal networks online whereas the influence of gregariousness and positive emotions are not as prevalent or noticeable in the Internet. Thus, the hypotheses H_{10} receives partial support.

Regarding self-consciousness, also the relationship with unknown persons added could not be investigated due to the insufficient reliability of the scale.

Persons who are rather open to new actions were also thought to add more unknown person to their contact lists than persons lower on this trait (H_{11}). This hypothesis H_{11} is rejected as the correlation did not reach significance ($\tau = 0.096$, p = .0155). However, an examination for each gender showed a strong effect in that openness for actions shows a strong relationship with adding unknown others for women ($\tau = 0.248$, p = .0018, n = 92) whereas no relationship for men ($\tau = 0.048$, p = .3002, n = 271) could be found. The portion of women adding unknown persons at all is rather small (n = 92) compared to that of men (n = 271). Because with a bigger sample size, the level of significance is more likely to be reached, this effect is considerable.

Lastly, regarding the networking concept, a positive association with establishing new contacts was assumed for the general concept (H_{12}). With regard to its components, a positive relationship was predicted for the component of network building, but not for network use. Network building correlates highly significant with adding unknown persons ($\tau = 0.192$, p = .0000). This is not mirrored for the general concept which shows a weaker tendency ($\tau = 0.107$, p = .0054). As predicted, network use is not associated with adding unknown persons ($\tau = 0.047$, p = .2339). Thus, the last hypothesis H_{12} is also supported partly.

4.5 Discussion

In this chapter, the general research question whether persons with large personal networks differ from those with smaller personal networks was explored. In detail, the relationship of individual characteristics with two aspects of the personal networks displayed was investigated, namely the association with their size and with the use of the SNS specifically to establish new contacts. As individual attributes, the sociodemographic background, motivations, and personality were analyzed.

With respect to the size of personal networks in SNSs, men as well as persons with a higher educational background displayed larger networks in the SNS. Further, large personal networks were associated with differing motivations of using the SNS which supported the corresponding hypothesis. Persons with more links in the SNS reported more frequently the intent to stay in contact with other persons they know or have met and also the intent to manage their personal network. Thus, they appear to take greater care of their circle of acquaintances as is corroborated by the strong relationship between network size and the networking concept. Since the aspect of network use of the networking concept also correlated positively with larger networks, this further indicates that the attention to their personal network is is at least partly due to the consideration of the potential benefits an extensive network may provide.

Of the remaining personality traits, all included facets of extraversion, i.e. warmth, gregariousness, and positive emotions, the facet of competence as well as strength of personality were positively related to the size of the personal network. The trait of agreeableness and its subfacets played no role with regard to the size of personal networks nor did openness to actions. The two groups are discussed in turn.

The relationship of network size with extraversion validates the perceived association of users of SNSs between numerous links and extraversion (Tom Tong et al., 2008) and is in line with results from real life (Asendorpf and Wilpers, 1998). It also provides further evidence for the assumption of the contact list as an image of the real life personal network, at least regarding business-focused SNSs. The hypothesized positive relationship with conscientiousness was only partly met because solely the facet of competence correlated with the network size while the facet dutifulness showed no association with it. Because the links in SNSs are nondirectional, the relationship may be explained with the assumed social attractivity of competence, but also with competent persons using SNSs more intensely. In order to determine the directionality of the effect further research is necessary. The correlation of strength of personality with the size of personal networks was rather weak in this study compared to reports of real life (Weimann, 1991). This may be due to its rather low reliability in this study.

In contrast to most studies of offline networks (Kanfer and Tanaka, 1993; Klein et al., 2004; McCarty and Green, 2005), agreeableness is unrelated to maintaining a large personal network. In line with this result, a study investigating the developing networks of college freshman also showed that while predicting a low conflict rate with friends, agreeableness did not predict contact frequency (Asendorpf and Wilpers, 1998). This highlights the difference between meeting or communicating with many persons as represented by extraversion and having amicable relationships with them which is the domain of agreeableness. Finally, open persons did not have larger circles of acquaintances in the SNS than rather conservative persons. Concerning this trait previous research of real life networks has been inconclusive so far: a negative effect has been found regarding popularity while a positive relationship was shown regarding the number of persons dated (Klein et al., 2004; Paunonen and Ashton, 2001). Further research on the role of the factor of openness for the personal network seems necessary.

In sum, it can be said that persons with large networks are rather extraverted, deem themselves competent, engage consciously in networking behavior, and expect to set the pace, i.e. have a strong personality. In contrast, they are not characterized by an emphasis on harmonic interactions with others or by a preference for new actions. Of these traits, the size of the personal networks is best explained with the networking concept and with extraversion since they correlated most strongly. The aspect of competence could be relevant with regard to identifying opinion leaders or candidates for word of mouth marketing campaigns because persons scoring high on competence may express greater credibility than those scoring low.

The second research issue concerned the Internet networkers who try to get to know unknown persons in the SNS. Thus, the relation between individual characteristics and the establishment of new links in the SNS was investigated in order to find out whether the same attributes predict making contacts online as offline. The Internet networkers do not differ in their sociodemographic background from other users indicating that the establishment of new links is attempted by all user groups, e.g. of sex, equally. Con-

cerning the motivation, clear differences were found. The Internet networkers were more motivated to establish new ties and pursued a specific intent with that, e.g. being represented in the Internet or searching for a new employment. Furthermore, they also reported more frequently the motivation to manage their personal network. This corroborates previous results of motivational influences on new relationship in other Internet applications (di Gennaro and Dutton, 2007).

The establishment of new ties was positively associated with two of the three predicted personality traits, extraversion and networking behavior. Of the factor extraversion, only warmth correlated significantly after the adjustment of the significance level. This is assumably the basis for the significant correlation of the factor itself with the establishment of new ties. Congruently, extraversion has been associated positively with the degree of communicating with unknown persons in Internet applications (Birnie and Horvath, 2002). The effects of the facets gregariousness and positive emotions were lower and did not reach significance leading to a partial confirmation of the hypothesis. This suggests that more than being sociable, the aspect of approaching others and being outgoing leads to attempts to get to know new persons and thus to more contacts established in the SNS.

With regard to networking behavior, the aspect of network building was strongly associated with seeking new links in the SNS, as predicted. This shows that the concept can also be reliably employed in online settings although the items cover offline situations. Furthermore, it indicates that the behavioral pattern of networking operates offline as online. The facet of openness to actions was unrelated to new ties in the SNS. However, an explorative analysis dividing the sample by gender showed that this trait plays an important role for women establishing new ties while not for men. This effect can be explained by the female gender role which implies rather reserved than outgoing behavior. In line with this, for women to establish links with unknown persons might be rather liberal.

In sum, Internet networkers are characterized mainly by the same traits as persons with large networks in general. Mostly, the motivation and intent to extend the personal network in order to achieve a goal, e.g. being represented or building the basis for later use, leads to establishing new ties in the SNS. Furthermore, persons establishing links to unknown others appear to be more amiable and, for women, more open to new behaviors. The fact that of the included facets of extraversion only warmth correlated significantly suggests that this facet is more important in online interactions than sociableness or cheerfulness. However, almost half of the newly established links do not lead to further communication or contact. Thus, future research should differentiate the newly established ties between active and inactive ties and explore if persons maintaining newly established and active ties differ from those with inactive ties as well as from those who refrain from establishing new ties.

Several issues may possibly limit these inferences and therefore need to be considered. First of all, bias resulting from questionnaire effects such as intentional faking or social desirability are often assumed. Regarding the intentional reporting of false answers, it has been shown that scores are less easily faked when the items of a scale are not grouped together (Dilchert et al., 2006) as was the case of the items of the Big Five in this study. Generally, most people participate in personality surveys with hopes of learning something about themselves (Johnson, 2005). Especially, because the feedback that participants received would be biased by fake answering, honest response patterns are assumed which is supported by the factorial structures found. The effect of social

desirability describes a response pattern focused on socially appropriate answers. However, anonymity and the survey completion in the Internet both decrease socially desirable answering patterns in contrast to identifiability and completing a paper-and-pencil survey (Joinson, 1999). Thus, effects due to social desirability are not expected. Finally, the administration of the questionnaire on the Internet constitutes a different environment for the completion than the traditional paper-and-pencil method. Comparing these environments, several studies have shown that online measures are as consistent and valid as paper-and-pencil measures (Buchanan et al., 2005; Johnson, 2005). Especially in the Internet, surveys or parts of it may be resubmitted after changing some or all answers which occurs infrequently (Johnson, 2005). This was technically avoided by saving solely the first response set of each unique link sent out. Due to the questionnaire design, the random administration of two different sequences of the questionnaire parts, and the technical precautions, questionnaire bias is largely precluded.

Secondly, temporal effects may play a role in SNS data. Because it can be presumed that contacts are accumulated in the contact lists over time with little or no removals, e.g. deleting a contact or a user leaving the SNS, the size of personal networks as well as the number of unknown persons in the contact lists may be influenced by the duration of membership. In order to control potential temporal effects, the partial Kendall-τ (Kendall and Gibbons, 1990) controlling for the length of membership was computed for all significant correlations. It shows a minor decrease for most correlations after partialling out the influence of the length of the membership. Solely the relations of the size of personal networks with positive emotions as well as with strength of personality decrease considerably. The coefficients of all partial Kendall-τ are depicted in appendix C.5. However, as there is no significance test for coefficients of the partial Kendall-τ (Kendall and Gibbons, 1990), a conclusion regarding significance cannot be drawn. Because the decrease appears minor in most of the correlations, the temporal effect on the found correlations is not considered substantial.

