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Studying online support communities:
Investigating network patterns and characteristics of social support

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Dedication

For Dad.

I hope I make you proud.

Acknowledgement

My greatest thanks go to both of my supervisors, Panayiotis and Steph, who have provided helpful support throughout all stages of my PhD. It was their enthusiasm for research that inspired me in the first place and their helpful support that motivated me to keep going even when times were difficult. It is due to Panayiotis' guidance that I was able to keep an overview over my project and did not loose myself in the details. In addition, borrowing his "strategic hat" offered me a new way of thinking about my work. Steph helped me to critically and constructively question my work, always motivated to search for ways to improve it. Also, I am greatful for having had such a strong role model for being an academic and a mum!

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Declaration

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Abstract

People's activities on the internet have expanded from mainly retrieving information to communicating with each other in virtual settings. Thus, research investigating social interactions in online communities is becoming more and more important. However, the multi-faceted approaches of existing studies for the analysis of online communities make it difficult to combine the findings into a comprehensive understanding. This shows the need for holistic investigations of online communities.

This thesis provides such a holistic approach by investigating a combination of different aspects of a selected online support community for older people. MOSuC (Model of Online Support Communities), a model describing the key aspects of online support communities was developed based on existing theories of computer-mediated communication (CMC) as well as theoretical perspectives on social support. Five studies were conducted, each addressing one of the different aspects of the case study community: (i) the message content, (ii) the conversations structure, (iii) the social network of related community members, (iv) the roles that online community members take on, and (vi) the taget population's needs concerning the exchange of social support in online communities.The findings of these individual studies were then combined in context of MOSuC in order to provide a holistic description of the community.

As a result, this thesis provides detailed insight into the characteristics of the case study community as well as the interplay and dependencies between different aspects of the community. Based on the integration of multiple studies, the thesis sheds light on two main issues: the characteristics of the individual aspects of the community as well as how these aspects are related to and affect each other. In addition to the findings of the studies, the thesis also contributes MOSuC, which serves both as a theoretical framework of the aspects of online support communities, as well as a practical tool for integrating the individual studies. In addition, the application, modification and integration of multiple methods in this thesis provide a novel methodological way for an integrative analysis of online support communities.

List of abbreviations

CB: Community building
CMC: Computer-mediated communication
DAT: Discussion Analysis Tool
DS: Deep support
FI: Factual information
HCI: Human-computer interaction
IMHO: In my humble opinion
LS: Light support
MOSuC: Model of Online Support Communities
MUD: Multi-user dungeon, dimension, or sometimes domain
OT: Off topic
SD: Self disclosure
SIDE: Social identity model of de-individuation effects
SIG: Special interest group
SIP: Social information processing
SN: SeniorNet
SNA: Social network analysis
SPT: Social presence theory
TI: Technical information
TU: Text unit

1   Introduction

This chapter presents the motivation for studying online support communities. It discusses relevant background information that led to the research questions. The chapter then summarises the approach and the tasks undertaken to answer the research questions. In addition, this chapter presents the structure and the outline of the thesis.

Humans have always lived in communities, building and maintaining different kinds of relationships to other people whom they can turn to for companionship, information and emotional support, as well as material and financial help. However, as society changes (bureaucratization, industrialization, urbanization and capitalism) so change community settings and structures. In addition, technological developments (e.g. telephone, internet) change the way people communicate with each other (Wellman, 1988; 1979). These changes give rise to the need to constantly re-assess and evaluate community settings in order to understand how communities work, what makes them flourish and what individuals can and cannot get out of them (Wellman, 1979).

With the emergence of the internet, people have begun to study online social interactions and communities, often focusing on the questions of whether people can form a community in an online setting and whether people can build and maintain close and supportive relationships online (Wellman & Gulia, 1999). Research in this area is becoming more and more important as the internet is increasingly used for social interactions and collaborations. The growing popularity of social networking sites (e.g. MySpace, Facebook, LinkedIn) is in line with the increasing tendency to use the internet to connect to and interact with others online. People's activities on the internet have expanded from mainly retrieving information to communicating with each other in virtual settings (Lenhart, 2009a; Lenhart, 2009b). They use online communities to meet others, develop friendships, play, and exchange experiences and support (Preece, 2000b; Rheingold, 2000).

The study of online communities brings together different disciplines that have different approaches and apply different methods. For example, sociology research is often concerned with the interconnection between online and offline communities (Wellman, 1997; Wellman, 2004; Wellman & Hogan, 2004; Wellman et al., 2003). Communication research tends to investigate the content and composition of the conversations that people have in online communities (Herring, 2009a; Herring, 2009b). On the other hand, Human-computer interaction (HCI) researchers focus on the usability and sociability of online communities (Maloney-Krichmar & Preece, 2005; Preece & Maloney-Krichmar, 2003). So far, these approaches mostly remain distinct and methods for analysing online communities from these different disciplines are rarely combined. Most researchers agree, however, that an online community can only be fully understood if it is investigated from different angles and when different aspects

of the online community are combined in the analysis (Maloney-Krichmar & Preece, 2005).

The following paragraphs give first summary of the aim and structure of this PhD thesis. The main aim of this thesis is to undertake an in-depth analysis of an online community. This is done in order to gain a holistic understanding of the community based on the integration of the analyses of multiple aspects of the community. The focus of the investigation is specifically on online 'support' communities. Online support communities are described as settings in which people exchange advice, encouragement and information. They offer people a place for "identifying and communicating with others experiencing similar problems" (p.65) (Preece, 1999). In this thesis, approaches from different disciplines are combined in order to analyse a specific online support community from multiple perspectives. A set of research questions is formulated to combine different aspects of online support communities which have so far been analysed separately. These research questions are addressed through a combination of existing, modified and novel methods.

In order to combine the different analyses into a holistic understanding of the case study community, I develop MOSuC (Model of Online Support Communities), a model that describes the characteristics and components of online support communities. Firstly, I model the main components of online support communities based on the synthesis of the reviewed theories of computer-mediated communication (CMC) and theoretical perspectives on social support. Secondly, MOSuC is applied in order to combine the findings of the individual studies within this thesis into a holistic description of the case study community. Thus, it is demonstrated how MOSuC can be utilised in order to integrate different perspectives of online support communities in order to provide an all-encompassing understanding of their nature.

Summarising, this thesis provides two main contributions: The first contribution is MoSuC as it describes the components of online support communities and offers a basis upon which studies focusing on the individual components of such communities can be combined. The analysis of the case study community within this thesis demonstrates how MoSuC can be utilised in a holistic investigation of an online support community. The second contribution is the holistic understanding of the case study online support community. The integration of multiple perspectives that have so far been addressed separately offers a unique insight into the nature of the case study

community that goes beyond the investigation of individual aspects of online support communities. As a secondary contribution, the novel combination of existing and modified research methods and tools offers a methodological contribution.

In the following sections I provide in more detail the motivation for this research (section 1.1) and define its scope (section 1.2). Based on these, I proceed to formulate research questions and summarise the activities undertaken to answer them. Lastly I outline the importance of the research.

1.1 Motivation

As mentioned above, the aim of this thesis is to undertake an in-depth analysis of an online support community.

Up to now, studies investigating online support communities have focused on a variety of different aspects in order to analyse the exchange of support in these settings. Consequently, they have come up with different results regarding the appropriateness of online communities for exchanging support. On the one hand, many exploratory studies have found that online support communities are very beneficial for their members as they allow for the exchange of personal experiences, social support, and empathy (Maloney-Krichmar & Preece, 2005; Preece, 1998; Preece & Ghozati, 2001; van Uden-Kraan et al., 2008; White & Dorman, 2000; White & Dorman, 2001; Wright, 2000a; Wright, 1999; Wright, 2000b; Wright & Bell, 2003). On the other hand, researchers also have also pointed out problems of online support communities, such as the danger that the exchanged information is inaccurate (Dickerson et al., 2006; Winzelberg, 1997), and that people harm each other by sending deceptive or harassing messages (Feldman, 2000; Feldman et al., 1998; White & Dorman, 2001; Winzelberg, 1997). The fact that research studies have approached the analysis of online support communities from different methodological as well as disciplinary perspectives makes it difficult to combine the findings into a comprehensive understanding of the nature of online support communities.

These contradictory findings and multi-faceted approaches to the analysis of online support communities clearly show the need for a comprehensive and holistic investigation of an online support community that integrates the analyses of different aspects of the community. This thesis addresses this gap and provides such an original

analysis as it investigates a combination of different aspects of an online support community that have so far been addressed separately.

Regarding the population, the case study focuses on an online support community for older people. The percentage of people aged 65+ who go online has been steadily increasing in recent years (Jones & Fox, 2009). Currently, 56% of Americans aged 65-69 and 45% of Americans aged 70-75 go online (Jones & Fox, 2009). Similar figures can be found in the UK as 36% of British people aged 65+ go online (Office for National Statistics, 2009). While email is currently the most prevalent communication activity of older people online, the use of online communities is also growing within this group (Jones & Fox, 2009). Compared to younger users, older people are significantly more likely to look for health information online, with this being their third most popular online activity (Jones & Fox, 2009). This shows that many older people consider the internet as a source for health support, suggesting that online support communities might be of particular benefit for them. Thus, research is necessary in order to understand what kind of support older people expect from online support groups and how older people exchange support in these settings.

Several studies have already investigated the content that older people share in online support communities (Kanayama, 2003; White & Dorman, 2000; Wright, 2000b; Xie, 2008). Others have applied query-based techniques to investigate the perception of online supportive interactions among older people (Kanayama, 2003; McMellon & Schiffman, 2002; Wright, 1999; Wright, 2000b; Xie, 2007b; Xie, 2008) or looked at online social networks (Zaphiris & Sarwar, 2006). However, most of these studies investigated a small data-set and analysed the online support community from one specific perspective. Consequently, it is appropriate to undertake a substantial and integrated investigation in order to fully understand how older people exchange social support in online support communities.

1.2 The scope of the research

In this thesis, I focus on a specific kind of online community and a specific user group: Online support communities for older people. Debates arise when it comes to finding a common definition for the term 'online community'. Some scholars consider online communities as environments where support, empathy, and friendships develop (Rheingold, 2000); others are interested in the analysis, design and evaluation of

different technologies that support online communication and group building (de Souza & Preece, 2004; Maloney-Krichmar & Preece, 2005; Preece, 2000b). Preece et al. (2003) refer to online communities as settings where people can meet and communicate with each other online. Rheingold (2000) uses the term 'virtual community' and describes them as "social aggregations that emerge from the Net when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace" (p. 5). In this thesis I use the more rigorous definition of Preece (2000b) who states that online communities consists of "*people*, who interact socially [...], *a shared purpose* [...] that provides a reason for the community, *policies* [...] that guide people's interactions, and *computer systems* to support and mediate social interaction [...]" (p.10).

Online support communities offer the possibility for people to exchange advice, encouragement, and information (Finfgeld, 2000) concerning a specific problem (often health related). Such communities are formed by people who share similar experiences and who build a space of support, compassion and trust (Maloney-Krichmar & Preece, 2005; Preece & Ghozati, 2001). Online support communities often have the function of self support groups which are characterised by a high level of emotional support and understanding.

An online support community for older people serves as a case study in this thesis. In order to provide a holistic understanding of the community, different aspects are analysed: Firstly, this thesis identifies the components of social support that is exchanged in the case study community and shows how people form relationships by communicating with each other. Secondly, the composition of conversations in the community is investigated in order to study how online supportive communication develops. Thirdly, I also investigate how relationships between people form, and how individual members are integrated and take on certain roles and responsibilities within the online support community.

Rather than offering a comparison of the online support community with equivalent communities in offline settings or online support communities for other populations (e.g. younger people), this research provides a holistic depiction of the exchange of support in the case study community based on its quantitative and qualitative characteristics. By focusing on one community, I aim to provide an encompassing and comprehensive description of its nature. Thus, comparisons with

other online and offline (support) communities are out of the scope of this thesis. However, although this research does not investigate the extent to which the results are generalisable to other online (support) communities, it sets an example for an all-encompassing and holistic analysis of an online support community. By focusing on a specific kind of online community (i.e. online support community) and a specific target population (i.e. older people), I define the scope of the setting.

1.3 Aim of the research and research questions

As discussed above, the aim of this thesis is to undertake an in-depth analysis of an online support community in order to provide a holistic understanding of the community. Thus, I focus on the following key research question:

"How is social support exchanged in an online support community?"

Further sub-questions each address a specific aspect of the online support community:

I.   What are the characteristics of social support in the online support community?

II.   How does the exchange of social support influence the relations between people participating in the online support community?

III.   What is the conversation structure of supportive communication within the online support community like?

IV.   What kind of roles do people take on in the online support community?

V.   What are older people's needs concerning online support communities?

In addition, the following two sub-questions address methodological and theoretical issues of the analysis:

VI.   What methods are appropriate for studying online support communities?

VII.   How can a model provide a holistic description of the online support community?

In order to address the sub-questions a set of interrelated tasks was undertaken. The structure of the tasks is visualised in Figure 1.1.
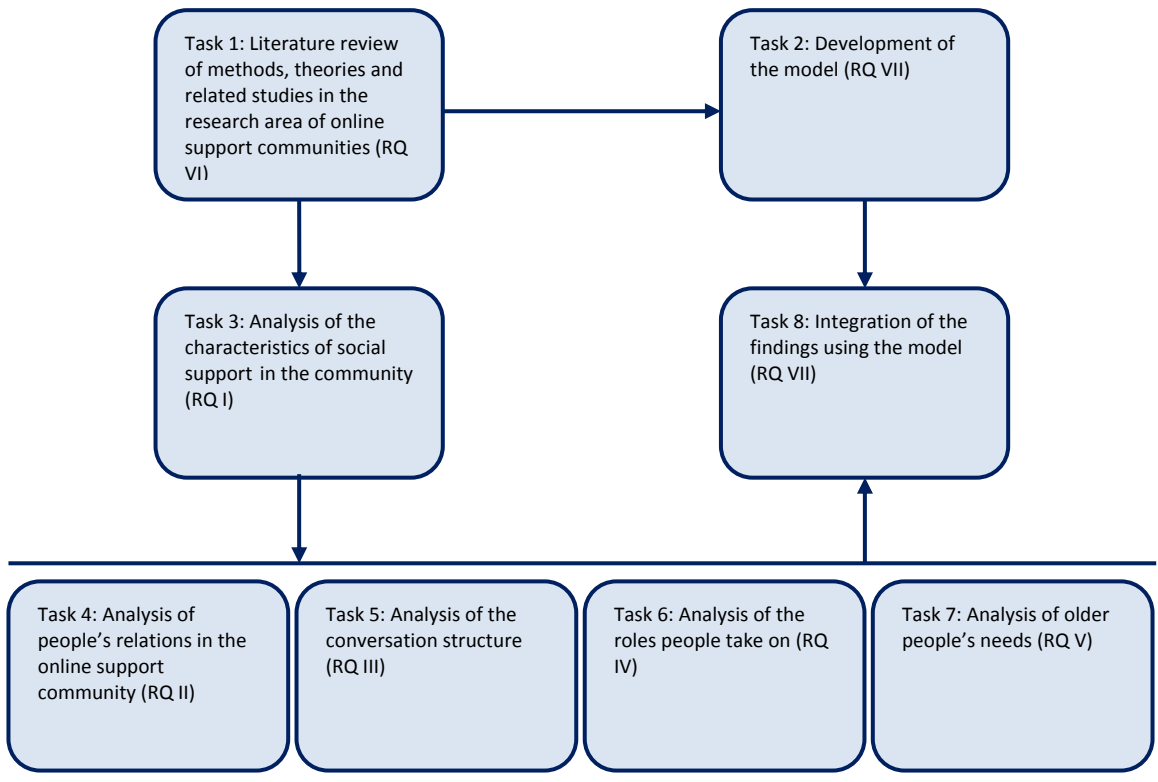
Figure 1.1: Flow diagram of tasks

- *Task 1. Literature review of methods, theories and related studies in the research area of online support communities*

A literature review was conducted in order to gain an overview of related work and to put this thesis in the context of the associated research areas (see chapter *2*). In the review, focus was placed on theories of computer-mediated communication (CMC), theoretical perspectives on social support as well as on related literature about online support communities for older people. In addition, specific emphasis was placed on methods that are appropriate for analysing the different aspects of online support communities mentioned in research questions I-V. This review is presented in section *2.4*. There, I discuss the methods and procedures that were applied in the individual studies within the thesis. It directly addresses research question VI.