As this study has only assessed the relations on one SNS, the effects may not be valid for other SNSs, as well. Before testing the assumed relations with individual characteristics, the meaning of the links displayed on it was determined providing the foundation for the development of the hypotheses as well as for the inferences drawn. The meaning of the links may differ between SNSs due to a variety of reasons such as different mission statements or ease of establishing links. Consequently, the results should be generalized to other SNSs with care and a special focus on a similar meaning of links. Assuming that the meaning of links on business-focused SNSs is comparable, the results could be generalized within that class of SNSs. Further research is necessary to determine if the same individual characteristics and motivations impact the size of personal networks in leisure-oriented SNSs.

Finally, it might be argued that the effect sizes found are fairly small with sizes of the coefficient Kendall-τ ranging between 0.1 and 0.25. However, correlation coefficients between personality traits and behaviors found in previous studies were around .4 which is only moderately higher (Funder, 2001). Thus, the effect sizes found can be considered within normal range and show the influence of individual characteristics on the personal networks people maintain and simultaneously, on the differences between the human hubs and other persons. Furthermore, it has been shown that small reliabilities of measures result in an underestimation of effects (West and Finch, 1997). Thus, because the relia-

bilities of a part of the employed measures was rather low, this might have led to lower correlation coefficients. The low reliabilities found can be explained with the shortness of the measures used here because the number of items included in a scale increases the reliability coefficient. However, when conducting online surveys, the time necessary to complete the questionnaire is a crucial factor for attracting participants and achieving a low drop-out rate. Further research is necessary to develop reliable, but short measures for the use in the Internet in order to better employ this medium for research.

Concerning the research questions posed initially, it can be concluded that persons with large personal networks in SNSs are extraverted, competent and behave consciously in ways to extend their personal network. In the same vein, persons who establish new ties to unknown persons in the SNS are also more extraverted and engage more in networking behavior which shows the similarity to findings of real life. This indicates that online networkers are the same as offline networkers. The effects were significant although the level of significance was adapted conservatively due to the multiple testing. The impact of two of the included measures, self-consciousness and compliance, could not be examined due to their insufficient reliability. Therefore, the ascribed moderating role of self-consciousness in online environments (McKenna and Bargh, 2000) could not be investigated. Furthermore, the assumption that the facets of the Big Five are better predictors can not be supported with the results. Only competence and dutifulness differed considerably in their relations to the size of personal networks. Although this shows that more precise statements are possible with the employment of the facets, the use of a reliable measure of a broad trait such as extraversion or networking behavior is more efficient for the purpose of identifying persons with large personal networks.

Thus generally, the employment of SNSs data can contribute considerably to research on opinion leadership and related fields if the meaning of the ties of the SNS investigated is known. These research fields and the issue of persons who are willing to relay marketing messages in SNSs will likely gain importance for the goal of using SNSs as marketing channels because users increasingly oppose the placement of advertisements in SNSs (Kubsova and Knappmann, 2008).

4.6 Summary

Drawing on the notion that persons with large personal networks have special characteristics and can therefore be distinguished from others, the relation between individual characteristics and aspects of the personal networks in SNSs was explored in this chapter. For this, an online questionnaire surveying the use of the SNS and personality was provided to users of a business-focused SNS. Together with the self-reports, the relational data as displayed in the SNS was employed. The analyses confirmed the expected motivational influences on the size of personal networks as well as on the establishment of new ties. The intent to keep in contact was associated with larger personal networks whereas the goal of seeking new ties, e.g. because of searching a job, related to establishing links to unknown others. The intent to manage the personal network was associated with both larger personal networks and more new ties established. The results concerning personality traits indicate that most of all extraverted, and specifically amiable persons who consciously engage in networking behavior have larger personal networks in the SNS. These traits also predicted the establishment of new links to unknown persons in the SNS. In

conclusion, the relationship between individual attributes and the personal network which persons built around themselves was shown.

Chapter 5

Conclusion

5.1 Summary of contributions and review of work

The main objective of this work was to provide a sound evaluation of the data of SNSs and thus establish a reliable basis for inferences based on such data. In addition, the presented research concerning the impact of individual characteristics on the displayed personal networks is valuable for the further employment of SNSs data.

The present work makes the following contributions:

- It analyzes the features of SNSs as potential factors of influence of the data of SNSs. The features were classified into the four categories of technical and regulatory framework, mission statement, and culture. Based on these categories, a research scheme of the influence of the features on the elements of a social network was developed. In the conceptual analysis, the potential influences of these factors on the composition of the actors as well as on the number and meaning of links in the social networks developing on SNSs were shown. Thus, it contributes with the first systematic identification of influencing factors which may lead to bias in the data of SNSs. Furthermore, it substantiates two of the proposed influencing effects in field studies.

- It provides the first profound empirical investigation of the motivations and ways in which persons use SNSs. Specifically, it illustrates the composition of personal networks, existing perceptions of ties between strangers, as well as the frequency and motivations for seeking and accepting contact links from unknown persons. A clear focus on relationships existing in real life as opposed to newly established online connections was consistently shown.

- It provides evidence for the effect of individual characteristics on the personal networks established in SNSs. Furthermore, it demonstrates that persons' motivations for SNS use influence their personal networks. In a survey study, it was found that extraverted, competent, and networking oriented persons accumulate larger personal networks. Moreover, extraversion and network orientation also lead to establishing ties with unknown others. Thus, it contributes to the research of attributes of connectors and also to the starting literature on individual antecedents of social networks.

- It provides a partial German translation of the public domain instrument of the International Personality Item Pool representation of the NEO-PI-R^{TM}measuring the prominent personality concept of the Big Five. The factor structure was plausibly replicated and the reliability coefficients of the facet and factor scales showed acceptable values. Consequently, the psychometric properties of the newly translated German scales are comparable to the original English instrument. The reliability and applicability of the German instrument was thus proven.

The contributions build upon each other and were thus reported in several steps. The first chapter introduced the context of this research: new web applications collect vast amounts of personalized and also relational data which can be employed and analyzed for research as well as business purposes. SNSs are an instance of these new Internet applications and due to their huge popularity, they constitute the focus of this work. Moreover, the research questions were motivated and described as well as an overview of the chapters to follow was given.

The foundations for the contributions were established in the second chapter. In the beginning, the main research field of this work, social network analysis, was introduced. The term of social networks was defined and focal concepts such as actor centrality and the strength of ties were illustrated. Moreover, the object of study, SNSs, were described and defined. The profiles of users, as well as the process of establishing a tie, and additional facilities were illustrated. The features of SNSs were categorized into the technical and regulatory framework, the mission statement, and the culture which provided the structure for the third chapter. Furthermore, the importance of the meaning of ties was discussed and the corresponding research issues were detailed. Finally, the research model guiding the contributions was pictured.

The third chapter was divided into a conceptual part and an empirical part containing three studies. In the first part, a conceptual scheme was developed which systematically considers influences of the features of SNSs on the elements of a social network, i.e. actors and ties. The conceptual scheme further distinguished between influences on different aspects concerning actors and ties: Regarding the actors, possible influences on the number or the composition of actors were distinguished whereas with respect to the links, influences on the number or on the meaning of established links were differentiated. Following the research scheme, the features of SNSs, the technical and regulatory framework, mission statement, and culture were analyzed concerning their possible impact on these aspects of either actors or links. In this way, possible sources of influence of the SNS itself were identified. While the regulatory framework may only influence the types of nodes in the social network, the technical framework and the mission statement both shape the homogeneity of actors as well as the number and meaning of the links established in the SNS. Lastly, the culture may also affect the homogeneity of actors and the number of links established.

The first study in the empirical part investigated the influence of a fake hub on the social network as an example of the influence of different types of nodes in the social network on its structure. It was posited that a node which has exceedingly many ties in the social network can influence the structure of the social network which constitutes a bias if its ties imply a different meaning than the ties of the other nodes. The impact of a fake hub was analyzed in a discussion forum on 14 data sets. In order to evaluate its influence, the structure of the social networks with and without the fake hub was compared. In the

comparison of degree centrality, the fake hub resulted as the most central actor in the 14 data sets. Furthermore, analyzing the main communication patterns its potential to alter the structure of the social networks was shown. Thus, the study provided evidence for the influence of the fake hub. Secondly, a study concerning the effect of the linking costs was conducted in order to study this effect of the technical framework on the number of links established in the social network. It was hypothesized that the higher the linking costs in a SNS, the fewer links are realized. The hypothesis was tested by a comparison of the number of links which profiles displayed on two SNSs with different linking costs. The results showed that users of the SNS with higher linking costs had significantly lesser links than users on the SNS with lower linking costs. First evidence for the effect of the linking costs on SNSs was thus provided. Thirdly, the information of links in SNSs was evaluated. For this, a survey study was conducted on a business-focused SNS which focused on user's motivations and ways of use of the SNS. A focus on existing connections was shown. The personal networks of users were composed mostly of work colleagues, acquaintances and friends. Links between unknown third parties are perceived to denote a professional real life, but probably lose connection. This perception also provides evidence for the focus on real life relationships. Moreover, only a minority of users seek to establish links to persons they do not yet know. However, a considerable portion of the links to unknown persons is sought with persons in the extended network such as requesting a link of the friend of a friend. This further corroborates the focus on the real life social network. Thus, it was concluded that on busines-focused SNSs only a small portion of the displayed links could be assumed insignificant and therefore considered as absent ties. The majority of the displayed ties depicted a person's weak ties of several contexts such as work contacts or private acqaintances.

The fourth chapter explored the effects of individual characteristics on the size of personal networks as well as on the establishment of links with unknown persons. Initially, the employed concepts of motivation and personality as well as the measurement of psychological concepts were briefly introduced. The study combined two sources of data employing a survey on the individual characteristics and the data in the SNS concerning the size of the personal networks. The predicted effects were tested using correlational analysis. It was shown that extraverted, competent and consciously networking persons have larger personal networks. Furthermore, also the strength of the personality related positively to the size of personal networks. With regard to establishing links to unknown persons, solely the facet warmth and the networking aspect network building correlated positively with establishing new ties. Thus, evidence of a clear effect of individual characteristics was provided. Moreover, the results indicate that the same traits predict offline as well as online networking behavior and thus, large personal networks.

This chapter concludes by recapitulating the main objective and stating the research contributions of this work. Furthermore, it recapitulates the chapters and summarizes the answers to the initially posed research questions. The work closes with an outlook on further research in this field.

Based on the findings presented in this work, the initially posed research questions can be answered as follows:

1. *Which factors influence the use of SNSs and the resulting personal networks?*

    The potential of SNS features to impact the user population as well as the links established in it was conceptually derived. In detail, an impact of the technical

framework and the mission statement on the homogeneity of the users as well as on the number and the meaning of the links was deduced. Further, it was inferred that the regulatory framework may influence the type of actors in SNSs. Lastly, effects of the developed culture of the SNS on the homogeneity of users and the number of established links were posited. Field studies investigating two of the deduced influences provided supporting evidence for the assumed effects. The first field study analyzed the influence of a fake hub on the structure of the social networks and demonstrated its biasing effect. The proposed limiting effect of the linking costs was confirmed in a second field study showing that on the SNS with higher linking costs less links were established than on the one with lower linking costs. In sum, it is concluded that the different features of SNSs influence both the composition of actors as well as the number and meaning of ties of the resulting social networks in them.

2. *What is the information in SNSs?*

The survey study on a German business focused SNS revealed personal networks of medium size with a majority of personally known contacts, i.e. colleagues, acquaintances, and friends. This focus on existing connections was backed up by the information people perceived from the displayed links between strangers. Moreover, a considerable part of newly established ties linked person who were already closely indirectly connected, e.g. contacts of contacts. Consequently, the information of links in business-focused SNSs conveys a meaningful, yet loose and rather professional connection.

3. *To what extent do individual differences shape the personal networks displayed in SNSs?*

The results of the survey study provide evidence that a person's characteristics play a distinct role for the personal network he builds and maintains and consequently also for social networks in general. It was shown that extraverted persons and those who customarily attend to their personal network display larger networks. Also competent persons and those with a strong personality accumulate more contacts. Regarding the use of SNSs to extend the personal network, it was shown that again extraversion, particularly warmth, and network orientation, particularly network building, further the establishment of links to previously unknown persons. The concordance of traits influencing the size of personal networks and the establishment of new ties on the SNS indicates a strong similarity between online and offline networking.

All in all, it was demonstrated that the relational information on business-focused SNSs is meaningful contrary to other accounts. Deductive and empirical evidence for the impact of the SNS itself was provided. Moreover, the role of individual characteristics in the process of social network development was shown. Summing up, it is concluded that the features of the SNS itself pose a general influence while motivations and traits constitute individual-related sources of influence on the relational information.

5.2   Future work

Social networks sites have recently been extremely popular and are gaining importance for academic as well as business-related research. As SNSs are still a new object of research, many open questions remain which need to be resolved. Several issues could extend and broaden the this work.

Factors of influence on SNSs data. On the basis of the research scheme, several potential effects of the SNS itself were derived in the conceptual analysis. As there is no previous research on influence factors concerning SNS data, the posited effects could be empirically investigated by further research. For instance, the influence of mission statement and of the culture on the number and meaning of established ties could be explored by comparative studies between e.g. leisure oriented and business focused SNSs. The identified categories of features of SNSs could also be applied in the related area of research concerning the credibility of the website itself which influences the impact of word of mouth occuring on it (Brown et al., 2007).

The information of SNSs. The relational information on a business focused SNS was shown to be meaningful. However, an inference regarding leisure oriented SNSs was not derived due to the manifold differences. The information contained there poses an interesting issue for future research. Leisure oriented SNSs may be more attractive objects of study for marketing purposes because they attract more users than business focused SNSs and, more importantly, their users may spend more time on the SNSs leading to an enhanced reachability.

Individual-related influences. This work demonstrated that individual attributes relate to the size of personal networks. As studies characterizing human hubs or connectors are still sparse, further research may provide important insights into the development of social networks. For instance, the research could be extended to the level of the general social network investigating the role of individual attributes in connection with specific network positions such as bridging many different groups. With regard to possible applications of SNSs for marketing purposes, the relationships between individual characteristics, word of mouth behavior and source credibility poses a challenging issue for future research.

Appendix A

The complete questionnaire

Persönlichkeiten im Web 2.0-Teil 1/5| *Personalities on the net, part 1/5*

Auf dieser Seite drehen sich die Fragen um das Nutzungsverhalten und den erwarteten Nutzen von Xing/OpenBC. | The questions on this page revolve around the manner of use and the expected benefit of Xing.

Bitte beantworten Sie die Fragen, wie es auf Sie am ehesten zutrifft. Falls Sie Ihre Meinung nach dem Ankreuzen einmal ändern sollten, können Sie Ihre Antwort durch Anklicken eines anderen Kästchens korrigieren. Das zuerst gesetzte Kreuzchen wird damit automatisch gelöscht. | Please tick the answers that apply best to you. You can change your answer by simply ticking a different box.

Frage 1
Was stellt ein Kontakt auf Xing/openBC hauptsächlich für Sie dar? |*What constitutes a contact on Xing for you?*

- Eine enge professionelle oder private Beziehung. |*A close professional or private relationship.*
- Eine kollegiale Beziehung. | *A professional relationship.*
- Eine flüchtige Bekanntschaft. | *A loose acquaintanceship.*
- Eine Möglichkeit, einen ehemaligen oder losen Kontakt bei Bedarf wiederherstellen zu können. | *The possibility to reactivate a former or loose contact.*
- Eine strategische Erweiterung meines Netzwerkes. | *A strategic expansion of my network.*

Frage 2
Wie viele Personen umfasst Ihre Kontakteliste auf Xing/openBC? | *How many persons do you have on your contact list?*

- 0-9
- 10-19
- 20-29
- 30-39
- 40-49
- 50-74
- 75-99
- 100-124
- 125-149
- 150-200
- >200

Frage 3

Welchen Anteil Ihrer Kontakte auf Xing/openBC würden Sie als Freunde bezeichnen? (in %) | *Friends constitute __% of your contacts on Xing.*

Frage 4

Welcher Anteil Ihrer auf Xing/openBC aufgeführten Kontakte ist mit Ihnen verwandt? (in %) | *Relatives constitute __% of your contacts on Xing*

Frage 5

Welchen Anteil Ihrer Kontakte auf Xing/openBC würden Sie als Bekannte bezeichnen? (in %) | *Acquaintances constitute __% of your contacts on Xing*

Frage 6

Welcher Anteil Ihrer Kontakte auf Xing/openBC sind Kollegen aus Ihrem jetzigen oder früherem Arbeitsumfeld? (in %) | *Former and current colleagues constitute __% of your contacts on Xing*

Frage 7

Welcher Anteil Ihrer Kontakte auf Xing/openBC sind wiedergefundene oder erneuerte private Kontakte, die Sie vorher aus den Augen verloren hatten? (in %) | *Reactivated contacts constitute __% of your contacts on Xing*

Frage 8

Welcher Anteil Ihrer Kontakte auf Xing/openBC sind Personen, die Sie nur einmalig getroffen haben, z.B. auf einem Kongress oder einer Feier? (in %) | *Persons you have met only once constitute __% of your contacts on Xing*

Frage 9

Wie viele Personen haben Sie in Ihrer Kontakteliste auf Xing/openBC, die Sie zum Zeitpunkt der Kontakterstellung nicht persönlich kannten? (Angabe als Zahl) Falls Sie "0" eingeben, überspringen Sie bitte Fragen 10 bis 15! | *How many persons do you have in your contact list whom you did not personally know at the time of the link creation? If you enter "0", please skip questions 10 to 15!*

Frage 10

Haben Sie schon einmal auf Xing/openBC eine Kontaktanfrage an eine Ihnen bisher unbekannte Person gestellt? | *Have you ever posed a contact request to a person who you did not know personally?*

- ◉ Ja / *Yes*
- ◉ Nein / *No*

Frage 11

Wenn ja, aus welcher Motivation? (Kreuzen Sie bitte alles Zutreffende an.) | *If yes, what was your motivation? (Please check all applicable answers.)*

☐ Ich habe sie in den Kontakten meiner Kontakte gesehen. | *It was a contact of a contact.*

☐ Ich habe nach dieser Person auf Xing (openBC) gesucht. | *I have searched for that person.*

☐ Ich habe sie nach einer allgemeinen Suche auf Xing (openBC) gesehen. | *I have found him / her after a general search.*

☐ Ich habe sie in einem Diskussionsforum auf Xing (openBC) gesehen. | *I have seen him/her on the discussion forum on Xing.*

☐ Ich habe sie im Gästebuch eines Kontaktes gesehen. | *I have seen him/her in the guest book of a contact.*

☐ Ich habe ihr Profil in einer Gruppe gesehen. | *I have seen his/her profile in a group.*

☐ Ich habe sie zufällig auf Xing (openBC) gesehen. | *I have seen him/her on Xing by chance.*