- *Task 2. Development of MoSuC*

Based on the review of CMC theories as well as theoretical perspectives on social support (see chapter *2*), MOSuC (Model of Online SUpport Communities), a model that describes the main components of online support communities was developed. Existing studies analysing online (support) communities from multiple perspectives were mapped onto MOSuC in order to elaborate on the model's coverage

and focus. MOSuC can be utilised in order to integrate the analyses of different aspects of an online support community into a holistic description of the setting. Thus, MOSuC served as a basis for tasks 3-7 (the individual studies each addressing a specific aspect of the community) as well as task 8 (the integration of the findings of the individual studies into a holistic description of the case study community). The development of MOSuC is presented in chapter *3*. This activity addresses research question VII.

- *Task 3. Analysis of the characteristics of social support in the case study community*

A study was conducted in order to identify the characteristics of social support as exchanged in the case study community. Firstly, the communication content of the case study community was analysed and a code scheme was developed that described the content of the exchanged messages. Then, subsequent analyses were conducted in order to analyse the code scheme's generalisability to other online support communities for older people and its applicability to describe the exchange of social support. Based on the findings, the code scheme was amended accordingly in order to appropriately describe the characteristics of social support in the case study community. This activity is reported in chapter *4* and answers research question I.

- *Task 4. Analysis of the relations between online community members*

In order to analyse the relations between members of the online community, the social network that is formed by the communication activities within the online support community was analysed (e.g. who talks to whom). Utililising the previously developed code scheme (see chapter *4*), special focus was placed on the question of whether specific kinds of message content promote connectedness of the poster to other members of the online community. A study applying a combination of two existing methods (content analysis and social network analysis) in order to address this issue is presented in chapter *5*. Findings of this study answer research question II.

- *Task 5. Analysis of the conversation structure in the online support community*

Two studies were conducted in order to investigate conversation patterns within the case study community. The focus of the first study was on sequences of two related messages and their contribution to the sustainability of the conversation. The second study analysed the association between communication content and communication structure. A combination of different methods for analysing the structure of related

messages was applied (e.g. content analysis, message-sequence analysis, social network analysis). The combined findings of these two studies provide a comprehensive understanding of the structure of the conversation within the online support community. The studies are presented in chapter *6*. The findings of chapter *6* answer research question III.

- *Task 6. Analysis of the roles that people take on in the online support community*

The different roles that people take on within the case study community were identified based on people's individual posting behaviour as well as the communication activities between them. A combination of structural analysis and content analysis was conducted. The findings describe the roles and provide an understanding of their behavioural and structural characteristics. The study investigating roles in the online support community for older people is presented in chapter *7*. Its findings answer research question IV.

- *Task 7. Elicitation of older people's needs concerning their participation in online support communities*

A study investigating older people's needs concerning their participation in online support communities was conducted to better understand the motivations of older people to participate in online support communities and the reasons for their possible reluctance to do so. Interviews were held with older people who had a range of levels of expertise with online settings for exchanging social support. The interview study is presented in chapter *8*. The findings of this chapter answer research question V.

- *Task 8: Integration of the findings using the model*

The combination of the findings using the model developed in chapter *3* (MOSuC) provided a comprehensive understanding of the case study community. MOSuC allowed for the summary and integration of the individual studies which offered further insight into the interplay between the investigated aspects of the community. In doing so, I was able to obtain a detailed picture of the relations between the different aspects which could not have been extracted from the individual studies alone. In addition, the components of MOSuC were refined in the context of the conducted studies. In summary, I showed how MOSuC can be utilised in order to integrate different aspects of the online support community and to provide a holistic

understanding of the setting. The combination of the studies within this thesis in the context of MOSuC is presented in chapter *9*. In combination with task 3, this activity addressed research question VII.

1.4 The importance of this research

The findings of this thesis provide an in-depth understanding of how social support is exchanged in an online support community for older people. Through the analysis of different aspects of the community, this thesis demonstrates an original way of analysing an online support community and offers insight into the different aspects of the investigated community and their interplay. Specifically, the thesis offers two main contributions:

The first contribution is MOSuC. In this thesis, the work with MOSuC can be divided into two steps: Firstly, MOSuC is developed based on reviewed CMC theories and theoretical perspectives on social support. As a result, MOSuC describes the basic components of online support communities. Secondly, MOSuC integrates the findings of the studies within this thesis, providing a holistic understanding of the case study community. In addition, this integration of the individual studies also results in the refinement of MOSuC. In summary, the contribution of MOSuC is twofold, as it (i) describes online support communities based on a combination of different perspectives and it (ii) integrates multiple analyses of an online support community into a holistic understanding of the setting.

The second contribution of this research is a holistic description of an online support community for older people based on a combination of multiple analyses each addressing a different aspect of the community. These aspects include: (i) the characteristics of social support as exchanged in the community, (ii) the relationships and network patterns that emerge out of the communication within the community, (iii) conversation patterns within the online community, (iv) the roles that people take on in the community, and (v) older people's needs and preferences concerning online support communities. This thesis goes beyond the study of individual aspects of online support communities, and provides a combination of different analyses yielding a holistic understanding of the case study community. In addition, as a secondary contribution, methodological insight is gained through the novel combination of existing and modified research methods and tools that are utilised in the analyses.

I believe that the outcome of this thesis is of use for researchers in the area of HCI/CMC as it contributes a novel way of analysing an online support community to provide a holistic understanding of the setting. Findings of this thesis also help better understand how older users interact with each other in online support communities. This benefits practitioners and designers of online support communities for older people. If we understand the various aspects of online social support and how it is exchanged by older people in online communications, we can find ways to nurture it and design online communities to better facilitate supportive communication. As a research area, the investigation of online support communities for older people is relatively new and of increasing interest in the field of HCI/CMC.

1.5 The structure of this thesis

This thesis is structured into nine chapters in addition to this introduction:

- *Chapter 2 Literature review*: This chapter provides an in-depth review of the literature on CMC theories, theoretical perspectives on social support, online support communities and older people's internet usage. In addition it also discusses appropriate methods to be applied in order to study online support communities (Task 1).

- Chapter *3 Development of MOSuC (Model of Online SUpport Communities):* Based on the reviewed CMC theories as well as on the discussed theoretical perspectives on social support, MOSuC was developed. MOSuC describes the main components of online support communities. Existing studies were mapped onto MOSuC in order to elaborate its coverage and focus (Task 2).

- Chapter *4 Analysing the characteristics of online social support*: This chapter presents an analysis of the communication content of the case study community. Components and characteristics of social support as exchanged in the community are presented in form of a code scheme that describes the content of communications (Task 3).

- *Chapter 5 Characteristics of social network structures*: This chapter investigates the influence of the content of messages on the relations between online community members. To this end, social network analysis was applied in order to analyse relations between members of the community (e.g. who talks to whom) (Task 4).

- *Chapter 6 Analysis of the conversation* structure: An analysis of the conversation structure within the online support community for older people was conducted.

Results show how messages relate to each other to form a conversation and how these conversations influence the level of activity within the online community (Task 5).

- *Chapter 7 Investigation of roles in the online support community:* Role analysis was performed in order to analyse the characteristics of the roles that people take on when participating in the online support community. Findings identify a set of roles and provide descriptions of their characteristics (Task 6).

- *Chapter 8 Older people's perceptions and experiences of online social support*: Interviews were conducted with 31 older participants with various backgrounds in using the internet in general and online support communities in particular. These interviews highlight older people's motivations to participate in online support communities and their reasons for reluctance to do so (Task 7).

- *Chapter 9 Discussion*: The findings of the previous studies (chapters *4-8*) are integrated and discussed in the context of MOSuC. This chapter demonstrates how MOSuC can be applied in order to integrate multiple studies focusing on different aspects of an online community into a holistic description of the community (Task 8).

- *Chapter 10 Conclusion*: This chapter reflects on the research activities within the thesis as well as on the development and utilisation of MOSuC. I discuss how this thesis has expanded the horizon of research into online support communities for older people and provides suggestions for future research in this area.

2   Literature review

This chapter reviews literature on computer-mediated communication theories, theoretical perspectives on social support and online support communities. Also, it discusses older people's internet usage focusing especially on their participation in online support communities. In addition, methods that can be applied in order to address the research questions are presented. This literature review forms the basis for further work in this thesis.

In this chapter, I review a wide range of relevant literature which forms the basis of my PhD work. The review commences with the presentation of CMC theories that explain the nature of online communication and how it differs from offline communication. In particular, emphasis is placed on the communication of personal and emotional information in online settings. Then, I proceed to explore in more detail the nature of social support. After presenting three fundamental theoretical perspectives on social support, the differences and similarities of online and offline support are considered. Based on the combination of both, CMC theories and theoretical perspectives on social support, literature on online support communities is reviewed with a particular focus on online support communities for older people. In order to discuss the methodological aspects of researching online communities, different methods that can be applied in order to address the research questions are presented. In particular, the application of content analysis, social network analysis, the analysis of conversation structures, role analysis, and query-based techniques are discussed. These four sections offer a sound foundation on which this PhD work is based.

2.1 Computer-mediated communication

Research in the area of computer-mediated communication (CMC) focuses on the nature of communication via different technologies (e.g. internet, mobile phone) and investigates the impact of CMC characteristics on the social interactions between people (Kelsey & St. Amant, 2008). The internet offers many opportunities to support communication. Technologies such as bulletin boards, usenet groups, listservs, newsgroups, video conferencing, chats, blogs, MUDs (multi-user dungeon, dimension, or sometimes domain), 3D virtual worlds (e.g. SecondLife and ActiveWorlds) and wikis each have their own attributes and support different kinds of communication. Researchers commonly divide them into asynchronous and synchronous communication technologies and distinguish them according to the different media that they support (e.g. text, graphic, audio, video) (Zaphiris et al., 2007).

In the following sections, I discuss CMC theories that help to explain the characteristics of online communication. Firstly, the 'social presence theory' (Short et al., 1976) is presented. The social presence theory discusses the extent to which different communication media support the awareness of the co-presence of the communication partners. Then, I discuss the 'social information processing theory'

(Walther, 1992; Walther, 1996), which proposes that the restrictions imposed by the lack of non-verbal cues in online settings can be overcome, and that given sufficient time, CMC can be as intimate as face-to-face communication. Lastly, the 'social identity model of de-individuation effects' (SIDE) (Postmes et al., 1998; Spears & Lea, 1992; Spears & Lea, 1994) is discussed. It deals with CMC in group settings and concludes that members of online communities are more likely to act according to group norms as opposed to individual norms.

I chose to focus on these theories as each of them covers a specific aspect of CMC. Furthermore, they are relevant for text-based and asynchronous CMC which fits the characteristics of the case study community. In addition, the chosen theories cover the relevant range of theoretical perspectives and present different viewpoints on social interaction in online communities. In addition to a detailed description of the three theories, I discuss their explanations in the context of online support communities. Additional CMC theories, such as media richness theory (Daft & Lengel, 1986), uses and gratification theory (Blumler & Katz, 1974), and social penetration theory (Altman, 1973; Altman & Taylor, 1973), have been set aside for this review due to the limited scope of this thesis.

2.1.1 Social presence theory

The social presence theory (Short et al., 1976) deals with the ability of the mediating technology to create a sense of co-presence between communication partners during a communication process. The underlying concept is that the degree to which the mediated communication can convey social presence influences the way people interact with each other. The social presence theory helps to explain how different kinds of mediating technologies influence social behaviour and communication. Social presence is considered to be a quality of the communication medium and describes the degree to which a communicator is aware of the presence of his/her communication partner. The higher the social presence, the more accurate is the perception of the communication partner. Thus, social presence is not only communicated by the spoken word, but is also conveyed via non-verbal cues, like body language, facial expressions and the tone of the voice (Short et al., 1976). Hwang and Park (2007) build on this traditional concept of social presence and argue that rather than being a characteristic of the medium, social presence is a user's subjective experience and can be characterised by a sense of co-presence, mutual awareness, and connectedness (Hwang & Park, 2007).

CMC settings are generally considered to be characterised by a low social presence because they lack non-verbal cues and are mostly textual. Some scholars believe that the lack of non-verbal cues such as eye-contact and body language hinders the communication from becoming personal (Culnan & Markus, 1987; Short et al., 1976) and describe CMC as "impersonal, unsociable, cold, and insensitive" (as summarised in Lea and Spears (1995), pp. 214). However, empirical research suggests that it is indeed possible to engage in personal and emotional communication and people even develop friendships and relationships online (Preece, 2000b; Rheingold, 2000). The following sections discuss advantages as well as disadvantages of personal communication in CMC settings characterised by a low level of social presence.

2.1.1.1   Disadvantages of low social presence

In CMC settings, people often have a lower awareness of their communication partners and fewer possibilities to convey their personal characteristics and current emotional state as compared to face-to-face settings. Due to a lower social presence, the accuracy of the receiver's understanding of the message as intended by the sender is considerably lower and misunderstandings occur more frequently (Kruger et al., 2005). Once misunderstandings occur in CMC settings, it is often difficult to resolve them successfully and they can easily escalate.

Also, in CMC settings, people are less aware of the presence of others. As a result, they become less inhibited and less afraid of possible negative consequences of their actions and sometimes engage in more extreme behaviour than they would in an offline setting (Denegri-Knott & Taylor, 2005; Joinson, 2005; Kiesler et al., 1984). In online communities, such behaviour can lead to violent attacks against other community members.

In addition to misunderstandings and misbehaviour, the lack of visual and audible cues makes identity deception easy. As Turkle (1995) notes, people often take on different identities in online communities in order to act out different aspects of themselves. In online communities, this opportunity to hide and alter one's identity can be misused and people might appear as somebody they are not. Once such a lie is detected, it can have a severe impact on the atmosphere within the community, as other members can feel betrayed and hurt by the deception (Bowker & Tuffin, 2003; Feldman, 2000; Feldman et al., 1998). Identity deception might be especially critical in

online support communities as these communities often deal with sensitive topics. Misunderstandings, misbehaviour, and deception in these settings often result in people dropping out of the online community (Feldman, 2000; Feldman et al., 1998).

2.1.1.2   Advantages of low social presence

In contrast to the arguments made in section *2.1.1.1*, some scholars state that CMC does not suffer from low social presence, as communicators in CMC settings apply additional strategies in order to elicit information about their communication partners (Ramirez et al., 2002) and find ways to make up for the missing cues (van Uden-Kraan et al., 2008; Walther, 1992; Wolf, 2000). For example, abbreviations like IMHO (In My Humble Opinion) and smilies are used in order to provide additional information about the meaning of the written text (e.g. irony, humour, insecurity) (Wallace, 1999; Wolf, 2000).

An advantage of CMC settings characterised by a low social presence is that people's inhibitions are reduced and their courage to disclose personal information increases (Joinson, 2001; Rheingold, 2000; Tidwell & Walther, 2002; Wallace, 1999). This phenomenon explains the high level of emotional self-disclosure, especially found in online support communities (Eichhorn, 2008; Kanayama, 2003; Pfeil & Zaphiris, 2007; Preece, 1999; White & Dorman, 2000; Winzelberg, 1997; Wright, 2000b). Once people start to disclose information about themselves, others are encouraged to do the same (Henderson & Gilding, 2004; Pfeil & Zaphiris, 2007; Wallace, 1999). This is especially the case for online support communities in which people share a common illness or experience a similar situation. Knowing that other people are in a similar situation and exchanging and sharing experiences often leads to a higher level of trust in online communities, which in turn encourages people to disclose more information about themselves. Wallace (1999) refers to this phenomenon as 'reciprocity in self-disclosure' and considers it to play a very important role in online communities.

As discussed in section *2.1.1.1*, another phenomenon resulting from the reduction of social presence is identity deception. In addition to negative consequences, identity deception can also have a positive impact, as it allows people to take on a different identity and to try out new and different aspects of their personality. For example, as Bowker and Tuffin (2003) found in studying the internet use of people with disabilities, not being stigmatised by visible aspects of the disability gives physically

disabled people the opportunity to act independently of their physical conditions and to alter parts of their identity. Similarly, scholars have found that anonymity, reduced non-verbal and demographic cues and a lower social presence can reduce anxiety and make online support and communication more comfortable (Caplan, 2003; Han & Belcher, 2001; McKenna et al., 2002; Wright, 2002).

2.1.2   Social information processing (SIP) theory

In order to explain the findings of empirical research that it is indeed possible to establish close friendships in CMC settings, Walther (1992) developed the social information processing theory. This theory states that CMC settings are as suitable as face-to-face settings for establishing close and personal relationships between communicators. According to the social information processing theory, relationships between communicators develop when people reveal information about themselves and use that information in order to build an impression of each other. Similar to the social presence theory, Walther (1992) argues that the lack of non-verbal cues restricts the communication but he also states that the communicators can make up for this by asking more direct questions and providing more self-disclosing information (Tidwell & Walther, 2002; Walther, 1992). Furthermore, although CMC is restricted by a lack of non-verbal cues, it benefits from textual cues (Ramirez et al., 2002). When communicators have learned to adapt to the situation, relationships and friendships created and maintained in CMC settings can be as strong as their face-to-face counterparts (Walther, 1992).

Walther (1996) goes even further by introducing the 'hyperpersonal perspective' to the social information processing theory which proposes that due to a selective self-presentation and an over-emphasis on similarities between the communicators, some relationships in CMC settings are closer and more intimate than they would be in face-to-face settings. People tend to over-emphasise the attributes that they receive via CMC and therefore construct an idealised impression of their communication partner (Henderson & Gilding, 2004). Although these impressions tend to be incomplete, they are more intense compared to face-to-face settings (Hancock & Dunham, 2001). Walther (1996) explains that the hyperpersonal perspective occurs "[w]hen users experience commonality and are self-aware, physically separated, and communicating via a limited-cues channel that allows them to selectively self-present and edit; to

construct and reciprocate representations of their partners and relations without the interferences of environmental reality" (p.33) (Walther, 1996).

The asynchronous nature of online communities and the possibility of editing messages before sending them is believed to strengthen the 'hyperpersonal perspective', as people have more time to read and reflect on a message, think about and construct a new message, carefully censoring the self-presentation that they want to make towards the other person (Walther, 1996). For example, Kanayama (2003) found that the opportunity to take time to understand, think about and reflect on each other's messages is beneficial especially for older people as it gives them the freedom to write and decode messages at their own pace, which supports the development of satisfactory social relationships.

Regarding the exchange of social support, Robinson and Turner (2003) consider CMC settings superior to face-to-face settings as, due to the 'hyperpersonal perspective', people perceive the support in CMC settings to better match their needs. In addition, Turner et al. (2001) found that it is the individuals' online and offline supportive networks, their needs as well as their experiences with online support communities that influence the development of hyperpersonal relationships in these settings.

2.1.3   Social identity model of de-individuation (SIDE) effects

Similar to Walther (1992; 1996), Spears and Lea (1992) explore the social and psychological dimensions of CMC and conclude that CMC does not per definition restrict social activities. They developed the social identity model of de-individuation (SIDE) effects, which focuses on CMC in group settings (e.g. online communities) and states that individual online behaviour is influenced by social group norms that are established in the respective communication setting. This approach is associated with the social identity theory that argues that group processes cannot be understood by investigating individual processes alone but should also incorporate the consideration of group dynamics (Hogg, 2006).

Postmes et al. (1998) state that social identity develops in online communities when their members are in a state of de-individuation. This means that people do not see themselves as individuals in a group, where 'they' interact with 'others', but they establish a 'we'-feeling in which the awareness of an individual identity is switched into

an awareness of a group identity (Hogg, 2006). As Rogers and Lea (2005) describe, "the group exists within the individual as a cognitive representation, rather than the individual existing within the external group" (p. 153). Instead of acting due to individual norms, driven by the thought of the consequences of misbehaviour, people act according to the social identity as established in the respective group or community. In online communities, where flaming[1] is within the group norm, rude behaviour is more common compared to online communities where the group norm is otherwise and flaming is not prevalent (Postmes et al., 1998; Spears & Lea, 1994). This is also in line with Preece and Ghozati (2001) who analysed the frequency of flaming and empathic content in different kinds of online communities. Findings show that flaming is more prevalent in online communities that discuss sports than in those that discuss health issues. In contrast, online support communities include more empathic content than online communities discussing sports or politics. According to the SIDE theory, these findings reflect the group norms in the different online communities.

Members of an online community often meet around a common theme or experience and thus quickly identify similar feelings and thoughts. This sense of similarity among community members is then exaggerated due to the lack of contrasting cues (Hogg, 2006). Thus, especially low technology solutions (e.g. lacking visual and audio cues) can nurture strong bonds among group members (Rogers & Lea, 2005), as a high level of anonymity accentuates the perceived unity within the group (Christopherson, 2007; Sassenberg & Postmes, 2002), helps people to identify with the group and leads to over-emphasised group solidarity (Lee, 2004). Walther (1996) states that "when participants are led to perceive that they are in a group relationship, each tends to hold a 'social self-categorization' rather than an 'individual self-categorization,' [which leads to the] attributions of greater similarity and liking with one's partners" (p. 18). In cases where members are seeing themselves as a part of a community, they begin to favour members of the group over people outside the group (Postmes et al., 1998). Behaviour and norms of the 'in-group' are accepted and preferred as compared to 'out-group' behaviours (Hogg, 2006) (for a detailed discussion see Klein et al. (2007)). The shift from individual to social identity allows people in online communities to emphasise different aspects of their identity. For example, people with disabilities might choose to place emphasis on their disability in certain online

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[1] Flaming describes a hostile and insulting interaction among online community members

communities, but not in others. As one participant cited in Bowker and Tuffin (2002) said: "[P]eople don't need to know that I have a disability if I am contributing to an analysis of the last All Black test, fine wines and food, movies, raising teenagers etc because it has no relevance." (p.336) Thus, depending on the setting, people choose how to present themselves (Bowker & Tuffin, 2002) and change their behaviour to fit in the chosen representation (Yee & Bailenson, 2007).

In summary, the SIDE theory argues that people in an online community behave according to group norms. Many online support communities manage to set group norms of supportive, empathic and helpful behaviour, which explains the high level of empathy, understanding and trust in these settings (Pfeil & Zaphiris, 2007; Preece, 2000b; Preece & Ghozati, 2001; Rheingold, 2000).

2.1.4   Summary: computer-mediated communication

In the previous sections, I discussed three CMC theories and their implications for the analysis and understanding of online support communities. Summarising, I conclude that online communities can offer people a place for exchanging experiences and social support. However, the communication process in these online communities is different from comparable offline settings as the fact that the communication is mediated by the computer alters the communication characteristics. This poses the need for CMC researchers to investigate in detail the communication dynamics and patterns in online support communities.

After elaborating the nature of online communication in detail, I now focus on the subject of 'social support'. The next section provides further information about the nature of social support in general, and about social support in online settings in particular.

2.2 Social support

In order to understand how people exchange social support in online settings, we first have to understand how people define social support offline. So far, no consensus about the definition of social support has been reached (Hupcey, 1998). Depending on the focus of each study, measurements and components of social support vary widely. Generally, social support is described as the exchange of verbal as well as non-verbal cues in order to communicate emotional and informational messages that reduce the

receiver's stress and "directly or indirectly communicate to an individual that she or he is valued and cared for by others" (p.176) (Barnes & Duck, 1994). But according to Ford et al. (1996) we have to be careful with just looking at the communication content and non-verbal cues when investigating the exchange of social support as "[f]irst, not all ostensibly supportive social interactions are experienced as supportive...[and]...[s]econd, the supportee's perception of the quality or substance of social support is a better predictor of successful coping than the sheer number or quantity of support at one's disposal" (p.189). Thus, it is not only the messages but also the sender and recipient of such that contribute to the definition of social support.

In the following, I firstly focus on the description of social support. Three theoretical perspectives on social support are presented and I discuss how they can be applied to analyse and understand online support communities. In addition, I discuss different characteristics of social support. Secondly, I place emphasis on the difference between online and offline social support. To that end, I discuss five key differences between the exchange of social support in CMC and face-to-face settings.

2.2.1   Theoretical perspectives and definitions of social support

Theoretical perspectives on social support aim to explain how the social relationships that we have with others influence our well-being. They state in detail how our social relationships alter the ways we think, feel, and behave. In addition, they describe how the reception of social support buffers and mediates coping with stressful life events. In their overview of social support theories and measurements, Lakey and Cohen (2000) distinguish between three main theoretical perspectives on social support: The 'stress and coping perspective', the 'social constructionist perspective', and the 'relationship perspective'. In the following, I give a brief overview of these three perspectives and discuss their application and relation to studies investigating online support communities. In addition, I then discuss the different characteristics of social support.

2.2.1.1   *The stress and coping perspective*

The stress and coping perspective claims that the reception of social support acts as a buffer between stressful life events and health. The more social support people receive, the easier it is for them to deal with stress and the less is their health affected by it (Lakey & Cohen, 2000). Wright (2000a; 1999) investigated the relationship between

social support, perceived stress and coping strategies for people participating in an online support community. He found that participating in an online support community encourages people to take direct action in order to deal with stress. This way of coping is considered to be a positive strategy. Negative coping strategies like venting about the problem or avoiding it were not found to be common among online support community members (Wright, 2000a; Wright, 1999). Similarly, Kalichman et al. (2003) found that health-related internet use is associated with more positive coping responses (e.g. active coping and information-seeking coping).

However, according to the stress and coping perspective, it is not only the amount of social support that has an influence on the recipient's well-being, but also the recipient's perception of this support (Lakey & Cohen, 2000). For the perceived support to be high, it is important that the kind of support matches the need of the recipient. Mismatching, meaning that the efforts and actions taken to help are not well-matched to the needs of the recipient, can cause difficulties and can have a negative impact on the relationship between the supporter and the recipient (Cutrona & Russell, 1990). Several characteristics of online support communities suggest that mismatching is less prevalent in these settings: Members of online support communities have often had similar experiences and thus understand each other's feelings and thoughts (Pfeil & Zaphiris, 2007). Also, online support communities bring together people with a lot of expertise concerning the topic. The emotional understanding as well as the factual expertise help to ensure that the support provided in online support communities matches the needs of the recipients (Maloney-Krichmar & Preece, 2005).

2.2.1.2   *The social constructionist perspective*

The basis of the social constructionist perspective is the underlying assumption that people construct their own view of the world, themselves and their social relations. This suggests that people do not have a clear consensus about what constitutes social support, and some might consider a specific behaviour as supportive whilst others might think that this behaviour is not at all supportive (Lakey & Cohen, 2000). The social constructionist perspective claims that people develop a stable and consistent view about the supportiveness of others in their life and judge the actions of others according to that view. People who generally have a high perception of support interpret the behaviour of others as more supportive than people who generally consider their environment to be less supportive, although the objective behaviour might be the same

(Lakey & Cohen, 2000). In order to apply this perspective to online support communities, Turner et al. (2001) compared people's perceptions of online and offline support. They argue that it is people's experiences that shape their perception and assessment of the available support. Their findings show that people engage in online support communities to a greater extent when their perceived offline support is low.

In online communities, people have fewer cues at hand for the perception of others and thus also for the construction of their social context. Often, the only cues that they have about each other are based on the text that they exchange. The hyperpersonal perspective (Walther, 1996) states that people tend to stress similarities to others when presenting themselves in online communities and thus they perceive each other and the online community in a more positive way. Differences and discrepancies between people that might be salient in face-to-face conversations are hidden by the fact that the communication is mediated by the computer. Online, people can take time to work on their self-presentation and members often arrange their own image in such a way as to appear friendly and knowledgeable to others (Walther, 1996) (for a more detailed discussion see section *2.1.2*). In online support communities, positive thinking and a feeling of support and togetherness are often stressed. This leads to the construction of a supportive perception of the online support community. This perception is regularly reinforced by praising the feeling of togetherness and level of support in the online support community (Pfeil & Zaphiris, 2007).

2.2.1.3   *The relationship perspective*

The relationship perspective views social support not as a separate phenomenon but as an experience that is highly interlinked with relationship processes (e.g. communication, companionship, intimacy). This perspective claims that having relationships to others is the fundamental basis for the exchange of social support (Lakey & Cohen, 2000). As Lin et al. (1979) summarise: "...social support may be defined as support accessible to an individual through social ties to other individuals, groups, and the larger community" (p.109). Isolation – in contrast to being connected to others – is believed to be linked to a lower self esteem of the person and is also believed to have a negative effect on health (Lakey & Cohen, 2000).

Several studies have focused on the social relationships between people in online support communities and on the social network that these relationships form. For

example, Nahm et al. (2003) investigated the patterns of older people's participation in online support communities as well as the number of relationships that they develop in these settings. Results show that the amount of time that members spend in online communities and their level of computer knowledge correlate positively with the number of relationships that they have. Also, the more relationships people have with other members within the online support community, the more support they receive. In addition, female members were found to have more relationships than male members. Furthermore, difficulties in accessing and using the online community due to physical disabilities were found to have a negative influence on the number of relationships. Similarly, Wright (1999) concludes that the amount of time people spend in an online support community has a positive impact on their number of relationships in this setting and their satisfaction with the support they receive.

2.2.1.4 *Characteristics of social support*

After a brief summary of three theoretical perspectives on social support and their application in studying online support communities, the focus of this section is now on discussing the different characteristics of social support in face-to-face as well as CMC settings. In face-to-face settings, almost all definitions describe social support as a phenomenon with multidimensional aspects. Whilst some definitions stress informational support (Cobb, 1976), others focus on tangible support (Craven & Wellman, 1973) or on the social needs of people like approval, esteem, succour, and belonging (Kaplan et al., 1977). Most definitions of social support include both tangible components like financial or practical help as well as intangible components like encouragement (Heitzmann & Kaplan, 1988).

Similarly, researchers investigating social support in online support communities also describe the characteristics of social support in sets of different terms or categories. For example, Moursund (1997) investigated the aspects of social support exchanged in 'the sanctuary', a MUD (Multi User Domain) for adult survivors of sexual abuse. He distinguishes between expressions of companionship (talking about problems, sharing experiences), information, positive feedback, motivational support, and belongingness (Moursund, 1997). Similarly, Klemm and Wheeler (2005) studied the messages of an online cancer caregiver listserv over a period of two months. Through inductive content analysis three major themes emerged from the messages: hope, emotional roller coaster, and physical/ emotional/ psychological responses. Another commonly used typology is

the set of categories developed by Cutrona and Suhr (1992) who describe social support in terms of informational support, emotional support, esteem support, tangible aid, and social network support. Although this categorisation was originally developed for the exchange of social support in offline settings, it has also been applied in order to analyse the exchange of social support in online support communities (Braithwaite et al., 1999; Coulson, 2005; Coulson et al., 2007; Eichhorn, 2008). These studies found that emotional and informational support are most common in online support communities, and tangible support is, as expected, least common. For example, investigating 1,472 messages of an online community for people with disabilities, Braithwaite et al. (1999) sorted the messages into Cutrona and Suhr's (1992) categories. Their findings show that emotional support is most common within the messages (40%), followed by informational support (31.7%), esteem support (18.6%), and network support (7.1%). Tangible support that involves practical support is least frequent (2.7%). Braithwaite et al. (1999) conclude that online support communities can provide environments where people "actively help one another to manage some of the physical and social limitations imposed by [the] disability" (p.142).