☐ Sie wurde mir von einer dritten Person vorgestellt oder empfohlen. | *He / She was introduced or recommended to me by a third person.*

Frage 12

Haben Sie schon einmal auf Xing/openBC eine Kontaktanfrage von einer Ihnen bisher unbekannten Person angenommen? | *Have you ever accepted a contact request from a person who you did not know personally?*

○ Ja | *Yes*

○ Nein | *No*

Frage 13

Wenn ja, aus welcher Motivation? (Kreuzen Sie bitte alles Zutreffende an.) | *If yes, what was your motivation? (Please check all applicable answers.)*

☐ Warum nicht? | *Why not?*

☐ Ich wollte den Kontakt nicht ablehnen. | *I did not want to refuse the contact.*

☐ Ich habe mir ihr Profil angesehen und fand es interessant. | *His profile looked interesting.*

☐ Die Kontaktanfrage war ansprechend. | *The contact request was posed appealingly.*

☐ Unsicherheit (Vielleicht kennt diese Person mich?) | *I was unsure about knowing this person.*

Frage 14

Wie viele Ihrer Kontakte haben Sie bisher noch nicht persönlich kennengelernt? (Angabe als Zahl) Falls Sie "0" eingeben, überspringen Sie bitte Frage 15! | *How many of your contacts haven't you met personally until now? (If you enter "0", please skip question 15!)*

☐

Frage 15

Wie häufig haben Sie mit den Personen, die Sie noch nicht persönlich kennengelernt haben, Kontakt? (z.B. über Xing, Telefon, email?) | *How often do you communicate with the persons you haven't met, yet? (e.g. via Xing, phone, email?)*

○ täglich | *Daily*

○ Mehrmals in der Woche | *Several times per week*

○ wöchentlich | *Weekly*

○ monatlich | *Monthly*

○ hin und wieder | *At times*

○ gar nicht | *Not at all.*

Frage 16

Unabhängig vom persönlichen Kennenlernen, wurden Ihre anfänglichen Erwartungen bezüglich neuer Kontakte in den meisten Fällen ... / *Irrespective of meeting the other, have your initial expectations about the new contacts mostly been...*

- ○ erfüllt. / *met.*
- ○ teilweise erfüllt. / *partly met.*
- ○ nicht erfüllt, aber andere positive Folgen ergaben sich. / *not met, but other positive outcomes resulted.*
- ○ nicht erfüllt. / *not met.*
- ○ Ich hatte keine Erwartungen. / *I did not have any expectations.*

Frage 17

Wie wurde der Kontakt nach der Kontakterstellung (meistens) fortgeführt? (Kreuzen Sie bitte alles Zutreffende an.) / *In which manner was the contact after the link creation (mostly) continued? (Please check all appropriated answers.)*

- ☐ Wir haben uns persönlich getroffen. / *We did meet personally.*
- ☐ Wir haben weiterhin Kontakt via Telefon, email, Xing-Nachrichten. / *We communicate via phone, email, and/or messages on Xing.*
- ☐ Ich habe weitere Personen über diese Person kennengelernt. / *I have met others through this person.*
- ☐ Es gab keinen weiteren Kontakt. / *There was not continued contact.*

Frage 18

Was ist Ihrer Meinung nach der häufigste Grund, aus dem Menschen auf Xing/openBC einen Kontaktlink herstellen? / *In your opinion, what is the most common cause for persons to link on Xing?*

- ○ Weil sie sich beruflich kennen. / *They know each other professionally.*
- ○ Weil sie Studienkollegen sind. / *They are/were fellow students.*
- ○ Weil sie befreundet sind. / *They are friends.*
- ○ Weil sie sich privat kennen. / *They know each other privately.*
- ○ Weil sie sich einmal getroffen haben. / *They have met once.*
- ○ Weil sie sich früher gekannt haben. / *They have known each other in former times.*
- ○ Weil sie sich kennenlernen möchten. / *They would like to get to know each other.*

Frage 19

Wenn Sie eine Verbindung auf Xing/openBC zwischen zwei Ihnen unbekannten Personen sehen, welche Beziehung nehmen Sie zwischen den Personen an? / *If you see a link between two persons whom you both don't know, what kind of relationsship would you assume?*

- ○ Die Personen kennen sich wahrscheinlich nicht. / *They probably don't know each other.*
- ○ Die Personen kennen sich, wenn auch nicht persönlich. / *They know each other, but not personally.*
- ○ Die Personen haben sich zumindest einmal persönlich getroffen. / *They have met once.*
- ○ Die Personen treffen oder sprechen sich hin und wieder. / *They meet or talk at times.*
- ○ Die Personen stehen im regelmäßigen Kontakt miteinander. / *They meet or talk frequently.*

Frage 20

Was ist Ihrer Meinung nach der beabsichtigte Zweck von Xing/openBC? (Kreuzen Sie bitte alles Zutreffende an.) | *In your opinion, what is the intended purpose of Xing? (Please check all appropriate answers.)*

- ☐ Unterstützung und Erleichterung bei der Anbahnung neuer Kontakte. | *Support and facilitation for the initiation of new contacts.*
- ☐ Erleichterung der Personal- und Arbeitssuche. | *Facilitation of the job/applicant search*
- ☐ Management von bestehenden Kontakten. | *Management of existing contacts*
- ☐ Möglichkeit, entfernte Bekannte nicht aus den Augen zu verlieren. | *A possibility not to lose track of acquaintances*
- ☐ Online Adressbuch. | *Online address book*
- ☐ Möglichkeit zur Selbstpräsentation. | *A possibility for self-representation*
- ☐ Unterhaltung. | *Entertainment*

Frage 21

Was ist Ihr eigenes Ziel bei der Nutzung von Xing/openBC? (Kreuzen Sie bitte alles Zutreffende an.) | *What is your own goal for using Xing? (Please check all appropriate answers.)*

- ☐ Anbahnung neuer Kontakte. | *Initiation of new contacts.*
- ☐ Personal- oder Arbeitssuche. | *Job/applicant search*
- ☐ Management von bestehenden Kontakten. | *Management of existing contacts*
- ☐ Kommunikation mit Kontakten. | *Communication with existing contacts*
- ☐ Erhaltung des Kontaktes mit entfernten Bekannten. | *Keeping contact with acquaintances*
- ☐ Reaktivierung alter Kontakte. | *Reactivation of former contacts*
- ☐ Online Adressbuch. | *Online address book*
- ☐ Sichtbarkeit und Selbstpräsentation. | *Visibility and self-representation*
- ☐ Unterhaltung. | *Entertainment*

Senden

Achtung: Nach Drücken des "Senden" Buttons sind keine Änderungen mehr möglich! | *Please note! After you click on the button "Send", changes are not possible anymore!*

Figure A.1: The part of the questionnaire concerning the use of Xing which was presented first or fourth, depending on the order received (see also section 3.2.3.4). Please note: The English translation of the items was not psychometrically evaluated.

Persönlichkeiten im Web 2.0 - Teil 2/5| *Personalities on the net, part 2/5*

Auf den folgenden Seiten finden Sie ca. 75 Aussagen, die persönliche Verhaltensweisen und Gewohnheiten betreffen. Lesen Sie bitte jede Aussage aufmerksam durch und kreuzen Sie an, in welchem Maße diese auf Sie zutrifft. Überlegen Sie bitte nicht, welche Beantwortung möglicherweise auf den ersten Blick einen guten Eindruck vermittelt, sondern stufen Sie die Aussagen so ein, wie es für Sie persönlich am ehesten zutrifft. Es gibt keine richtigen oder falschen Antworten. Nur bei einer ehrlichen Bearbeitung kann sichergestellt werden, dass Ihre Ergebnisse in sich logisch und stimmig sind. Außerdem ist dann die Chance am größten, dass Sie von der Ergebnisrückmeldung profitieren können. |
On the following pages you will find ca. 75 statements which describe behaviors and habits. Please check for each statement whether it applies to you. There are no correct or wrong answers. With honest answers your feedback will be coherent.

Bitte bewerten Sie die Aussagen zügig aber sorgfältig. Wählen Sie möglichst spontan eine Antwortmöglichkeit. Es ist wichtig, dass Sie keine Aussage auslassen. Falls Sie Ihre Meinung nach dem Ankreuzen einmal ändern sollten, können Sie Ihre Antwort durch Anklicken eines anderen Kästchens korrigieren. Das zuerst gesetzte Kreuzchen wird damit automatisch gelöscht. | Please complete the questionnaire speedy and spontaneously. You can change your answer by simply ticking a different box.

Bei der Bearbeitung werden Sie möglicherweise den Eindruck gewinnen, dass einige Formulierungen inhaltlich ähnlich sind. Bitte lassen Sie sich dadurch nicht irritieren und antworten Sie wie oben erläutert. Wenn Situationen beschrieben werden, die Sie noch nicht persönlich erlebt haben, dann schätzen Sie bitte ein, wie Sie sich in diesen wahrscheinlich verhalten würden. | Although some statements appear similar, please answer all questions.

Ihre Ergebnisse werden angezeigt, sobald Sie alle Antworten vollständig abgeschickt haben. | Your feedback will be shown as soon as you have sent all answers.