Similarly, Preece (1998) investigated in detail the communication content of an online support community for patients with a specific knee injury. In her findings, she distinguishes between three main types of communication: The exchange of factual information, members writing about their own experiences, and empathic messages that voice understanding of each other's thoughts and feelings. Almost half of the messages (44.8%) within this support community are empathic, 17.4% contain factual information, and in 32.0% of the messages, people write about their own experiences (Preece, 1998).

In summary, the analysis and categorisation of the messages exchanged in online support communities suggest that people mainly utilise these communities for the exchange of informational as well as emotional support (Braithwaite et al., 1999; Coulson, 2005; Coulson et al., 2007; Eichhorn, 2008; Pfeil & Zaphiris, 2007). However, most categorisations presented in the reviewed literature appear to be tailored to the individual communities under investigation.

2.2.2   Online versus offline support

In this section, the focus is shifted from the traditional understandings of social support to the unique features and characteristics of social support in CMC settings. To this end, I discuss online social support in comparison to offline support. Focus is placed on differences between these two settings concerning (i) group characteristics, (ii) relationships between support seeker and support provider, (iii) anonymity, (iv) access and availability, and (v) characteristics of supportive interaction.

2.2.2.1   Group characteristics

Differentiating between group characteristics of online and offline support communities, it is argued that the two settings promote different kinds of relationships among community members. This differentiation is based on the distinction between strong and weak ties (Granovetter, 1973). Granovetter (1973) defines the strength of a tie as a "combination of the amount of time, the emotional intensity, the intimacy (mutually confiding), and the reciprocal services which characterize the tie" (p.1361). Generally, social support in offline settings is exchanged via strong ties (e.g. among family members, friends, work colleagues). Often, these relationships are multiplex and evolve around a number of topics (Leatham & Duck, 1990). In contrast to that, the relationships between people in online support communities are usually based on one common experience and more likely to be uniplex. Thus, the exchange of social support in online support communities facilitates weak ties rather than strong ties (Wellman & Gulia, 1999).

Weak-tie relationships are generally more diverse than relationships in a group of strong ties and thus offer a wider spectrum of knowledge and expertise. As online support communities resemble networks of weak ties, they provide access to a diverse pool of experienced people. Often, people turn to online support communities because they cannot find the kind of support that they need in their immediate network of strong ties (Buchanan & Coulson, 2007; Walther & Boyd, 2002; Winefield et al., 2003). For example, Turner et al. (2001) found that members participate more in online support communities when the depth of online support is high and the depth of offline support is low. Similarly, Cummings et al. (2002) state that people who experience a low level of offline support are more likely to participate in online support communities.

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In addition, weak-tie relationships are considered to be beneficial, as "[the] perceived anonymity [...] allows people to seek information and support without having to deal with the uncertainty of how those in primary relationships might respond" (p.131) (Adelman et al., 1987). Furthermore, Adelman et al. (1987) argue that weak ties facilitate "low-risk discussions about high-risk topics" (p.133). Thus, online support communities are appropriate settings for the exchange of sensitive ('high-risk') information.

2.2.2.2   Relationship between support giver and support seeker

The question whether social support is exchanged in offline or online settings has an impact on the relationship between the support seeker and the support giver. In offline settings, people usually exchange social support after they have established a personal relationship. In online support communities, people often come straight to the topic of concern and reveal a great deal of personal and emotional information without establishing relationships with other community members beforehand (Walther & Boyd, 2002). This difference has a substantial impact on the distribution of power between the support seeker and support giver.

In offline settings, the support seeker often has to openly admit a weakness by asking for help from the support giver. This can lead to the support seeker being considered less competent and sometimes even being stigmatised according to the information that (s)he discloses (Albrecht et al., 1994; Goldsmith, 1992). The fact that the support seeker admits feelings of fear or incompetence and openly asks for help creates a situation of dependency of the support seeker on the support giver (La Gaipa, 1990). Sometimes this leads to a rejection of the help given in order to restore the balance within the relationship. In addition, seeking support from others in offline situations often creates the expectancy that the support seeker will reciprocate the service. A denial of such reciprocation would influence the equity and balance in the relationship and eventually harm it. In contrast, social support in online support communities is exchanged between people who otherwise do not have any relation to each other. This ameliorates the possible inequalities and uncertainties that arise when a person discloses personal information that weakens his/her position. Also, the expectation of reciprocity as it occurs in offline situations is less likely to be an issue in online support communities. One can just decide to quit posting and leave the online support communities without having to return the favour (Walther & Boyd, 2002).

2.2.2.3   The influence of anonymity

The fact that members of online support communities can maintain their anonymity greatly influences the exchange of social support, as people feel safer in disclosing personal information when they do not have to reveal their identity. McKenna and Bargh (2000) state that anonymity leads to a higher degree of self-disclosure. The fact that a person's offline identity is hidden reduces the anxiety and allows participants to reveal their emotions and thoughts to others more freely (McKenna et al., 2002; Peter et al., 2005). Thus, anonymity might be one of the most important reasons why people exchange deeply personal and emotional information in online support communities (Walther & Boyd, 2002). In addition, anonymity also prevents members from being judged according to their gender, race, age etc. (Wallace, 1999). However, anonymity can also have a negative influence on communication in online support communities as people are more prone to misbehave and to post irresponsible, hostile and deceptive messages (Feldman, 2000; Reid, 2002). Preece and Ghozati (2001) point out that the lack of negative consequences for hostile messages might be a reason for such misbehaviour.

Bargh (2002) argues that anonymity in online communities can have beneficial as well as harmful consequences. In order to understand the role of anonymity and deception in online communities, Bowker and Tuffin (2003) interviewed 21 people with disabilities and asked them about their engagement in online communities. Findings show that people develop different strategies in order to deal with anonymity and deception in online communities. Participants mentioned that they are cautious when interacting with strangers in online communities, that they try to separate their online interactions from their offline lives, and take time to carefully evaluate a communication partner based on his/her messages in order to judge his/her trustworthiness. Also, participants reported concealing information about being disabled, because they fear that people react in an intolerant way (Bowker & Tuffin, 2003). Thus, anonymity of CMC settings allows people to have control over what information they disclose about themselves (Bowker & Tuffin, 2002).

2.2.2.4   Access and availability

For many people, online support communities are easier to access than offline support groups. The fact that there are neither temporal nor geographic restrictions

allows people to utilise online support communities according to their own pace and without having to leave the house (Braithwaite et al., 1999). Also, people can write and read messages whenever they want and can put in as much time and effort as they wish (Coulson et al., 2007). In addition, people can concentrate on what they want to write in a message without having to listen to another person at the same time. This might enhance the quality of the social support as more time and effort can be put into a supportive reply (Walther & Boyd, 2002).

A unique characteristic of online support communities is that they often have an archive in which previous messages are listed and stored. This enables members to read these previous messages at all times, even if the original posters are no longer members of the community. Having access to a large number of messages offers the opportunity for online support community members to learn about the feelings and thoughts of other members. This knowledge can be used to evaluate own thoughts and feelings in comparison to others and thus enables members to conduct a form of 'reality check'. Finding similarities helps members realise that they are not alone and attributes normality to their behaviour. In particular, the comparison with a variety of different people enables members to judge how common or typical their own thoughts and feelings are (Adelman et al., 1987). This is not only possible for people who actively post messages in online support communities, but also for so-called 'lurkers' - members who only read but do not post messages (Walther & Boyd, 2002). As Mickelson (1997) states, lurkers in online support communities "can obtain comparison information or vicarious support without having to disclose anything about themselves...[and] obtain validation for their feelings of stigma without having to communicate those feelings to others" (p.172).

2.2.2.5   *Characteristics of supportive interaction*

In face-to-face settings, supportive interaction typically exists of two parts: (i) the support seeker asking explicitly for help, and (ii) the support giver providing support that is specifically tailored to the support seeker's situation. In online support communities, both the support seeker's as well as the support giver's parts differ from those in the face-to-face setting. Instead of explicitly asking for support, support seekers in online support communities tend to disclose their thoughts and feelings in the form of a personal narrative and then ask if others have had similar experiences. This kind of message then triggers supportive responses from other members within the community

(Pfeil & Zaphiris, 2007; Tichon & Shapiro, 2003). Also, online support community members tend to post questions like "what would happen if…" in order to explore possible effects of a certain behaviour or decision and to encourage others to talk about similar experiences (Turkle, 1995).

When giving support, members of online support communities tend to disguise advice and help in writing about their own experiences. Rather than giving explicit suggestions to the other person about how to behave in a certain situation, they write about how they dealt with the same or a similar issue (Pfeil & Zaphiris, 2007; Wright, 2000b). As members in online support communities often experience a common life situation, support seekers usually find people who have experienced a similar situation and thus can give valuable information and also emotional support by sharing their experiences (Preece, 1998).

2.2.3   Summary: social support

In this section, I have provided an overview of different aspects and characteristics of social support in face-to-face as well as in online settings. I started by presenting three theoretical perspectives on social support and explored how they are applied in studies investigating online support communities. Then, I focused in detail on the comparison between offline and online support in order to discuss the uniqueness and special characteristics of exchanging social support in online settings. As discussed in this chapter, researchers tend to focus on different aspects when investigating online support communities. Thus, definitions of online support communities are sparse and varied. Based on the review in section *2.1* and section *2.2*, I define that an online support community is characterised by

- the kind of support that is exchanged in the community (Coulson, 2005; Coulson et al., 2007; Eichhorn, 2008; Maloney-Krichmar & Preece, 2005; Pfeil & Zaphiris, 2007; Preece, 1998; Preece, 1999; Preece & Ghozati, 2001),

- the perception of the community by its members as being a supportive environment (Cummings et al., 2002; Turner et al., 2001), and

- the community facilitating the establishment of supportive relationships among its members (Nahm et al., 2003).

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Building on the previous two sections (*2.1* and *2.2*), I now move on to discuss in more detail related studies on online support communities, focusing especially on settings for older people.

2.3 Online support communities for older people

In this section, I build on the previous sections about CMC (see section *2.1*) and social support (see section *2.2*) in order to elaborate on online support communities. As the case study community in this thesis is an online support community targeted at older people, I focus specifically on online support communities for this population. After providing an overview of demographic data concerning the internet usage of older people, I discuss the benefits and challenges for this population using the internet and participating in online support communities. Reviewing related literature, I put my PhD study in context and anticipate its contribution to this research area.

2.3.1   Demographics of older people's internet use

The sociodemographics in countries of the developed world have changed dramatically in the last century. For example, in the UK, the life expectancy of older people increased from around 45 years (45.7 for men and 49.6 for women) in 1901 to around 80 years (75.7 for men and 80.4 for women) in 2001 (Office for National Statistics, 2001). At the same time, changes in family structures and an increase in geographic mobility mean that older people now often live apart from their family and friends. Thus, social isolation among older people and the concurrent health risks are a growing problem (McCarthy & Thomas, 2004; Thompson & Heller, 1990). Technical solutions that attempt to address this issue try to facilitate and strengthen older people's interaction with their family members (Gonzales et al., in press; Rowan, 2005) or the local community that they live in (Aarhus et al., 2009; Reed, 2003). McMellon and Schiffman (2002) also suggest that internet usage, especially the interaction with others in online communities provides an opportunity for older people to communicate with others and can thus help to counteract social isolation.

However, results from household surveys show that there is a digital divide between older and younger people concerning their internet usage. As of 2009, 73% of all adults (aged 16+) live in a household with internet access in the UK. This figure is reduced to 41% for people aged 65+ (Ofcom, 2009). The detailed numbers for all age groups can be seen in Figure 2.1. It shows that the percentage of people living in a

household with internet access is very high for people aged 16-44 (83%-90%). From the age of 45 onwards, this number decreases steadily until it plummets to 41% for people aged 65+.
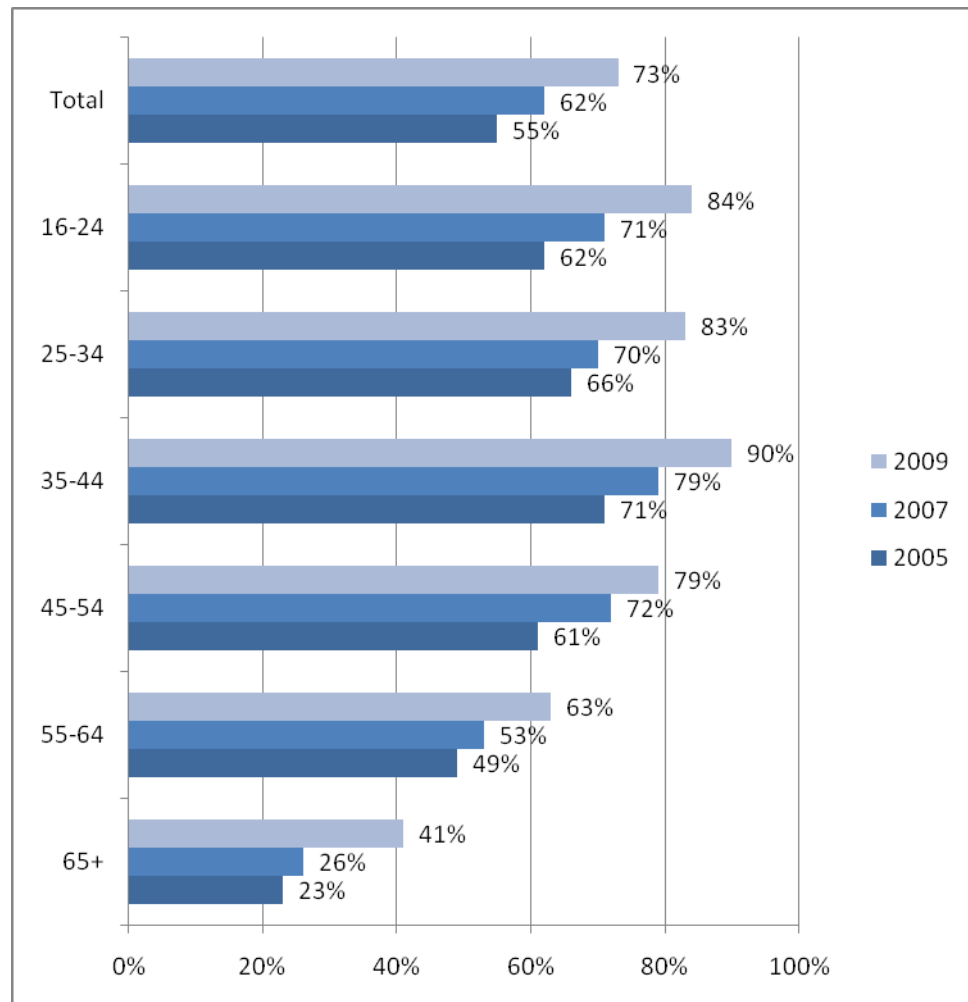
Figure 2.1: Take-up of internet depending on the age group (in % of people living in a UK household with internet access) (Ofcom, 2009)

There are several reasons for the low number of older internet users: On the one hand, physical and cognitive difficulties to use the internet lead to older people having difficulties to navigate and view webpages which are often directed at younger, 'mainstream' users (Coleman, 2001; Kurniawan et al., 2006). In addition, older people also encounter social obstacles, as CMC technologies are designed for the communication between younger people and thus possible social benefits are not obviously visible for older people (Selwyn et al., 2003).

However, Figure 2.1 also shows that the increase in internet take-up between 2007 and 2009 is highest for older people (from 26% to 41%) suggesting a tendency for this population to catch up with their younger peers. As of 2009, 9% of UK internet

users are aged 65+ as compared to 6% in 2007 (Ofcom, 2009). This shows an increasing trend among older people to go online. Similar figures can be found in the US where the percentage of older people going online has also been growing steadily in recent years (Jones & Fox, 2009). Currently, 56% of Americans aged 65-69 and 45% of Americans aged 70-75 go online (Jones & Fox, 2009). Figure 2.2 presents the composition of US internet users according to their age. As this figure shows, people aged 64+ constitute 11% of all adult internet users in the US. In summary, these numbers show that older people are becoming more internet literate and are on their way to form a substantial internet user group.
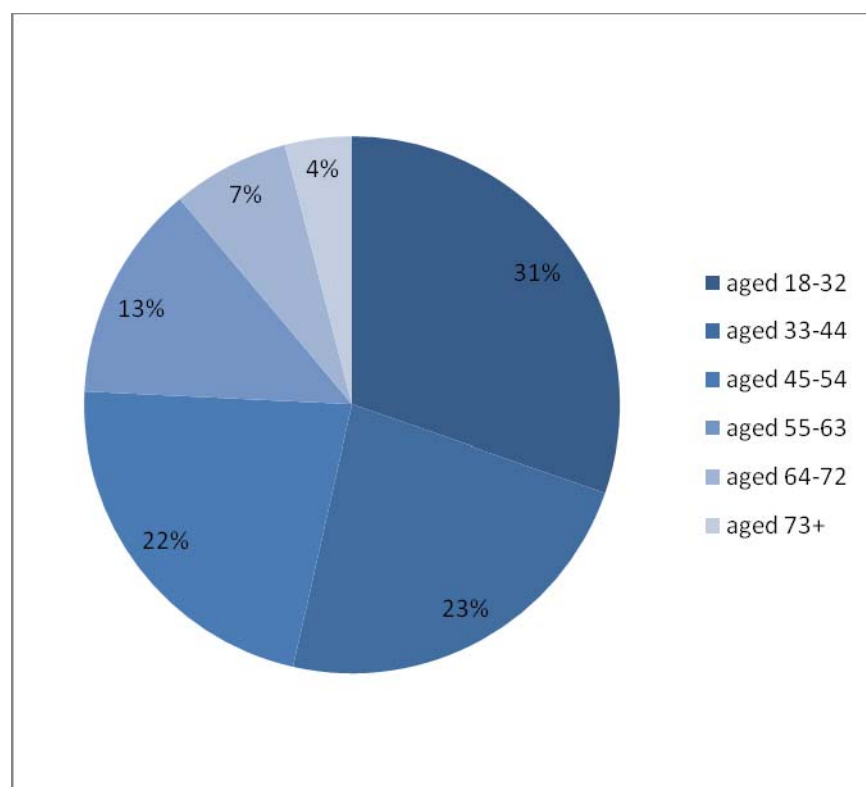
Figure 2.2: Makeup of US internet population (teenagers excluded) (Jones & Fox, 2009)

While email is currently the most prevalent communication activity of older people online, the use of online communities is also growing within this population (Jones & Fox, 2009). As Herring (2004) states: "Members of older generations as well have acquired extensive familiarity with CMC over the years, especially in the form of email, distribution lists, and webpages" (p.33). Compared to younger users, older people are significantly more likely to look for health information online, as researching for health information is the third most popular online activity among older people (Jones & Fox, 2009). This shows that many older people consider the internet as a source for obtaining information about health issues, suggesting that online support

communities discussing health issues might be of particular benefit for them. The next section discusses the impact of internet and CMC use on older people's wellbeing in more detail.

2.3.2 CMC and older people

2.3.2.1 Impact of computer usage and CMC on older people's wellbeing

Despite the multiple reasons for older people to be reluctant towards online social interaction, studies found that online social interaction can enhance older people's quality of life and wellbeing by counteracting the feeling of loneliness and social isolation (Czaja et al., 1993; Fokkema & Knipscheer, 2007; Xie, 2007a). For example, Eilers (1989) found that older people's mental abilities and social interactions increase if they regularly use computers. Also, according to Czaja et al. (1993) an increase in online social interaction correlates positively with the perceived quality of life of older people.

However, Dickinson and Gregor (2006) conducted a systematic review of existing studies in order to investigate the impact of computer usage on older people's quality of life. They conclude that the often-cited benefits of computer use for older people are not based on scientifically sound evidence. Rather than the computer use itself, they suggest that it might be the social interactions that older people engage in when learning how to use a computer that lead to an improvement in their wellbeing. Overall, they argue that existing research so far fails to provide clear evidence that computer use does indeed improve older people's wellbeing. More work in this area is necessary in order to derive clear conclusions (Dickinson & Gregor, 2006).

2.3.2.2 Older people's usage and perception of CMC

Research investigating why older people use CMC found that the opportunity to interact socially with like-minded people, the exchange of social support, and companionship are strong motivators (Kanayama, 2003; McMellon & Schiffman, 2002; Pfeil et al., 2009; Xie, 2008). For example, focusing on intergenerational communication, Harley and Fitzpatrick (2009a; 2009b) investigated an older person's social interactions with younger members via video blogging on the video sharing website YouTube. In a first study, the first eight videos of an older video blogger and the textual responses by younger people were analysed. Results show that YouTube

provides a platform for intergenerational communication which facilitates "reminiscence, reciprocal learning and co-creation of content" (p.5). In addition, findings suggest that it is the social benefit that motivates older people to learn new technical skills and engage in CMC (Harley & Fitzpatrick, 2009b). In a second study, the focus is placed on the analysis of one particular video that the older person posted and the video responses from three younger people. Thereby, emphasis is placed on the interactional and multimodal communicative modes with which people establish a conversational context that nurtures common ground, social contacts and intergenerational communication. Results show that inherent obstacles of communication via YouTube can be overcome through creative and proactive utilisation of different communicative modes (e.g.body movements). Moreover, the focus on non-linguistic communication emphasises the social and embodied part of the communication and takes away the focus on the technology. In summary, YouTube was found to facilitate companionship and the exchange of intergenerational social support beyond the boundaries of negative stereotypes. Thereby, it is of importance for older people to engage with younger people in order to also provide and not just receive social support (Harley & Fitzpatrick, 2009a).

Focusing on online supportive social interaction among older people, Kanayama (2003) studied an online community for Japanese older people with a focus on self-disclosure and the exchange of social support. She found that the fact that online interaction is mostly text-based is perceived as especially beneficial and helpful by older people, because textual communication is enhancing rather than limiting their ability to interact on a personal and emotional level. For example, she mentions that the asynchronous nature of online communities and the possibility to edit messages before sending them is perceived as beneficial. In her study, she also found that older people especially value the supportive communication and companionship connections to other members of the online community (Kanayama, 2003). Whilst her study provides profound insight into the content that is exchanged in the online community, it does not show how this content forms a dynamic conversation. Also, whilst she explains in detail the importance of companionship among older online support community members, her findings do not explain how the relationships between members of the community are formed through the communication.

Similarly, McMellon and Schiffman (2002) conducted questionnaires with older people, asking them how computer usage and especially the use of online

communication influence their social and personal lives. They found that email is the most commonly used way of communicating online. But in addition, older people also participate in online communities, meet others who are in a similar situation and engage in satisfactory social interactions with them (McMellon & Schiffman, 2002). McMellon and Schiffman (2002) conclude that older people perceive CMC as empowering. Investigating the impact of online communication on older people's lives, Bradley and Poppen (2003) focus explicitly on the question of whether using the internet and engaging in online social interactions increases or decreases older people's perceived loneliness. Providing computer equipment, internet access and training to housebound older people (disabled people and their caregivers), Bradley and Poppen (2003) investigated the impact that internet usage has on participants' perceived level of loneliness. Findings show that older people engage in social interactions via the internet and develop friendships in online communities. Questionnaire results show that older people's satisfaction with their social interactions increases significantly when they participate in online communities, suggesting that participation in online communities does indeed decrease the level of loneliness for housebound older people.

McMellon and Schiffman (2002) as well as Bradley and Poppen (2003) studied in detail older people's perceptions of online activities. However, they did not link these perceptions to people's actual online behaviour (e.g. frequency and content of communication). A combination of these two aspects would provide a more comprehensive understanding of the nature of online communities for older people.

2.3.2.3   *Characteristics of online support communities for older people*

In order to analyse online support communities for older people, scholars examine the messages that are exchanged in such settings. For example, Wright (2000b) studied the content of messages from 20 forums within SeniorNet, an online community targeted at older people. In particular, he investigated how older people give and receive social support in the community. His findings identify three main themes: (a) promoting community support (e.g. messages saying that the community was a great place to be), (b) advice disguised as self-disclosure (e.g. explaining how one deals with a problem), and (c) shared life events (e.g. describing events in daily life, often in relation to the topic of the discussion board). Results from an additional survey show that the spectrum of support experienced by members ranges from receiving factual information to

developing highly emotional attachments to the community (e.g. describing the online community as a family) (Wright, 2000b).

Similarly, Pfeil and Zaphiris (2007) investigated the communication content of an online support community for older people. Based on a content analysis of 400 messages, a code scheme describing different aspects of supportive activities that took place within the online community was developed. Findings show that different aspects of support are exchanged. The most frequent are i) to disclose information about themselves and ii) to post messages that nurture a feeling of togetherness within the online support community (Pfeil & Zaphiris, 2007).

In order to study the influence of three different types of CMC (chat room, one-to-one instant messaging, and online forum) on the kind of support that older people exchange in these settings, Xie (2008) studied an online community for Chinese older people which accommodates for all three communication types. She interviewed 33 older people and observed the communication activities on the online forum and in the chat room. Her findings show that chat rooms are primarily used for companionship, whereas online forums are primarily used in order to exchange informational support. Thirdly, one-to-one instant messaging was found to be used in order to exchange emotional and instrumental (practical) support (Xie, 2008). Overall, Xie (2008) concludes that older people have a positive association between CMC and the exchange of social support. These findings are in line with her previous studies which show that the exchange of social support is a major component of communication between older people in CMC settings and nurtures the development of friendships among them (Xie, 2005).

Wright's (2000b) as well as Pfeil and Zaphiris' (2007) and Xie's (2008) investigations give profound insight into the characteristics of social support that is exchanged in online support communities for older people. However, these studies focus on the characteristics of social support in isolation, and do not examine the implication of the different kinds of support for the development of relationships between online community members or for the formation of supportive conversations. In order to address this gap, Zaphiris and Sarwar (2006) focused specifically on the social networks of related members in online communities. They compared the social networks of newsgroups for younger and older people, and found that older people's activities and behaviours in online communities are more consistent and stable than that

of young people. Although the newsgroup for younger people was found to have a higher number of visitors, messages per person, and on average longer messages, the newsgroup for older people was found to have higher numbers of replies to messages and members were more connected to each other. Overall, the study concludes that "older people can be as active as younger users of [...] CMC and can form more stable and interactive groups with emerging natural leaders and influencers through CMC" (p.420). Although this study compels through the detailed analysis of the social networks of online community members, it fails to link these network characteristics to the content of the communication.

2.3.3   Summary: online support communities for older people

This section showed that a substantial amount of research has been conducted in the research area of online support communities for older people. Although the reviewed studies give considerable insight into online support communities for older people, each of them addresses only an individual part of these communities. While some studies have focused on the perception of online communication by older people (Bradley & Poppen, 2003; Kanayama, 2003; McMellon & Schiffman, 2002; Xie, 2008), others have focused on the characteristics of the communication content (Pfeil & Zaphiris, 2007; Wright, 2000b), or on the structure of the social networks of related members (Wright, 1999; Zaphiris & Sarwar, 2006). Thus, little is known about how these aspects interact with each other in order to form a comprehensive understanding of online support communities for older people. Also, different methods have been applied in order to study individual aspects of the communities (e.g. content analysis, social network analysis, interviews). This poses the question of how these methods can be combined in order to allow for a holistic analysis of an online support community for older people.

This PhD aims to address the gap by conducting a comprehensive investigation of an online support community for older people.Various methods are applied in order to study different aspects of the case study community. The combination of these analyses provides a holistic understanding of the investigated aspects and reveals how these interact with each other.

In order to complement the literature review on online support communities for older people, the next section focuses on the methods that are used in the analyses of

online communities. By presenting different methods that can be applied when investigating online communities, I provide the rationale underlying the selection of the methods and procedures in this thesis.

2.4 Methods for researching online communities

This section provides a summary of methods and procedures that can be applied when studying social interactions in online support communities. Thus, it addresses research question VI (What methods are appropriate for studying online support communities?). Based on the research questions, this section is divided into the following parts:

- Section *2.4.1* discusses content analysis, a systematic method for conceptualising a large amount of text into a reduced set of categories based on explicit rules of coding (Krippendorff, 1980; Stemler, 2001). Content analysis can be applied in order to address research question I (What are the characteristics of social support in the online support community?).

- Section *2.4.2* focuses on social network analysis (SNA), a method that can be used to investigate the relationships between online community members. I discuss how this method can be applied in combination with content analysis in order to address research question II (How does the exchange of social support influence the relations between people participating in the online support community?).

- In section *2.4.3,* emphasis is placed on different methods that can be applied to study conversation structures within the online support community (e.g. message-sequence analysis). I discuss the appropriateness of these methods to answer research question III (What is the conversation structure of supportive communication within the online support community like?).

- Section *2.4.4* discusses different ways of analysing the roles that people take on in online communities (e.g. behavioural role analysis, structural role analysis). Based on this review, appropriate methods are identified that can be applied in order to address research question IV (What kind of roles do people take on in the online support community?).

- Finally, section *2.4.5* gives a brief overview of query-based methods (e.g. interviews, questionnaires). These can be used in order to investigate the opinions, perceptions and expectations of users, and thus are appropriate techniques to be applied in order to address research question V (What are older people's needs concerning online support communities?).

2.4.1   Content analysis

In order to address research question I (What are the characteristics of social support in the online community?), it was necessary to investigate the characteristics of the messages that were exchanged. In CMC research, text is often the main data used by the researcher in order to investigate communication and it is thus important to pay special attention to it (Baym, 2000). One method that is frequently applied in order to investigate the characteristics of messages in an online community is 'content analysis' (Krippendorff, 1980; Mayring, 2000). It facilitates the analysis of messages by describing their communication content in terms of a set of categories.

2.4.1.1   Key aspects of content analysis

Content analysis is a method for analysing large volumes of data (textual, pictorial etc.) in order to identify trends and patterns. Often, it is applied in order to conceptualise large amounts of text. Holsti (1969) describes content analysis as "[a] technique for making inferences by objectively and systematically identifying specified characteristics of messages" (p. 14). According to Mayring (2000), the content analysis procedure consists of the following main steps:

1. The selection of the data-set
2. The definition of the target of inference
3. The development of categories (inductive or deductive)
4. The coding of the data according to clearly defined rules
5. The testing of the reliability of the coding procedure
6. The qualitative and/or quantitative analysis of results

Studies that apply content analysis in order to investigate online support communities usually look at a subset of the messages in the community. The main activity of content analysis is then to describe the communication content of these messages through a set of categories. In some studies, whole messages are sorted into

categories (Coulson, 2005; Coulson et al., 2007; Eichhorn, 2008; Preece & Ghozati, 2001), whereas others assign multiple categories to one message (White & Dorman, 2000) or divide messages into sub-units and sort these into categories (Pfeil & Zaphiris, 2007). The categories are then further analysed, either in terms of qualitative descriptions or in a quantitative way (e.g. counting the frequency of categories to test hypotheses with quantified measurements) (Krippendorff, 1980; Mayring, 2000).