The answer alternatives are: does not apply at all, does not apply, neutral, applies, applies strongly

Auf Parties spreche ich mit vielen verschiedenen Leuten. [1: E2.1] | talk to a lot of different people at parties.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich bin gleichgültig gegenüber den Gefühlen anderer. [2: A3.1-r] | am indifferent to the feelings of others.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich sage die Wahrheit. [3: C3.1] | tell the truth.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich befürchte, Aufmerksamkeit auf mich lenken. [4: N4.1] | am afraid to draw attention to myself.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich bin ein Gewohnheitsmensch. [5: O4.1-r] | am a creature of habit.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich freunde mich schnell mit Leuten an. [6: E1.1] | make friends easily.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich glaube, dass andere Leute gute Absichten haben. [7: A1.1] | believe that others have good intentions.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich ziehe es vor, allein zu sein. [8: E2.2-r] | prefer to be alone.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich breche meine Versprechen. [9: C3.2-r] | break my promises.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Schwierige soziale Situationen machen mir <u>nichts</u> aus. [10: N4.2-r] | am not bothered by difficult social situations.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich vermeide den Umgang mit anderen. [11: E1.2-r] | avoid contact with others.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich erledige Aufgaben reibungslos. [12: C1.1] | handle tasks smoothly.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich bin besorgt um andere. [13: A3.2] | am concerned about others.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich kann Konfrontationen <u>nicht</u> ertragen. [14: A4.1] | can't stand confrontations.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich glaube, dass ich besser als andere bin. [15: A5.1-r] | believe that I am better than others.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich sehe das Leben von seiner Schokoladenseite. [16: E6.1] | look at the bright side of life.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich versuche, <u>nicht</u> über Bedürftige nachzudenken. [17: A6.1-r] | try not to think about the needy.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich glaube das, was Leute sagen. [18: A1.2] | trust what people say.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich nehme mir <u>keine</u> Zeit für andere. [19: A3.3-r] | take no time for others.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich finde es schwierig, auf andere zuzugehen. [20: N4.3] | find it difficult to approach others.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich beleidige Leute. [21: A4.2-r] | insult people.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich habe viel Spaß. [22: E6.2] | have a lot of fun.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich habe Mitgefühl mit Obdachlosen. [23: A6.2] | sympathize with the homeless.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich fühle mich in Gesellschaft anderer wohl. [24: E1.3] | feel comfortable around others.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich halte meine Versprechen. [25: C3.3] | keep my promises.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich fühle mich nur mit Freunden wirklich wohl. [26: N4.4] | only feel comfortable with friends.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich besuche gerne neue Orte. [27: O4.2] | like to visit new places.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich halte viel von mir selbst. [28: A5.2-r] | think highly of myself.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich liebe das Leben. [29: E6.3] | love life.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich liebe einen guten Streit. [30: A4.3-r] | love a good fight.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich habe eine hohe Meinung von mir selbst. [31: A5.3-r] | have a high opinion of myself.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich bin <u>nicht</u> an den Problemen andere Leute interessiert. [32: A6.3-r] | am not interested in other peoples' problems.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich halte andere auf Distanz. [33: E1.4-r] | keep others at a distance.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich vertraue anderen. [34: A1.3] | trust others.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich erledige Aufgaben erfolgreich. [35: C1.2] | complete tasks successfully.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich strahle Freude aus. [36: E6.4] | radiate joy.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich bin hervorragend in dem, was ich tue. [37: C1.3] | excel in what I do.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich vermeide Menschenmengen. [38: E2.3-r] | avoid crowds.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich liebe es, anderen zu helfen. [39: A3.4] | love to help others.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich breche Regeln. [40: C3.4-r] | break rules.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich kann Veränderungen <u>nicht</u> leiden. [41: O4.3-r] | dislike changes.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich räche mich an anderen. [42: A4.4-r] | get back at others.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich habe Mitleid mit Leuten, die es schlechter haben als ich. [43: A6.4] | feel sympathy for others who are worse off than myself.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich glaube an das Gute im Menschen. [44: A1.4] | believe in human goodness.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich verstehe es, Dinge zu erledigen. [45: C1.4] | know how to get things done.

   ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich liebe große Parties. [46: E2.4] | love large parties.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich ziehe es vor, mich an Dinge zu halten, die ich kenne. [47: O4.4-r] | prefer to stick with things that I know.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich prahle mit meinen Tugenden. [48: A5.4-r] | boast about my virtues.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich misstraue Menschen. [49: A1.5-r] | distrust people.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

Ich schreie Leute an. [50: A4.5-r] | yell at people.

    ○ trifft überhaupt nicht zu   ○ trifft nicht zu   ○ neutral   ○ trifft zu   ○ trifft stark zu

[Senden]

Achtung: Nach Drücken des "Senden" Buttons sind keine Änderungen mehr möglich!

Figure A.2: The items of the facets of the Big Five as presented in the online questionnaire (see also section 4.3.2). This part was presented second or first, depending on the order received. The English translation is taken from Johnson (2006). The translated items as well as the combination in the squared brackets is included here for better understanding, but was not presented in the online questionnaire. The first number in the squared bracket is the count of questions. The following two letters indicate the facet to which the item belongs, the third is a count of items of that facet and the "r" denotes if the item is to be reversly scored. E.g. [2:A3.1-r] denotes the second item in this questionnaire which belongs to the facet A3= Altruism and is the first item of this facet and reversly scored. Below, the numbers of the items contained in each facet is reported.
E1, Warmth: 6, 11, 24, 33.
E2, Gregariousness: 1, 8, 38, 46.
E6, Positive emotions: 16, 22, 29, 36.
A1, Trust: 7, 18, 34, 44, 49.
A3, Altruism: 2, 13, 19, 39.
A4, Compliance: 14, 21, 30, 42, 50.
A5, Modesty: 15, 28, 31, 48.
A6, Tender-mindedness: 17, 23, 32, 43.
N4, Self-consciousness: 4, 10, 20, 26.
O4, Openness to actions: 5, 27, 41, 47.
C1, Competence: 12, 35, 37, 45.
C3, Dutifulness: 3, 9, 25, 40.

Persönlichkeiten im Web 2.0 - Teil 3/5 | *Personalities on the net, part 3/5*

Answer alternatives: never/scarcely, sometimes, frequently, very frequently/always

Auf Betriebsfeiern oder Betriebsausflügen spreche ich mir unbekannte Kollegen an. [1: B] | At the company party or outing I talk to colleagues who I haven't met yet.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Wenn ich Bekannte treffe, gehe ich auf sie zu und frage, was es Neues bei ihnen gibt. [2: U] | When meeting acquaintances, I approach them and ask about news.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Ich tausche mit Bekannten sachbezogene Tipps und Hinweise aus. [3: U] | I exchange business- and issue-related tips and advice.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Ich nutze meine Kontakte, um mich im Vertrauen in wichtigen Fragen beraten zu lassen. [4: U] | I use my contacts to get advice on important issues confidentially.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Wenn ich auf inoffiziellem Wege Informationen bekomme, die für Bekannte wichtig sind, gebe ich ihnen diese Informationen weiter. [5: M] | When getting information informally which might be relevant for acquaintances, I pass it on.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Wenn ich jemanden an einen Bekannten oder Kollegen verweise, so rufe ich diesen kurz an, um ihm Bescheid zu geben. [6: M] | When referring somebody to an acquaintance or colleague, I call him/her to inform him/her about it.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Wenn mich jemand bei einem schwierigen Problem beraten hat, teile ich ihm später mit, wie das Problem gelöst wurde. [7: M] | When I've received advice on a difficult problem, I'll tell the advisor later how I solved the problem.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Wenn ich eine Person kennenlerne, die für mich wichtig sein könnte, ergreife ich die Initiative und stelle mich ihr vor. [8: B] | When I meet a person who might be important for me, I take the initiative and introduce myself.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Wenn ich offene Fragen nicht klären kann, rufe ich Bekannte an und frage sie um Rat. [9: U] | If I can't solve issues, I call acquaintances and ask for their advice.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Ich halte aus Interesse Kontakt zu früheren Kollegen oder Kommilitonen. [10: M] | Out of interest, I keep in contact to former colleagues and fellow students.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Ich nutze Veranstaltungen, wie Messen oder Tagungen, um mich mit Bekannten auf persönlicher Ebene auszutauschen. [11: M] | I use the opportunities of conferences to communicate with acquaintances also on a personal level.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Wenn ich einem Bekannten nicht persönlich weiterhelfen kann, höre ich mich für ihn um. [12: M] | If I can't help an acquaintance personally, I ask around for him/her.

   ◎ Nie / sehr selten   ◎ manchmal   ◎ häufig   ◎ sehr oft / immer

Ich baue Kontakte auf, um persönliche Ansprechpartner zu besitzen. [13: B] | I establish contacts to have personal contact persons.

  ◯ Nie / sehr selten ◯ manchmal ◯ häufig ◯ sehr oft / immer

Wenn ich in heiklen Fragen Informationen benötige, wende ich mich an verlässliche Kontakte und frage, ob sie mehr darüber wissen. [14: U] | When I need information on delicate issues, I approach reliable contacts and ask about their knowledge.

  ◯ Nie / sehr selten ◯ manchmal ◯ häufig ◯ sehr oft / immer

Ich nehme Einladungen zu offiziellen Empfängen und Feiern wahr, um neue Personen kennenzulernen. [15: B] | I go to official receptions and festivities to get to know new persons.

  ◯ Nie / sehr selten ◯ manchmal ◯ häufig ◯ sehr oft / immer

Wenn ich von einer interessanten Stelle (Arbeitsplatz) höre, wende ich mich an Bekannte, um mehr darüber zu erfahren. [16: U] | If I hear about an interesting job opportunity, I ask my acquaintances for more information.