Depending on the aim of the study, researchers either apply inductive content analysis with the aim of developing a set of categories (Pfeil & Zaphiris, 2007; Preece, 1999; Rodgers & Chen, 2005) or they follow the deductive approach, sorting the messages into a pre-defined set of categories (Braithwaite et al., 1999; Coulson et al., 2007; Eichhorn, 2008; Preece & Ghozati, 2001; Winefield, 2006).

The deductive approach imposes a pre-defined set of categories onto the data. Thus, the categories are rarely tailored to the specific characteristics of the online community (e.g. population, communication medium). However, the application of the same set of categories in different research studies allows for a verification and generalisation of these categories. For example, Cutrona and Suhr's (1992) categories that describe several aspects of support were applied to investigate the characteristics of social support in several online support communities (Braithwaite et al., 1999; Coulson, 2005; Coulson et al., 2007; Eichhorn, 2008). The advantage of a deductive content analysis is that it allows for a comparison of the communication content across different settings and thus makes it possible to generalise the findings (Preece & Ghozati, 2001).

In contrast, inductive content analysis focuses on the development of a set of categories that describes the communication content of a specific online support community (Mayring, 2000). Often, the developed categories are used to analyse the communication content in a qualitative way which provides a detailed description of the categories' characteristics (Rodgers & Chen, 2005). Also, some studies provide the frequencies of occurrence of the categories to give an idea about the distribution of the different kinds of communication content in the community (Pfeil & Zaphiris, 2007; Preece, 1999). The benefits of this approach are that the results are not limited by a pre-defined set of categories, and the developed set of categories exactly describes the communication content in the community. The challenge of this approach is, however, that it is difficult to compare findings and discuss them in relation to other studies as the set of categories is unique and specifically tailored to the online support community

under investigation. Although this kind of empirical investigation is a good way to explore the communication content in an online support community, it is difficult to generalise the findings of such an investigation.

2.4.1.2   *Application of content analysis*

Content analysis is a suitable method for investigating the content of the communication in an online support community. It can be used on its own, but can also be embedded in an overall ethnographic study. In combination with other methods, like social network analysis etc., content analysis can be a valuable part in a holistic investigation of an online support community.

Content analysis provides the opportunity to describe the characteristics of the communication content and is thus an appropriate method to address question I (What are the characteristics of social support in the online support community?). Chapter *4* reports on how I applied content analysis as part of this thesis in order to identify the characteristics of social support as exchanged in the case study community.

2.4.2   Social network analysis

Research question II (How does the exchange of social support influence the relations between people participating in the online support community?) requires the analysis of the relations between members in the online support community. One method that facilitates the analysis of relational data is social network analysis (SNA).

Originally rooted in the fields of sociology and anthropology, SNA is based on the concept of social network theory (Wasserman & Faust, 1994). According to social network theory, a social network is comprised of actors (nodes) and relations between them (ties). SNA has been widely used to study offline social networks and has recently been applied to investigate online communities (Aviv et al., 2003; Hampton & Wellman, 2000; Haythornthwaite, 2000; Kavanaugh & Patterson, 2001; Laghos & Zaphiris, 2006; Turner et al., 2005; Welser et al., 2007; Zaphiris & Sarwar, 2006). Garton et al. (1997) argue that people who are connected via computers (as in online communities) form a social network. Similarly, Wellman (1996) states: "When a computer network connects people, it is a social network. Just as a computer network is a set of machines connected by a set of cables, a social network is a set of people [...] connected by a set of socially-meaningful relationships" (p.1).

2.4.2.1   Key aspects of SNA

Social network analysis (SNA) investigates the relations between online communitity members. SNA can be based both on members reporting the number and names of their friends (resulting in a social network describing friendship) as well as on the observed communication activity (e.g. who talks to whom). The analysis of relational properties between members in the online support community is different from standard CMC methods, which often focus on the attributes of individuals without taking into account their relationships to other community members. The strength of SNA lies in the analysis of social relations between people in the context of the structure of the social network in which these relations develop (Garton et al., 1997). Rather than the attributes of the individuals, it is the pattern of the relations that is of interest when applying SNA (Levine & Mullins, 1978). SNA therefore shifts the focus from an individualistic viewpoint to the structural analysis of the whole social network (Garton et al., 1997).

SNA can be applied in a quantitative way, measuring characteristics of a social network like density, cohesiveness etc. These measurements are then interpreted. For example, the more dense a social network is, the more interconnected are the members of the network and the more have these members direct contact with each other (Garton et al., 1997). Similarly, in a social network with a high reciprocity, people tend to respond to each other often and the relations between them are mutual, whereas in a social network with a low reciprocity, more one-directional ties exist and the relations are more unbalanced.

In order to analyse social networks in a more qualitative way, the network can be visualised, based on a variety of measurements or structural information. These graphical representations of the social network can for example be used to identify people that are central or isolated in the network and spot asymmetries in the network structure (Scott, 2000). Garton et al. (1997) state that SNA is a valuable method to study CMC as it offers an opportunity to study how "third parties affect communications, how relations offline affect relations online, and how CMC intersects with the structure and functioning of social systems."

2.4.2.2   Application of SNA

In summary, SNA is a useful method in order to investigate the relations between online community members. As mentioned before, SNA can be based on members reporting the number and names of their friends (resulting in a social network describing friendship) as well as on the communication activity (e.g. who talks to whom). In the latter case, SNA can be combined with the analysis of the content of the communication in an online support community: It is possible to distinguish between different kinds of communication and for example compare the social network based on supportive communication with the social network based on hostile communication within the same online community. Such an analysis can provide insight into the impact of these two kinds of communication on the relations between online community members. Thus, I consider SNA an appropriate method in order to address research question II (How does the exchange of social support influence the relations between people participating in the online support community?). Chapter *5* reports a study in which SNA and content analysis were combined in order to investigate the influence of the exchange of social support on the relations between online support community members.

2.4.3   Analysis of the conversation structure

Different methods can be applied in order to analyse the conversation structure within the case study community and address research question III (What is the conversation structure of supportive communication within the online support community like?). After a brief introduction of the key aspects of conversation analysis in general, I focus on the analysis of the structure of related messages in order to investigate the conversation within online communities.

2.4.3.1   Key aspects of the analysis of the conversation structure

When trying to analyse the structure of a conversation, a good starting point is conversation analysis (Sacks, 1995). Hutchby and Wooffitt (2008) state that conversation analysis "...is the study of recorded, naturally ocuring talk-in-interaction [...] to discover how participants understand and respond to one another in their turns at talk, with a central focus on how sequences of actions are generated". In the context of CMC, the analysis of conversation is often based on message-sequences. This is described by Jeong (2005b) as an approach that examines "group processes by studying

the sequential nature of messages and responses exchanged between [participants]" (p. 367).

Thus, the key aspect for investigating the conversation structure within an online support community is to identify how messages within this community are related to each other (e.g. whether one message responds to a previous one) (Jeong, 2005b; Jones et al., 2004; Kalman et al., 2006; Rafaeli & Sudweeks, 1997). However, one has to consider that several conversations can go on at the same time, resulting in the fact that related messages might not be posted in a consecutive order (Greenfield & Subrahmanyam, 2003; Lapadat, 2002). Herring (1999) found that adjacent messages are often neither related nor relevant to each other. Also, it is quite common in CMC settings that one initial message triggers multiple responses, and one message refers to multiple other messages. This occurs mostly in asynchronous online communities where messages are often longer and frequently refer to multiple conversations. Thus, it is important for the analysis of the conversation structure to carefully identify the relations between messages within the online support community.

In addition to the relations between messages, it can also be beneficial to investigate their content in order to identify common communication patterns. For example, Joyce and Kraut (2006) found that long initial messages or messages that include a question are more likely to trigger a response compared to short messages or messages that do not contain a question. Also, responses are reported to be similar in style and form to the initial message (Becker-Beck et al., 2005). For example, initial messages that sound negative were found to trigger negative responses and longer initial messages were found to trigger longer responses (Joyce & Kraut, 2006). When investigating the structure of a conversation, one can either focus on a sequence of two related messages (e.g. initial message-response) or focus on patterns of several related messages. In addition, observing these patterns over a longer period of time can help identify the association between the conversation structure and the increase or decline of the level of activity.

2.4.3.2   *Application of the analysis of conversation structure*

The analysis of related messages and their content can give valuable insights into the conversation structure within an online community as it helps to identify how conversations build up and are sustained (Jeong, 2005b). Thus, in order to address

research question III (What is the conversation structure of supportive communication within the online support community like?), I analyse the structure and content of related messages. Doing so, I divide the investigation into two parts: (i) focusing on message-sequences of two related messages and (ii) analysing conversation structures of three or more related messages. Please refer to chapter *6* in which the method and findings of these analyses are reported.

2.4.4   Role analysis

In this section, I review methods that can be applied in the analysis of roles in online communities and are thus suitable for addressing research question IV (What kind of roles do people take on in the online support community?). After a short introduction in which I define the term 'social role', I focus on two approaches to role analysis: functional role analysis and structural role analysis.

2.4.4.1   Definition of the term 'social role'

The term 'social role' offers a way of thinking about people not as individuals but as similar entities. Grouping similar people and defining their characteristics and attributes allows us to identify principles of social behaviour and structures beyond the level of the individual (Golder & Donath, 2004). Definitions of the term 'social role' vary and different researchers tend to focus on different aspects of social roles. Biddle (1979) defines a social role as "a behavioral repertoire, characteristic of a person or a position; a set of standards, descriptions, norms, or concepts held for the behaviors of a person or social position" (p. 9).

Merton (1968) states that a social role "refers to the behaviour of status-occupants that is oriented toward the patterned expectations of others" (p.41). Golder and Donath (2004) summarise several definitions and conclude that a social role is defined by two main aspects: (i) the characteristics of the individual (the skills, responsibilities and privileges that a person enjoys) and (ii) the social context of the person in terms of relationships towards others and expectations that others have of him/her. Thus, social roles in a community can best be investigated by studying the behaviour of individual members as well as their relationships to others. Two prevalent procedures are important in this context: functional role analysis and structural role analysis. I discuss these further in the following sections.

2.4.4.2   *Functional role analysis*

According to the functional role theory, social roles are characterised by the function that individuals have within the group and are mostly described by observable behaviour (Biddle, 1986). For social roles in online communities, this means that the roles are defined based on the posting behaviour of individual members. This posting behaviour can be analysed based on the level of activity and the kind of content that individual members post in an online community. For example, people can be categorised into roles based the number of words or messages at they post to the community. In addition, content analysis as discussed in section *2.4.1* can be a sound basis for functional role analysis. Using a code scheme, it is possible to investigate the content that individual members post to the community. This analysis can then be taken as a basis to look for recurring patterns that allow us to group members according to the content that they write.

2.4.4.3   *Structural role analysis*

Structural role theory defines social roles based on the structural position that people take on in groups. This approach considers the system as a whole and identifies roles based on the relations between members and their status within the group (Inkeles, 1970). When following the structural approach for investigating social roles in online communities, researchers often apply SNA (Fisher, 2005; Fisher et al., 2006; Pfeil et al., accepted; Welser et al., 2007). As previously discussed, SNA focuses on relations between group members and offers the possibility to categorise members based on similar relational patterns (Hanneman & Riddle, 2005) (also see section *2.4.2*). One measurement of SNA that is particularly suitable for structural role analysis is the calculation of the regular equivalence between members within the social network. Regular equivalence in this context refers to similarities in the patterns of members' relationships with other members. Hanneman and Riddle (2005) describe regular equivalence as follows: "Two nodes are said to be regularly equivalent if they have the same profile of ties with members of other sets of actors that are also regularly equivalent." Figure 2.3 visualises the concept of regular equivalence. The nodes represent people and the lines represent relations between them. Circled members belong to the same role based on their relationships with entities from other roles.
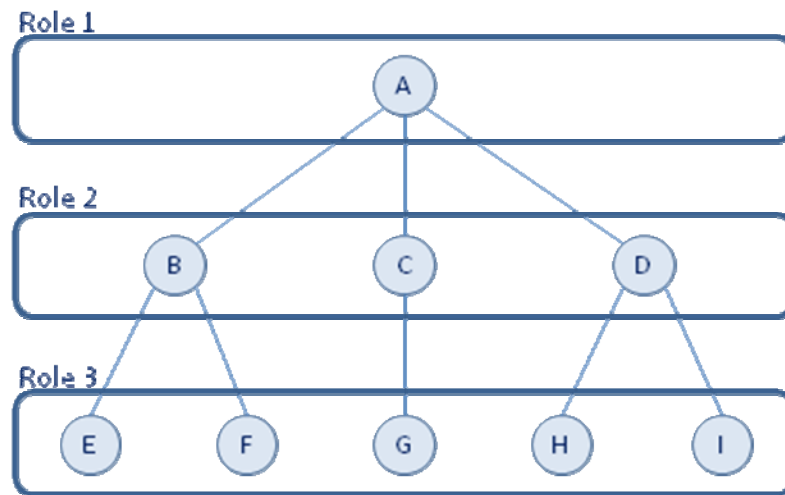
Figure 2.3: Conceptualisation of regular equivalence (Hanneman & Riddle, 2005)

The analysis of the regular equivalence offers a way for identifying groups of people who have a similar structural position within the online community. This allows us to identify social roles based on the structural similarities between members (Hanneman & Riddle, 2005). The roles can then be further refined by characterising these structural positions.

2.4.4.4   *Application of role analysis*

In this section, I discussed two ways of analysing the social roles that people take on in online communities: (i) investigating the behaviour of online community members based on their posting activity (functional role theory), and (ii) analysing the structural position of people within the online community (structural role theory). In both approaches, people who show similar behaviour or have a similar structural position are grouped together and form a social role. I believe that a combination of these two approaches is appropriate to investigate the roles that people take on within the online support community and thus address research question IV (What kind of roles do people take on in the online support community?).

2.4.5   Query-based techniques

Query-based techniques (e.g. interviews, questionnaires) have been extensively applied in order to investigate how members of online support communities perceive the communication activities and how the exchanged support impacts on their daily lives (Maloney-Krichmar & Preece, 2005; Wright, 2000a; Wright, 1999; Wright, 2000b; Xie, 2007a; Xie, 2008). Thus, they can be applied to tackle research question V

(What are older people's needs concerning online support communities?). The identification of older people's needs concerning online support requires the analyst to elicit comprehensive explanations and personal stories from participants. As interviews are more likely to obtain detailed descriptions of behaviour compared to questionnaires (Kiesler & Sproull, 1986), interviews seem to be the more appropriate method. In the following section, I report the key aspects of interviews and discuss how they can be used in order to address research question V.

2.4.5.1   Key aspects of interviews

When conducting interviews with members of an online support community, focus can be placed on specific aspects of the community and members can be questioned about their perceptions of and experiences with these aspects. For example, interviews have been conducted with members of online support communities in order to investigate how they perceive the exchange of social support in these settings (Xie, 2007b; Xie, 2008). In addition, interviews have been conducted in order to analyse the influence of CMC characteristics on the online communication. For example, Bowker and Tuffin (2002; 2003) applied interviews to investigate an online community for people with disabilities. In their analysis, they focused on the role of anonymity and deception (Bowker & Tuffin, 2003). In particular, they analysed how people with disabilities choose to disclose information about themselves and their disability (Bowker & Tuffin, 2002).

Interviews are mostly analysed in a qualitative way, eliciting key themes and topics that are mentioned by participants (Tesch, 1990). These themes and topics are then utilised in order to answer the respective research question. Interviews can be applied as the sole method in a study but can also be conducted to complement other methods. For example, Maloney-Krichmar and Preece (2005) applied multiple methods (e.g. content analysis, interaction process analysis, role analysis) in combination with interviews in order to study an online support community.

2.4.5.2   Application of interviews

Interviews can give insight into how members perceive the exchange of social support in online support communities and what they consider to be the benefits and challenges of participating in such communities. Therefore, I consider it an appropriate method to investigate older people's needs concerning the participation in online

support communities (research question V). However, it is important to note that interview findings represent people's viewpoints and opinions, which are not always reflected in their behaviour. Thus, it is useful to combine interviews with other research methods that study people's behaviour in online support communities (e.g. content analysis or SNA) (Maloney-Krichmar & Preece, 2005).

2.4.6 Summary: methods for researching online communities

In this section, I reviewed different research methods that can be used to study an online support community. This was done in order to address research question VI (What methods are appropriate for studying online support communities?). By presenting appropriate methods for studying different aspects of online support communities, I discussed their suitability to be applied in order to answer research questions I-V. In summary, the following methods were discussed:

- Content analysis (to address research question I)

- Social network analysis (to address research question II)

- Analysis of the conversation structure (to address research question III)

- Role analysis (to address research question IV), and

- Interviews (to address research question V)

2.5 Conclusion

In section *2.1,* I focused on the unique characteristics of CMC and communication in online communities. Doing so, I discussed in detail the differences between CMC and offline communication. I concluded that the communication process in online communities is different from comparable offline settings as the fact that the communication is mediated by the computer alters the communication characteristics. Thus, additional research is necessary in order to investigate the impact of these differences on the exchange of social support in online support communities. In section *2.2,* I discussed the nature of social support, particularly in online settings. I presented three main theoretical perspectives on social support and how they are currently applied in studies investigating online support communities. In addition, I extracted the differences between online and offline social support. Whilst this section discussed in

detail the nature of online social support, it did not provide a comprehensive understanding of how different aspects of online support communities can be combined in order to provide a holistic description of such communities. Furthermore, this review did not differentiate between different user groups who participate in online support communities. Based on the two basic components – computer-mediated communication and social support - I introduced the setting of my PhD research: online support communities for older people (see section *2.3*). After providing demographic data about older people's internet and CMC usage, I discussed the perception and characteristics of online support communities for this target population. Based on the detailed description of online support communities and the related CMC theories as well as the theoretical perspectives on social support, I went on in order to present different methods that can be applied when studying such online support communities. Doing so, I placed specific emphasis on methods that can be utilised in order to investigate the case study community and address research questions I-V.

While my review showed that a considerable amount of work has been done concerning the analysis of online support communities for older people, I also showed that most studies focus on only one or two aspects of the communities. As already discussed above, neither CMC theories nor the theoretical perspectives on social support are on their own appropriate to fully describe the characteristics of online support communities for older people. Thus, an integrated and all-encompassing description of an online support community based on a combination of these is necessary. The next chapter addresses this gap and reports the development of MOSuC, a model that describes online support communities based on a combination of theoretical perspectives on social support and CMC theories.

3   Development of MOSuC (Model of Online SUpport
Communities)

*This chapter presents the development of MOSuC (Model of Online Support
Communities), a model which integrates different aspects of online support communities
in order to offer a description of such settings. CMC theories as well as theoretical
perspectives on social support serve as a basis for the development of MOSuC. The first
part of the chapter describes the development of MOSuC. In the second part of the
chapter, studies reported in the literature analysing online (support) communities from
different perspectives are mapped onto MOSuC in order to elaborate on the model's
coverage and focus.*

The aim of this chapter is to report the development of MOSuC, a model that integrates different aspects of online support communities in order to provide a holistic description of such settings. Thus, this chapter addresses research question VII (How can a model provide a holistic description of the online support community?). The first part of this chapter (section *3.1*) describes the development of MOSuC based on CMC theories as well as theoretical perspectives on social support. In the second part (section *3.2*), MOSuC is discussed in the context of existing research studies. Thirdly, the utilisation of MOSuC in this PhD thesis is explained in section *3.3*.

3.1 The development of MOSuC

As stated above, the aim of MOSuC is to provide a description of online support communities and to integrate multiple aspects of such a community in order to provide a holistic understanding of the setting. In the following, I present two perspectives which characterise online support communities based on the previously discussed CMC theories (see section *2.1*) as well as the described theoretical perspectives on social support (see section *2.2.1*). The first perspective is called 'message – user' perspective. This perspective is based on the review of CMC theories and describes the two main units that are involved in online support communities. The second perspective is called 'characteristic – network' perspective. This perspective is based on the review of the theoretical perspectives on social support and describes two ways of looking at the exchange of social support. The combination of these two perspectives results in the identification of four main areas (quadrants) which form the basic structure of MOSuC. It is these four areas and their interplay which enable MOSuC to provide a description of online support communities.

3.1.1   The 'message – user' perspective

As discussed in section *2.1*, CMC theories focus on the nature of communication via different technologies (Kelsey & St. Amant, 2008). Thus, the main characteristic of all forms of CMC is that the communication does not take place face-to-face but is mediated by some form of technology. The 'medium' that facilitates the communication plays a very important role. All three of the CMC theories reported in section *2.1* (social presence theory (SPT), social information processing (SIP) theory, social identity model of de-individuation (SIDE) effects) are concerned with the influence of the mediating technology on the communication activity between users.

In the case of online support communities, the communication is mediated via the internet, more specifically via messages that are posted and viewed online. It is these messages that facilitate the communication between users. On the one hand, they offer the opportunity for users to get close to each other (e.g. as described in SIDE effects see section *2.1.3* and SIP theory see section *2.1.2*), but on the other hand, they can also form a barrier that stands between users (e.g. SPT see parts in section *2.1.1*).

Thus, communication in online support communities can be seen as an interplay between users of the online community and the messages that these users write and read. Himelboim (2008) states that online communities "are often discussed in terms of participants [...] or messages" (p. 159) (Himelboim, 2008). Thus, users and messages comprise the two units of analysis in the investigation of online support communities.

- A *user* is defined as a person who participates in the online support community. Users can be investigated by analysing their opinions, perceptions, the roles they play etc. (Buchanan & Coulson, 2007; Cummings et al., 2002; Han & Belcher, 2001).

- A *message* is defined as a block of text which is posted to the online support community by one person at one point in time. Messages that are exchanged in the community can be investigated by the analysis of their content and size, the structure of related messages etc. (Arguello et al., 2006; Klemm & Wheeler, 2005; van Uden-Kraan et al., 2008).

Figure 3.1 visualises this perspective.

Figure 3.1: Messages and users as the two units of analysis

The importance of users and messages in the analysis of online support communities is also reflected in the literature, as most studies investigating online support communities either focus on users or messages. A few studies also focus on both, the analysis of messages and of users. For example, Jones et al. (2001; 2004) investigated the association between the number of messages and the number of people participating in different online communities. Their findings show that at times when

the level of activity is high (many messages in a short period of time), people experience information overload and tend to drop-out of the online community.

In summary, the 'message – user' perspective describes the two main units of analysis to focus on when investigating online support communities: messages and users.

3.1.2   The 'characteristic – network' perspective

In the previous section, two main units of analysis of online support communities were identified based on the reviewed CMC theories. This section focuses on the reviewed theoretical perspectives on social support in order to identify the main perspectives for looking at these previously identified units. Based on the discussion in section *2.2.1*, I focus on two aspects that influence the exchange of social support: (i) the characteristics of the support that is exchanged (e.g. the stress and coping perspective see section *2.2.1.1*, and section *2.2.1.4*) and (ii) the relationships between people that facilitate the exchange of social support (e.g. the relationship perspective, see section *2.2.1.3*). Thus, the analysis of social support can be approached from two perspectives: Focusing on the characteristics of support (e.g. in form of supportive messages) or focusing on the facilitation of social support through relationships with others. For the development of MOSuC, I apply these two perspectives to online support communities. As a result, two ways of approaching the analysis of online support communities are identified: (i) placing emphasis on the characteristics of the investigated units of analysis (characteristic) and (ii) placing emphasis on the relations between these units (network).

- Analysing a unit of analysis through the investigation of its *characteristics* means that the attributes of individual entities (e.g. messages or users) are investigated. In the analysis of messages, this includes for example the size and content of such. When analysing users, this includes their attributes (e.g. age, gender) as well as their opinions and behaviour.

- Analysing a unit of analysis through the investigation of the *network* means that the units are analysed based on the properties of the relations between them. Relations in the context of messages are given for example by how one message refers to another one. In the context of users, relations can be defined by the communication activities (e.g. who talks to whom).

These two perspectives are visualised in the 'characteristic – network' perspective shown in Figure 3.2.

Figure 3.2: The two main perspectives for looking at online support communities

These two perspectives of looking at online support communities are also reflected in the literature: Up to now, the main emphasis has been on the analysis of the characteristics of the exchanged support (Braithwaite et al., 1999; Coulson, 2005; Coulson et al., 2007; Eichhorn, 2008; Kanayama, 2003; Klemm & Wheeler, 2005; Pfeil & Zaphiris, 2007; Rodgers & Chen, 2005; Tichon & Shapiro, 2003; Turner & Fisher, 2006; van Uden-Kraan et al., 2008; Winefield, 2006; Winzelberg, 1997; Wright, 2000b; Xie, 2008). These studies describe the kinds of support exchanged in online support communities and some also include how these kinds of support are perceived by members of the online support community. For example, Xie (2008) investigated the exchange of social support among older internet users in three different settings: voice chat, online forum and instant messaging. Analysing the messages exchanged in these settings, as well as people's perception of them, she distinguishes between different characteristics of support: companionship, informational support, instrumental support, and emotional support. She concludes that the characteristics of the exchanged support are related to the choice of medium. For example, voice chat is utilised for companionship, whereas the online forum is primarily used for informational support.

Some studies have also investigated members' social networks in online support communities, focussing especially on how the networks facilitate the exchange of social support (Eastin & LaRose, 2005; Nahm et al., 2003). For example, Nahm et al. (2003) found that the amount of time that members spend in online communities and their level of computer knowledge correlate positively with the number of relationships that they have. Also, the more relationships people have with other members within the online support community, the more support they receive. In addition, female members were found to have more relationships than male members. Furthermore, difficulties in accessing and using the online community due to physical disabilities were found to have a negative influence on the number of relationships. Similarly, Wright (1999) concludes that the amount of time people spend in an online support community has a

positive impact on their number of relationships in this setting and their satisfaction with the support they receive.

Summarising, the 'characteristic – network' perspective of MOSuC describes two approaches to analysing online support communities: (i) focusing on the characteristics of the investigated units of analysis or (ii) focusing on the network of related units.

3.1.3   The two perspectives combined

As discussed in section *3.1.1* and section *3.1.2*, MOSuC is based on two perspectives: the 'message – user' perspective that distinguishes between the message and the user as the unit of analysis in online communities, and the 'characteristic – network' perspective that depicts two approaches to the analysis of social support. The combination of these two perspectives results in MOSuC which consists of four areas (quadrants) that need to be addressed in order to provide a comprehensive understanding of an online support community. Figure 3.3 shows how MOSuC is formed from the inter-relationship between the perspectives.
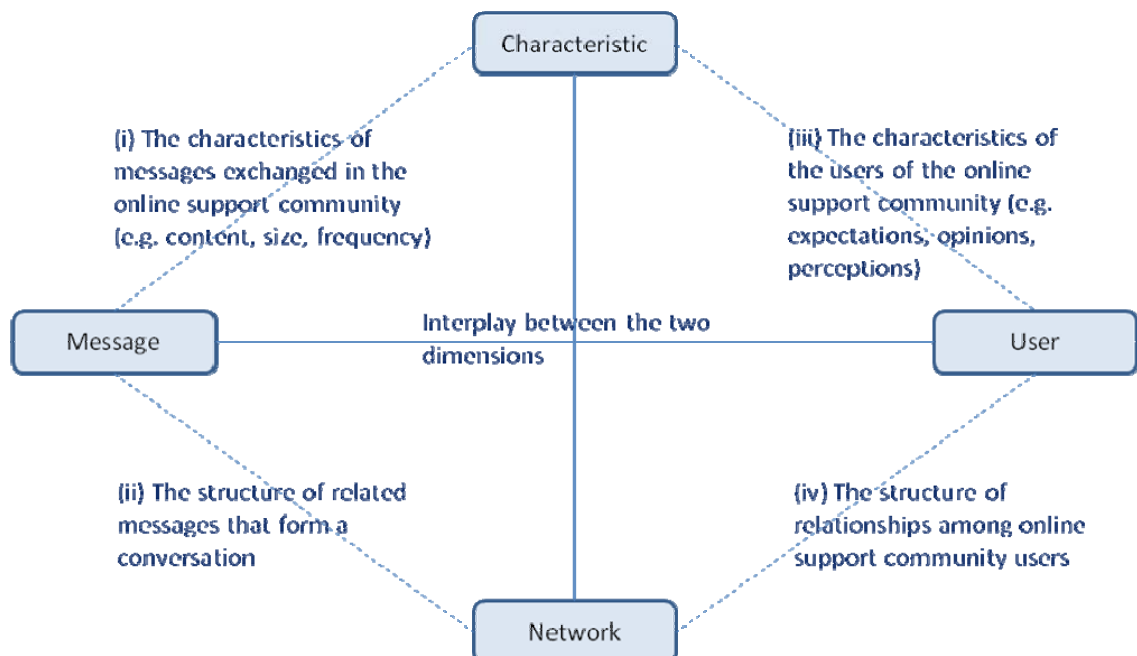
Figure 3.3: Model of Online Support Communities (MOSuC)

Based on MOSuC, four main areas of an online support community are identified: (i) the characteristics of messages exchanged in the online support community, (ii) the structure of related messages that form a conversation, (iii) the characteristics of the users of the online support community (e.g. their expectations,

opinions and perceptions), and (iv) the structure of relationships among online support community users. In addition, MOSuC emphasises the interplay between the two perspectives. In the following, the four quadrants are described in more detail. In order to complement the description of the individual quadrants, examples are given from existing research studies.

3.1.3.1   The 'message – characteristic' quadrant

The 'message – characteristic' quadrant of MOSuC places the focus on the different characteristics of messages in an online support community. These characteristics are for example the content of messages, their size, and the frequency with which they are posted. The thorough description of these message characteristics provides an understanding of these messages and how they are utilised in order to exchange social support.

When analysing the content of messages, this content is often related to the characteristics of social support (Braithwaite et al., 1999; Coulson, 2005; Coulson et al., 2007; Eichhorn, 2008; Kanayama, 2003; Klemm & Wheeler, 2005; Moursund, 1997; Pfeil & Zaphiris, 2007; Preece, 1999; Preece, 2000a; Rodgers & Chen, 2005; Tichon & Shapiro, 2003; Turner & Fisher, 2006; van Uden-Kraan et al., 2008; Winefield, 2006; Winzelberg, 1997; Wright, 2000b; Xie, 2008).

In some studies, inductive content analysis was applied in order to investigate the message content and to develop sets of categories that describe the nature of the exchanged social support (Klemm & Wheeler, 2005; Pfeil & Zaphiris, 2007; Preece, 1998; Preece, 1999; Rodgers & Chen, 2005; Tichon & Shapiro, 2003; van Uden-Kraan et al., 2008; Wright, 2000b). For example, van Uden-Kraan et al. (2008) distinguish between seven categories that describe the self-help mechanisms in three different online support communities: personal experience, providing information, empathy or support, requesting information, gratitude, friendship, and creative expressions. The description of these categories, as well as the frequency with which they occur in the online support communities, give profound insight into how members of the respective communities utilise the settings in order to support each other.

In some studies, the categories are not derived from the data, but an existing code scheme is used to analyse the content of messages in an online support community. This is often done in order to compare the online support community to

other communities (Braithwaite et al., 1999; Coulson, 2005; Coulson et al., 2007; Eichhorn, 2008; Preece, 2000a; Rafaeli & Sudweeks, 1997; Winefield, 2006; Winzelberg, 1997). For example, Preece (2000a) coded messages of different kinds of online communities into the following categories: empathetic, hostile, factual, personal narrative, and other. Her analysis shows that online support communities contain the highest percentage of empathetic messages whereas online communities about religion, sport, social, cultural, and political issues contain a high percentage of hostile messages.