  ◯ Nie / sehr selten ◯ manchmal ◯ häufig ◯ sehr oft / immer

Ich übernehme ehrenamtliche Tätigkeiten, die mir auch sonst nützlich sein könnten. [17: B] | I do voluntary work which might benefit me in other respects.

  ◯ Nie / sehr selten ◯ manchmal ◯ häufig ◯ sehr oft / immer

Ich nutze Veranstaltungen, um neue Kontakte zu knüpfen. [18: B] | I use events to establish new contacts.

  ◯ Nie / sehr selten ◯ manchmal ◯ häufig ◯ sehr oft / immer

Ich bitte Bekannte gegebenenfalls, sich für mich nach Informationen umzuhören. [19: U] | If necessary, I ask acquaintances if they could ask around for information for me.

  ◯ Nie / sehr selten ◯ manchmal ◯ häufig ◯ sehr oft / immer

Senden

Achtung: Nach Drücken des "Senden" Buttons sind keine Änderungen mehr möglich!

Figure A.3: The items of the networking scale as presented in the online questionnaire (see also section 4.3.2). This part was presented third or second, depending on the order received. Note: The English translation of the items was not psychometrically evaluated. The English translation and the combination in the squared brackets is included here for better understanding, but was not presented in the online questionnaire. The number is the count of items and the letter denotes the subfacet to which the item belongs. Below, the numbers of the items contained in each facet is reported.
B, building: 1, 8, 13, 15, 17, 18.
M, maintenance: 5, 6, 7, 10, 11, 12.
U, use: 2, 3, 4, 9, 14, 16, 19.

Persönlichkeiten im Web 2.0 - Teil 4/5 | *Personalities on the net, part 4/5*

Answer alternatives: agree / disagree

Gewöhnlich rechne ich bei dem, was ich mache, mit Erfolg. | Usually I count on success in what I do.

   ⭘ trifft zu   ⭘ trifft nicht zu

Ich bin selten unsicher, wie ich mich verhalten soll. | I am rarely unsure about how to behave.

   ⭘ trifft zu   ⭘ trifft nicht zu

Ich übernehme gern Verantwortung. | I like assuming responsibility.

   ⭘ trifft zu   ⭘ trifft nicht zu

Ich übernehme bei gemeinsamen Unternehmungen gern die Führung. | I like to take the lead in joint events.

   ⭘ trifft zu   ⭘ trifft nicht zu

Es macht mir Spaß, andere Menschen von meiner Meinung zu überzeugen. | I like to convince other people of my opinion.

   ⭘ trifft zu   ⭘ trifft nicht zu

Ich merke öfter, dass sich andere nach mir richten. | I often notice that others conform with me.

   ⭘ trifft zu   ⭘ trifft nicht zu

Ich kann mich gut durchsetzen. | I can assert myself well.

   ⭘ trifft zu   ⭘ trifft nicht zu

Ich bin anderen oft einen Schritt voraus. | I am often a step ahead of others.

   ⭘ trifft zu   ⭘ trifft nicht zu

Ich besitze vieles, worum mich andere beneiden. | I have a lot for which others envy me.

   ⭘ trifft zu   ⭘ trifft nicht zu

Ich gebe anderen Ratschläge/ Empfehlungen. | I give others advice and recommendations.

   ⭘ trifft zu   ⭘ trifft nicht zu

[Senden]

Achtung: Nach Drücken des "Senden" Buttons sind keine Änderungen mehr möglich!

Figure A.4: The items of the scale of strength of personality as presented in the online questionnaire (see also section 4.3.2). Note: The English translation of the items was not psychometrically evaluated and is included only here for better understanding. This part was presented fourth or third, depending on the order received.

Persönlichkeiten im Web 2.0 - Teil 5/5 | *Personalities on the net, part 5/5*

Frage 1
Alter | Age

[   ]

Frage 2
Geschlecht | Sex

- ○ weiblich | female
- ○ Männlich | male

Frage 3
Ich habe Erfahrung im Umgang mit dem Internet. | I have experience with the Internet.

- ○ trifft gar nicht zu | disagree strongly
- ○ trifft nicht zu | disagree
- ○ neutral | neutral
- ○ trifft zu | neutral
- ○ trifft stark zu | agree strongly

Frage 4
Die Möglichkeiten, die das Internet heute bietet, erkunde und nutze ich gerne. | I like exploring and using the opportunities of the Internet.

- ○ trifft gar nicht zu | disagree strongly
- ○ trifft nicht zu | disagree
- ○ neutral | neutral
- ○ trifft zu | neutral
- ○ trifft stark zu | agree strongly

Frage 5
Beruf: | profession:

- ○ Student | Student
- ○ Angestellte/r | Employee
- ○ Selbständig / Freiberuflich | Freelancer
- ○ Arbeitslos | Unemployed
- ○ Rentner/in | Retired

Frage 6

Höchster erreichter Abschluss: | Highest degree

- ○ Hauptschule | Secondary General School Certificate
- ○ Mittlere Reife | Intermediate Secondary School Certificate
- ○ Abitur | General qualification for university entrance
- ○ Bachelor | Bachelor
- ○ Diplom, Magister, Master | Diploma, Master
- ○ Dr. | PhD

Frage 7

Bei Interesse an den Studienergebnissen bitte hier Ihre Email-Adresse eintragen: | If you are interested in the results of the study, you may submit your email-address here:

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Frage 8

Raum für Anmerkungen oder Fragen zur Studie: | Comments and suggestions:

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  Senden

Achtung: Nach Drücken des "Senden" Buttons sind keine Änderungen mehr möglich!

Figure A.5: The questions concerning sociodemographic background as presented in the online questionnaire (see also section 3.2.3.4). This part was always presented last independent of the order received.

Appendix B

Statistics of the study on Xing

B.1 Test of differences I

Tests of differences of demographic and relational variables due to sampling and questionnaire ordering. The formula of the Pearsons χ^2 is stated in appendix C.1.

Questionnaire starts with the part on . . .		Profession			Total
		Student	Employees	Freelancer	
Xing	Number	24	124	30	178
	Expected number	20.16	134.73	23.11	178
Personal attributes	Number	17	150	17	184
	Expected number	20.84	139.27	23.89	184
Total	Number	41	274	47	362
	Expected number	41	274	47	362

Pearson's χ^2 = 7.160, df = 2, p = 0.0279.

Table B.1: Expected and observed frequencies of profession x questionnaire order.

Sampling procedure		Profession			Total
		Student	Employees	Freelancer	
Random sample	Number	18	111	26	155
	Expected number	17.56	117.32	20.12	155
Full sample	Number	23	163	21	207
	Expected number	23.44	156.68	26.88	207
Total	Number	41	274	47	362
	Expected number	41	274	47	362

Pearson's χ^2 = 3.615, df = 2, p = 0.164.

Table B.2: Expected and observed frequencies of profession x sampling procedure.

Ordering	Xing - Personality			Personality - Xing			Mann - Whitney	
	N	Mean rank	Rank sum	N	Mean rank	Rank sum	U	p
Personal network size	204	197.22	40232.5	192	199.86	38373.5	19322.5	0.818
No. of unknown persons added	205	190.71	39095.5	185	200.81	37149.5	17980.5	0.361
Link request posed	132	129.30	17068.0	128	131.73	16862.0	8290.0	0.758
Link request accepted	124	124.05	15381.0	125	125.95	15744.0	7631.0	0.670
Age	178	188.45	33544.5	185	175.79	32521.5	15316.5	0.249
Sex	178	185.17	32961.0	185	178.95	33105.0	15900.0	0.453
Professional degree	178	176.28	31377.0	185	187.51	34689.0	15446.0	0.183
Internet experience	178	180.72	32168.0	185	183.23	33898.0	16237.0	0.737
Internet affinity	178	184.20	37288.0	185	179.88	33278.0	16073.0	0.648

Table B.3: Mann-Whitney U tests of differences in the relational and demographic variables due to the questionnaire ordering.

Sampling	Random sample			Email sample			Mann - Whitney	
	N	Mean rank	Rank sum	N	Mean rank	Rank sum	U	p
Personal network size	167	197.22	32936.5	229	199.43	45669.5	18908.5	0.850
No. of unknown persons added	166	213.56	35451.0	224	182.12	40794.0	15994.0	0.005
Link request posed	115	118.20	13592.5	145	140.26	20337.5	6922.0	0.005
Link request accepted	112	126.23	14137.5	137	124.00	16987.5	7534.5	0.621
Age	156	185.17	28886.5	207	179.61	37179.5	15651.0	0.616
Sex	156	180.30	28126.5	207	183.28	3793.5	15880.5	0.722
Professional degree	156	176.79	27578.5	207	185.93	38487.5	15332.5	0.283
Internet experience	156	181.44	28305.0	207	182.42	37761.0	16059.0	0.897
Internet affinity	156	179.11	27940.5	207	184.18	38125.5	15694.5	0.596

Table B.4: Mann-Whitney U tests of differences in the relational and demographic variables due to the sampling procedures.

B.2   The difference in the drop-out rate due to the ordering of the survey parts in the questionnaire study

Drop-out rate	number of	Sequence: starts with …		
Sampling		Xing part	Personality part	Total
Random sample	drop-out / sent	11 / 85	2 / 89	13 / 174
	percent	12.94%	2.25%	7.47%
Full sample	drop-out / sent	17 / 125	6 / 110	23 / 235
	percent	13.60%	5.45%	9.79%
Total	drop-out / sent	28 / 210	8 / 199	409
	percent	13.33%	4.02%	8.80%

Table B.5: The differences in the drop-out rate in the different sample groups of the questionnaire study.

The differences in the groups were tested using the binomial test as in equation B.1. Accordingly, the probability $f(x \leq 8 \mid 199)_{p=0.1333} < .000$ and also, $f(x \geq 28 \mid 210)_{p=0.0402} < .000$. Thus, in the survey starting with the personality part, significantly less participants dropped out than in the one starting with the SNS part. Between the sampling groups, no significant differences in drop out existed ($f(x \geq 23 \mid 235)_{p=0.0747} = .075$, $f(x \leq 13 \mid 174)_{p=0.0979} = .185$).

$$f(X \leq k \mid n) = \sum_{j=0}^{k} \binom{n}{j} p^j q^{n-j} \tag{B.1}$$

Appendix C

Statistics related to individual attributes

C.1 Formulas of employed statistics

Formula of cronbach's α of scale reliability

$$\alpha = \frac{N}{N-1}\left(1 - \frac{\sum_i V_i}{V_t}\right), (i = 1, 2, \ldots, n).$$ (C.1)

i = items of a measure
V_i = variance of items scores
V_t = variance of test scores

Formula of Pearsons χ^2 statistic for goodness of fit

$$\chi^2 = \sum_{i=1}^{k} \frac{(n_i - np_{i_o})^2}{np_{i_0}}$$ (C.2)

n_i = observed frequencies in the cells of the table
np_{i_0} = the frequencies expected under H_0

C.2 Test of differences of individual variables due to sampling and questionnaire ordering

	Group means		Equal variances		T-Test for equality of means			95% CI of means	
	random	email	F	Sig.	T	df	Sig. (2-sided)	upper	lower
Extraversion	3.81	3.71	3.477	0.063	1.945	373	0.053	-0.001	0.192
Warmth	3.93	3.79	3.289	0.071	2.505	373	0.013	0.030	0.248
Gregariousness	3.61	3.55	0.011	0.917	0.952	373	0.341	-0.067	0.193
Positive emotions	3.88	3.80	2.508	0.114	1.413	373	0.158	-0.033	0.202
Agreeableness	3.59	3.51	0.393	0.531	2.044	373	0.042	0.003	0.149
Trust	3.63	3.52	1.860	0.173	2.009	373	0.045	0.003	0.233
Altruism	4.05	3.99	0.000	0.983	1.160	373	0.247	-0.039	0.151
Compliance	3.47	3.39	0.004	0.952	1.303	373	0.193	-0.040	0.200
Modesty	2.30	2.33	0.144	0.705	-0.556	373	0.579	-0.177	0.099
Tender-mindedness	3.71	3.61	1.838	0.176	1.690	373	0.092	-0.016	0.218
Conscientiousness	4.07	4.08	0.060	0.807	-0.222	373	0.825	-0.094	0.075
Competence	3.91	3.91	1.169	0.280	-0.069	373	0.945	-0.107	0.099
Dutifulness	4.29	4.31	0.563	0.454	-0.357	373	0.721	-0.114	0.079
Openness for actions	3.58	3.55	4.114	0.043	0.501	373	0.617	-0.086	0.145
Strength of personality	7.97	7.84	1.620	0.204	0.719	368	0.473	-0.241	0.519
Networking	2.65	2.66	0.064	0.800	-0.201	364	0.841	-0.093	0.076
Network building	2.44	2.37	0.160	0.690	1.146	364	0.253	-0.048	0.184
Network use	2.76	2.81	1.231	0.268	-1.071	364	0.285	-0.152	0.045

The Levene-Tests of equal variances was conducted.

As all Levene-Tests of equal variances are non-significant, only the t-test for equal variances is displayed.

The random sample contained 161 responses, the email-sample 214.

CI = confidence intervall.

Big Five facets score from 1 to 5; strength of personality scores from 1 to 10; the networking scales score from 1 to 4

Table C.1: T-Test of differences regarding the individual variables between the groups of differing questionnaire order.

	Group means		Equal variances		T-Test for equality of means			95% CI of means	
	Xing	Personality	F	Sig.	T	df	Sig. (2-sided)	upper	lower
Extraversion	3.75	3.76	0.17	0.68	-0.29	373	0.769	-0.110	0.082
Warmth	3.84	3.87	0.03	0.85	-0.52	373	0.606	-0.137	0.080
Gregariousness	3.56	3.59	0.92	0.34	-0.46	373	0.646	-0.159	0.099
Positive emotions	3.84	3.83	0.27	0.60	0.26	373	0.792	-0.101	0.132
Agreeableness	3.57	3.52	0.00	1.00	1.47	373	0.141	-0.018	0.127
Trust	3.56	3.57	0.35	0.55	-0.12	373	0.901	-0.122	0.108
Altruism	4.07	3.96	1.10	0.29	2.32	373	0.021	0.017	0.204
Compliance	3.36	3.49	3.03	0.08	-2.11	373	0.036	-0.245	-0.009
Modesty	2.36	2.28	0.25	0.62	1.11	373	0.267	-0.059	0.214
Tender-mindedness	3.69	3.62	1.55	0.21	1.08	373	0.281	-0.052	0.180
Conscientiousness	4.08	4.08	1.16	0.28	-0.02	373	0.985	-0.085	0.083
Competence	3.91	3.91	1.67	0.20	0.00	373	0.997	-0.102	0.102
Dutifulness	4.30	4.30	0.00	0.99	-0.04	373	0.966	-0.098	0.093
Openness for actions	3.58	3.55	2.53	0.11	0.66	373	0.508	-0.076	0.153
Strength of personality	7.84	7.94	0.31	0.58	-0.52	368	0.601	-0.476	0.276
Networking	2.63	2.68	0.00	0.96	-1.17	364	0.243	-0.134	0.034
Network building	2.37	2.44	0.31	0.58	-1.15	364	0.251	-0.182	0.048
Network use	2.75	2.82	0.00	0.95	-1.36	364	0.176	-0.164	0.030

The Levene-Tests of equal variances was conducted.

As all Levene-Tests of equal variances are non-significant, only the t-test for equal variances is displayed.

CI = confidence intervall.

The sample starting with the Xing part contained 182 responses, the sample starting with the personality part 193.

Big Five facets score from 1 to 5; strength of personality scores from 1 to 10; the networking scales score from 1 to 4

Table C.2: T-Test of differences regarding the individual variables between the groups of differing sampling procedures

C.3 The factor analysis of the individual variables

Factor loadings of the items of the Big Five facets

Items of the Big Five facets	Factors				
	1	2	3	4	5
E1.1	**0.467**	0.327	0.029	0.160	-0.240
E1.2	**0.649**	0.144	-0.013	0.056	0.212
E1.3	**0.548**	0.227	0.106	0.210	0.067
E1.4	**0.469**	0.214	-0.096	0.138	0.067
E2.1	**0.528**	0.107	0.054	0.092	-0.276
E2.2	**0.547**	0.138	0.035	0.033	0.105
E2.3	**0.477**	0.161	0.077	-0.039	0.023
E2.4	**0.437**	0.181	0.082	0.077	-0.225
E6.1	0.231	**0.545**	0.154	-0.203	-0.124
E6.2	**0.546**	0.343	0.075	-0.173	0.038
E6.3	**0.483**	0.405	0.100	0.015	-0.008
E6.4	**0.497**	0.371	0.152	0.005	-0.054
N4.1	**-0.385**	-0.026	-0.094	-0.108	0.105
N4.2	-0.144	0.006	-0.180	0.137	**0.265**
N4.3	**-0.586**	-0.098	0.016	-0.189	0.182
N4.4	**-0.192**	0.122	0.170	-0.035	0.009
O4.1	**0.456**	-0.218	-0.077	0.013	-0.048
O4.2	**0.448**	-0.044	0.161	0.080	-0.008
O4.3	**0.501**	-0.170	0.176	-0.012	-0.021
O4.4	**0.542**	-0.174	-0.012	0.012	-0.046
A1.5	0.133	**0.626**	-0.090	0.059	0.258
A1.1	0.059	**0.752**	0.021	0.131	0.009
A1.2	-0.126	**0.616**	0.053	0.175	0.034
A1.3	0.142	**0.667**	0.062	0.181	0.142
A1.4	0.083	**0.723**	0.034	0.250	-0.022
C1.1	0.128	-0.111	**0.616**	0.096	0.185
C1.2	0.091	-0.006	**0.690**	0.162	0.067
C1.3	0.154	0.128	**0.684**	0.012	-0.187
C1.4	0.240	-0.077	**0.603**	0.248	0.003
C3.1	0.075	0.170	**0.355**	0.058	0.277
C3.2	0.016	0.021	**0.523**	0.074	0.422
C3.3	0.013	-0.050	**0.583**	0.062	0.367
C3.4	-0.174	-0.014	0.017	-0.012	**0.499**
A6.1	0.118	-0.016	-0.085	**0.573**	0.045
A6.2	0.012	0.140	0.038	**0.653**	-0.099
A6.3	0.276	0.058	0.038	**0.588**	0.160
A6.4	-0.077	0.056	0.074	**0.727**	-0.090
A3.1	0.088	0.066	-0.116	**0.581**	0.297
A3.2	0.080	0.092	0.119	**0.574**	0.088
A3.3	**0.322**	0.020	0.025	0.205	0.312
A3.4	0.139	0.258	0.122	**0.505**	0.019
A4.5	-0.139	0.068	0.123	-0.066	**0.527**
A4.1	**-0.326**	0.143	-0.166	0.047	0.083

Continued on Next Page...

Factor loadings of the items of strength of personality

Statement	Factors 1	2	3
Gewöhnlich rechne ich bei dem, was ich mache, mit Erfolg.	**0.507**	0.126	-0.059
Ich bin selten unsicher, wie ich mich verhalten soll.	**0.722**	0.087	-0.269
Ich übernehme gern Verantwortung.	**0.644**	-0.056	0.326
Ich übernehme bei gemeinsamen Unternehmungen gern die Führung.	**0.453**	0.070	**0.486**
Ich kann mich gut durchsetzen.	**0.540**	0.083	0.384
Ich merke öfter, dass sich andere nach mir richten.	0.304	**0.511**	0.166
Ich bin anderen oft einen Schritt voraus.	0.069	**0.738**	0.018
Ich besitze vieles, worum mich andere beneiden.	-0.032	**0.783**	0.031
Es macht mir Spaß, andere Menschen von meiner Meinung zu überzeugen.	0.029	0.205	**0.760**
Ich gebe anderen Ratschläge/ Empfehlungen.	-0.040	-0.027	**0.512**
Varimax rotated (after Kaiser normalisation)			
The rotation converged after 5 interations			

Table C.4: The factor loadings of the scale of the strength of personality. The highest factor loadings are written boldly.

Items of the Big Five facets	Factors 1	2	3	4	5
A4.2	-0.020	0.105	0.120	0.133	**0.578**
A4.3	-0.205	0.126	-0.042	-0.077	**0.432**
A4.4	0.123	0.088	-0.043	0.112	**0.488**
A5.1	0.063	-0.051	**-0.515**	0.148	**0.304**
A5.2	-0.134	-0.221	**-0.597**	0.204	**0.268**
A5.3	-0.048	-0.226	**-0.609**	0.145	**0.338**
A5.4	0.116	-0.215	-0.178	0.017	**0.533**
Varimax rotated (after Kaiser normalisation)					
The rotation converged after 5 interations					

Table C.3: The factor loadings of the confirmatory factor analyis of the personality items of the Big Five facets. The highest factor loadings are written boldly. E1 = Warmth, E2 = Gregariousness, E6 = Positive Emotions, N4 = Self-consciousness, O4 = Openness to actions, C1 = Competence, C3 = Dutifulness, A1 = Trust, A3 = Altruism, A4 = Compliance, A5 = Modesty, A6 = Tendermindedness. The four items of each scale are denoted by the numbers after the scale labels, e.g. the first item of the facet warmth is denoted by E1.1.

Factor loadings of the items of the networking scale

	Factors		
	1	2	3
Wenn ich Bekannte treffe, gehe ich auf sie zu und frage, was es Neues bei ihnen gibt.	**0.383**	0.298	0.209
Ich tausche mit Bekannten bei inoffiziellen Gelegenheiten sachbezogene Tipps und Hinweise aus.	**0.625**	0.218	-0.023
Ich nutze meine Kontakte, um mich in Vertrauen in wichtigen Fragen beraten zu lassen.	**0.717**	0.200	0.027
Wenn ich offene Fragen nicht klären kann, rufe ich Bekannte an und frage sie um Rat.	**0.624**	-0.006	0.361
Wenn ich in heiklen Fragen Informationen benötige, wende ich mich an verlässliche Kontakte und frage, ob sie mehr darüber wissen.	**0.577**	0.105	0.263
Wenn ich von einer interessanten Stelle (Arbeitsplatz) höre, wende ich mich an Bekannte, um mehr darüber zu erfahren.	**0.377**	0.221	0.254
Ich bitte Bekannte gegebenenfalls, sich für mich nach Informationen umzuhören.	**0.534**	0.332	0.079
Wenn ich auf inoffiziellem Wege Informationen bekomme, die für Bekannte wichtig sind, gebe ich ihnen diese Informationen weiter.	**0.567**	-0.059	0.003
Ich halte aus Interesse Kontakt zu früheren Kollegen oder Kommilitonen.	**0.455**	0.311	-0.002
Wenn ich einem Bekannten nicht persönlich weiterhelfen kann, höre ich mich für ihn um.	**0.538**	0.254	0.112
Auf Betriebsfeiern oder Betriebsausflügen spreche ich mir unbekannte Kollegen an.	0.114	**0.588**	0.293
Wenn ich eine Person kennenlerne, die für mich wichtig sein könnte, ergreife ich die Initiative und stelle mich ihr vor.	0.312	**0.502**	0.362
Ich baue inoffizielle Kontakte auf, um persönliche Ansprechpartner zu besitzen.	0.377	**0.589**	-0.037
Ich nehme Einladungen zu offiziellen Empfängen und Feiern wahr, um neue Personen kennenzulernen.	0.067	**0.767**	0.147
Ich übernehme ehrenamtliche Tätigkeiten, die mir auch sonst nützlich sein könnten.	0.091	**0.448**	-0.026
Ich nutze Veranstaltungen, um neue Kontakte zu knüpfen.	0.157	**0.811**	-0.070
Ich nutze Veranstaltungen, wie Messen oder Tagungen, um mich mit Bekannten auf persönlicher Ebene auszutauschen.	0.163	**0.644**	-0.060
Wenn ich jemanden an einen Bekannten oder Kollegen verweise, so rufe ich diesen kurz an, um ihm Bescheid zu geben.	0.077	0.038	**0.787**
Wenn mich jemand bei einem schwierigen Problem beraten hat, teile ich ihm später mit, wie das Problem gelöst wurde.	0.125	0.055	**0.779**

Varimax rotated (after Kaiser normalisation)
The rotation converged after 5 interations.

Table C.5: The factor loadings of the scale of networking. The highest factor loadings are written boldly.

C.4 The correlations between size of personal networks and the addition of unknown persons with sociodemographic variables

Profession * Personal network size in categories of 50						
	Social network size in categories of 50					Total
Profession	0-50	51-100	101-150	151-200	more than 200	
Student	15	12	7	4	3	41
Employee	42	82	59	40	49	272
Freelancer	8	11	8	6	14	47
Total	65	105	74	50	66	360
Pearson's χ^2 = 16.947, df = 8, p = 0.0306.						

Table C.6: Pearson's χ^2-test on the relation between profession and personal network size.

Profession * addition of unknowns			
	Unknown added or not		
Profession	No	Yes	Total
Student	23	18	41
Employee	102	172	274
Freelancer	12	35	47
Total	137	225	362
Pearson's χ^2 = 8.881, df = 2, p = 0.0118.			

Table C.7: Pearson's χ^2-test on the relation between profession and adding unknown persons.

Kendall-Tau-b		Size	Unknowns	Age	Sex	Prof. degree	Experience	Curiosity
Size	Correlation	1	0.237	0.026	0.120	0.124	0.113	0.084
	Sig. (2-sided)	.	0.0000**	0.4729	0.0056*	0.0028*	0.0089	0.0486
	N	396	388	361	361	361	361	361
No. unknown contacts	Correlation		1	0.080	-0.032	-0.054	0.017	0.079
	Sig. (2-sided)		.	0.0402	0.4944	0.2291	0.7154	0.0838
	N		390	363	363	363	363	361
Age	Correlation			1	0.190	0.214	0.062	0.045
	Sig. (2-sided)			.	0.0000**	0.0000**	0.1645	0.3017
	N			363	363	363	363	363
Sex	Correlation				1	0.099	0.267	0.189
	Sig. (2-sided)				.	0.0515	0.0000**	0.0003**
	N				363	363	363	363
Professional degree	Correlation					1	0.046	0.059
	Sig. (2-sided)					.	0.3618	0.2399
	N					363	363	363
Internet experience	Correlation						1	0.488
	Sig. (2-sided)						.	0.0000**
	N						363	363
Internet affinity	Correlation							1
	Sig. (2-sided)							.
	N							363

** The correlation is significant at the level of significance of 0.01 corrected for multiple test, i.e. $\alpha/6 = 0.00167$.

* The correlation is significant at the level of significance of 0.05 corrected for multiple test, i.e. $\alpha/6 = 0.00833$.

Table C.8: Kendall-τ correlation coefficients between size of the personal networks, number of unknown persons added and sociodemographic variables.

C.5 The partial Kendall-τ coefficients controlling for the length of membership for all significant correlations

The formula of the partial Kendall-τ coefficient (Kendall and Gibbons, 1990)

$$\tau_{XY.Z} = \frac{\tau_{XY} - \tau_{ZX}\tau_{XZ}}{\sqrt{(1 - \tau_{ZY}^2)(1 - \tau_{ZX}^2)}} \qquad (C.3)$$

Correlations with size of personal networks		
Individual attribute	Zero-order τ	partial τ
Sex	0.120	0.075
Professional degree	0.124	0.064
Motivation: keeping in contact	0.163	0.150
Motivation: management	0.242	0.199
Extraversion	0.160	0.143
Warmth	0.150	0.140
Gregariousness	0.149	0.143
Positive emotions	0.114	0.087
Competence	0.118	0.116
Strength of personality	0.123	0.093
Networking	0.212	0.179
Network building	0.179	0.150
Networkuse	0.186	0.161

Table C.9: The partial Kendall-τ coefficients controlling for length of membership in month.The correlation between the size of personal networks and the length of membership is Kendall-τ = .456.

Correlations with the number of unknown persons added		
Individual attribute	Zero-order τ	partial τ
Motivation: new ties	0.257	0.265
Motivation: management	0.101	0.081
Extraversion	0.144	0.135
Warmth	0.152	0.145
Network building	0.192	0.180

Table C.10: The partial Kendall-τ coefficients controlling for length of membership in month.The correlation between the number of unknown persons added and the length of membership is Kendall-τ = .148.

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