In addition to the content of messages, some studies also focus on other message characteristics, e.g. the message size (Paccagnella, 1998; Schoberth, 2003) or the message frequency (Turner et al., 2005). For example, Paccagnella (1998) found that in the early period of an online community, when members who do not yet know each other are developing a common ground, they tend to write long messages. After this initial period, messages become shorter as members can build on the established common ground. Although the frequency of messages is not a characteristic of a single message, it is also considered to be a characteristic, as it describes an attribute of a set of messages independent of their relations. For example, Turner et al. (2005) consider the frequency of messages to be an indication of the size of an online community. In a comparison of all Usenet communities about various topics, they analysed the change in message frequency in the communities over time. This analysis enables them to see which parts of Usenet are growing and which are shrinking in order to identify popular communities.

In summary, messages are the main way of building and maintaining one's presence within an online community and are a main aspect to be taken into account when investigating such settings (Walther, 1992; Walther, 1996). Thus, the analysis of message characteristics is central to understanding online support communities.

3.1.3.2   The 'message – network' quadrant

The 'message – network' quadrant of MOSuC places emphasis on how related messages form conversations in online support communities. Investigating the structure of related messages, one can for example focus on the likelihood of messages triggering a reply (Arguello et al., 2006; Berthold et al., 1997; Joyce & Kraut, 2006; Pfeil et al., 2010) or analyse the position and purpose of messages within online conversations (Greenfield & Subrahmanyam, 2003; Jones & Rafaeli, 2000; Kalman et al., 2006; Pfeil

et al., under review). For example, Arguello et al. (2006) investigated the reply patterns of a sample of 6,174 messages from eight Usenet online communities (including two health-related online support communities). Their findings show that messages that contain on-topic content, information about autobiographical testimonials, or questions, are most likely to trigger a reply.

In addition, the positions of messages within a network of related messages are often analysed (Arguello et al., 2006; Berthold et al., 1997; Himelboim, 2008; Jones & Rafaeli, 2000; Jones et al., 2004; Kalman et al., 2006; Pfeil et al., 2010; Pfeil et al., under review; Turner et al., 2005). For example, Berthold et al. (1997) investigated the composition of threads in online communities. They defined a thread as a bulk of interrelated messages and compared messages at different positions within the threads. Their findings show that messages that start a thread have different qualities (e.g. content, size) from messages that end a thread.

Studying the impact of related messages on the overall conversation, Rafaeli and Sudweeks (1997) investigated reactive (responding to a previous message) and interactive messages (commenting on the relatedness of two previous messages) within different online communities. Their findings show that the level to which messages are related to each other is positively associated with a captivating and engaging conversation.

In summary, the investigation of the structure of related messages can give valuable insight into the composition of conversations in online support communities. Results of such analyses show how the structure of related messages facilitates supportive conversation.

3.1.3.3   The 'user – characteristic' quadrant

The 'user – characteristic' quadrant of MOSuC shifts the focus from the messages to how people perceive the communication and whether it matches their expectations. Incorporating the users into the analysis is important for identifying the benefits and challenges of online communities, especially those that are dedicated to the exchange of social support. As discussed in section *2.2.1.2*, different people perceive the same kind of support in different ways. Thus, the quality of the exchanged support not only depends on the messages but also on the match of these messages to the receiver's needs (Cutrona & Russell, 1990; Ford et al., 1996; Lakey & Cohen, 2000).

For the analysis of online support communities, this means that it is not only the characteristics of messages but also the needs of the receiver (e.g. characteristics of the users) that need to be investigated.

Studying users of online communities, researchers focus on their perceptions, opinions, and experiences with the online setting (Bargh, 2002; Bowker & Tuffin, 2002; Bowker & Tuffin, 2003; Buchanan & Coulson, 2007; Caplan, 2003; Dickerson et al., 2006; Fiore et al., 2002; Gatto & Tak, 2008; Han & Belcher, 2001; Haythornthwaite, 2000; Henderson & Gilding, 2004; McKenna et al., 2002; Mickelson, 1997; Peter et al., 2005; Pfeil et al., 2009; Rogers & Lea, 2005; Turner & Fisher, 2006; Walther & Boyd, 2002; Wright, 2002; Wright, 1999; Wright, 2000b; Xie, 2005; Xie, 2007b; Xie, 2008). Often, query-based techniques are applied in such studies. For example, Buchanan and Coulson (2007) conducted an online questionnaire with members of an online support community in order to understand their reasons for participating in this community. Findings show that users' motives and experiences of participating in the online community can be described through three emergent themes: 'Searching for help', 'Sharing fears', and 'I feel empowered' (Buchanan & Coulson, 2007). Similarly, Han and Belcher (2001) studied the perceived benefits and challenges of the exchange of social support in an online community for parents whose children suffer from cancer. The perceived benefits include the following themes: 'getting information', 'sharing experiences', and 'receiving general support'. The 'large volume of mail', and 'lack of physical contact' were found to be disadvantages of the exchange of social support in the online community (Han & Belcher, 2001). In order to identify users' needs for the design of an online support community for caregivers of Alzheimer patients, Tixier et al. (2009) conducted interviews with spouses of Alzheimer patients and carried out observations in offline support groups for caregivers. Their results suggest guidelines that should be adhered to in the development of such a community. For example, based on their data analysis, they suggest the implementation of a 'round-table' functionality where people can exchange their experiences concerning a specific topic.

In addition to the analysis of users' perceptions and needs, investigations of the roles that people take on in an online community can help to identify users' characteristics in more detail. Roles can be analysed based on users' communication activities like the quantity and content of their messages (Golder & Donath, 2004; Herring et al., 2002; Turner et al., 2005; Viégas & Smith, 2004). For example, Golder and Donath (2004) distinguish between the following roles that people take on in an

online community: the celebrity, the newbie, the lurker, the flamer, the troll, and the ranter. The description of these roles gives insight into people's motivations and responsibilities in the online community.

In summary, the investigation of online support communities from the perspective of users' characteristics can provide important insights into users' motivations to participate in the online support community and their reasons for reluctance to do so. Studying the users of online support communities is crucial for understanding the experience of participating in these settings.

3.1.3.4   The 'user – network' quadrant

The 'user – network' quadrant of MOSuC places emphasis on the relations between users in online support communities. The relationship perspective (see section *2.2.1.3*) argues that the exchange of social support is defined by an individual's relationships with others (Lakey & Cohen, 2000). Thus, the number of 'friends' as well as the quality of the relationships to these friends define an individual's reception of social support. In order to understand the exchange of social support in online communities, it is therefore necessary to investigate how online support community members are related to each other and how these relationships facilitate the exchange of social support. Doing so, researchers often focus on the network of related members in their analyses (Aviv et al., 2003; Eastin & LaRose, 2005; Fisher, 2005; Hampton & Wellman, 2000; Haythornthwaite, 2000; Himelboim, 2008; Laghos & Zaphiris, 2006; Paccagnella, 1998; Pfeil & Zaphiris, 2009; Turner et al., 2005; Zaphiris & Sarwar, 2006). Thereby, the quantitative characteristics of the network (e.g. how many people and how many links between them) are as important as the qualitative aspects of the network (e.g. the quality of a relationship). Also, the analysis of the structural position of individual members in the network can be utilised in order to identify the roles that people take on within an online community (Fisher, 2005; Fisher et al., 2006; Turner et al., 2005; Welser et al., 2007).

Social network analysis (SNA) is an appropriate method for analysing networks of related community members. As Garton et al. (1997) state, SNA focuses on the structural properties of related community members rather than their individual properties and can thus provide additional insight into the nature of the communication process. SNA has already been applied in order to analyse online communities (Aviv et al., 2003; Eastin & LaRose, 2005; Fisher, 2005; Hampton & Wellman, 2000;

Haythornthwaite, 2000; Himelboim, 2008; Laghos & Zaphiris, 2006; Paccagnella, 1998; Pfeil & Zaphiris, 2009; Turner et al., 2005; Zaphiris & Sarwar, 2006). For example, Aviv et al. (2003) investigated the differences between the social networks in a structured and a non-structured online learning community. Thereby, the strucutured community facilitated a formal debate among a small number of students that committed to the participation, whereas the non-structured community facilitated an informal discussion which was open to all students and did not follow a predefined schedule. Findings show that structured communities nurture the development of interconnected cliques among community members whereas the non-structured communities do not facilitate the development of such cliques.

When analysing online communities, there are different ways of applying SNA. Some researchers ask online community members about their relationships to others in the community and create the network based on the perceptions of its members (Eastin & LaRose, 2005; Haythornthwaite, 2000). Others construct the social network based on the communication activity among members in the online community (who talks to whom) (Fisher, 2005; Himelboim, 2008; Laghos & Zaphiris, 2006; Paccagnella, 1998; Pfeil & Zaphiris, 2009; Turner et al., 2005; Zaphiris & Sarwar, 2006). Research into online support communities is interested in the association between the network characteristics and other aspects that are related to the exchange of social support. For example, Eastin and LaRose (2005) found that individuals' confidence to receive online social support positively correlates with the size of their social network (e.g. the number of people that the individual engages with in order to exchange social support). Furthermore, the size of the social network positively correlates with the quality of the perceived social support (Eastin & LaRose, 2005; Nahm et al., 2003; Wright, 1999). In addition, the time spent online and the levels of computer literacy positively correlate with the size of the network as well. In constrast to that, increasing age and physical barriers were found to be related to a smaller network (Nahm et al., 2003).

In summary, the investigation of the relationships between members in an online support community can give insight into the distribution and exchange of social support and is thus an important aspect that contributes to the overall understanding of online support communities.

3.2 MOSuC in context of existing research

After providing a detailed description of MOSuC and its components in the previous section, I now investigate whether existing research studies that analyse online (support) communities can be mapped onto MOSuC. This is done for two reasons: (i) in order to analyse whether MOSuC is an appropriate model for existing research studies (Can all studies be mapped onto MOSuC?), and (ii) to investigate whether existing research studies cover all quadrants of MOSuC (For each study, which quadrant(s) of MOSuc does it address?). Also, discussing MOSuC in context of existing research studies further explains the characteristics of the quadrants, especially how they interact with each other. In the following, I first define the selection of the studies and the procedure of the mapping. Then, the results of the mapping are presented.

3.2.1   Literature included in the mapping

From all the work reviewed in this thesis, the following publications were included in the mapping: (i) research studies that investigated existing online communities, and (ii) studies that conducted research on people who participate in textual online communities or for whom an online community is about to be designed. Concerning online communities, only communities in which members mainly communicate via text (online forum, chat) were included. Communities in which the focus was on different media (e.g. video, voice-chat) were excluded. Only original investigations were included in the mapping. Publications that summarise existing literature were excluded as well as studies that conducted research in lab settings or investigated patterns of general internet use. Studies that describe the development of tools for analysing online communities were also excluded.

Out of the 219 cited references in this thesis, 80 studies were considered relevant for this mapping (see *Appendix A*). In order to map the studies onto MOSuC, the following questions were asked for each study: (i) does the study investigate message characteristics?, (ii) does the study investigate the network of related messages?, (iii) does the study investigate users' characteristics?, and/or (iv) does the study investigate networks of related users who participate in the community? A table was constructed to present the results and to show how the studies mapped onto the quadrants of MOSuC. This mapping is presented in *Appendix A*.

3.2.2   Results of the mapping

The results of the mapping are summarised in Figure 3.4, Figure 3.5, Figure 3.6, Figure 3.7, and Figure 3.8. Firstly, Figure 3.4 shows studies that were mapped onto one of the quadrants of MOSuC. Then, Figure 3.5 and Figure 3.6 focus on studies that were mapped onto two quadrants of MOSuC. Finally, Figure 3.7 and Figure 3.8 show studies that were mapped onto three quadrants of MOSuC. No study was mapped onto all four quadrants of MOSuC.
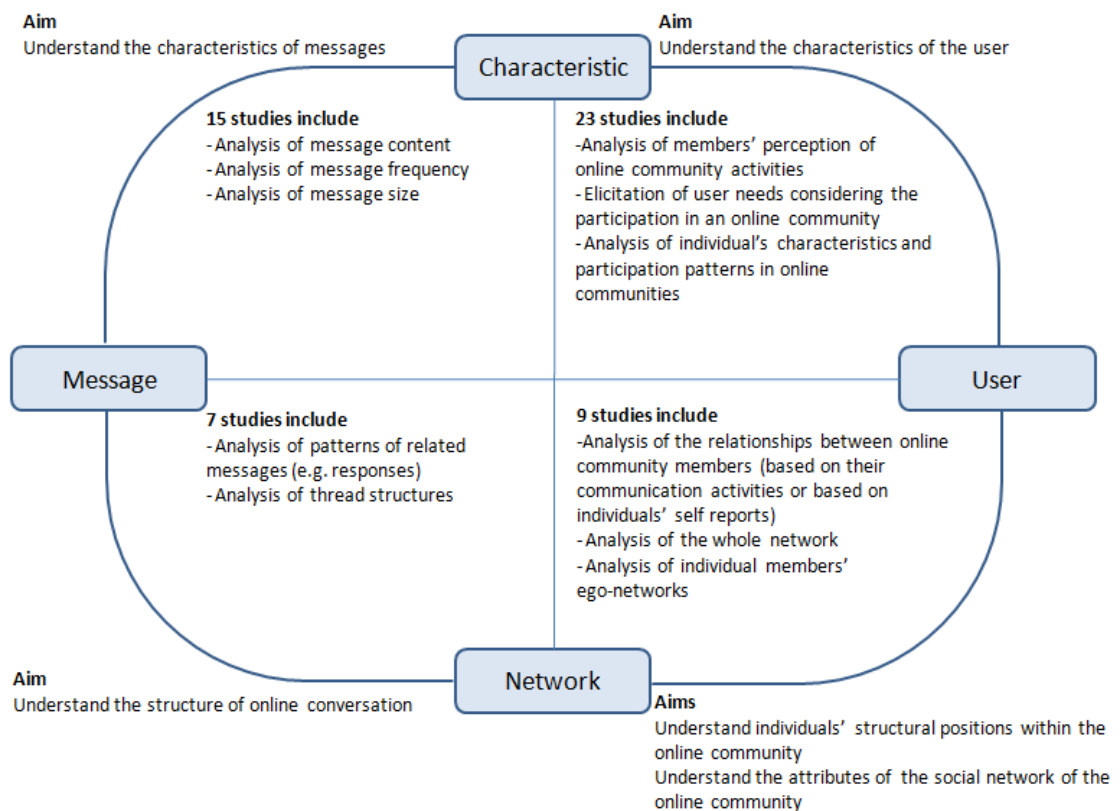
Figure 3.4: Studies that were mapped onto one quadrant of MOSuC

As Figure 3.4 shows, 54 out of the 80 relevant studies were mapped onto a single quadrant of MOSuC. Most of these studies focus on the investigation of the characteristics of online community users (23), followed by the investigation of message characteristics (15). Less focus is placed on the investigation of the networks of related users (9) as well as related messages (7). Although they can be mapped onto one of the four quadrants of MOSuC, studies that address the same quadrant can still have different aims and apply different methods of analysis (see Figure 3.4).

Some studies were mapped onto two or three quadrants of MOSuC. These studies often apply multiple methods in order to investigate different aspects of the online community and then combine the findings. Several of these studies involve ethnographic research, including the participation of the researcher in the online community and the analysis of the communication activities, as well as users' opinions and perceptions (Baym, 2000; Bowker, 2001; Fay, 2007; Ito et al., 2001; Kleinman, 2002; Maloney-Krichmar & Preece, 2005). For example, 15 of the relevant studies focus on the combination of the analysis of message and user characteristics. Figure 3.5 presents the aim and the different approaches of these studies.

Aim
Understand users' perceptions of the communication in relation to the actual message characteristics

Characteristic

15 studies include
- Combination of analysis of message content and members' perception of this content
- Analysis of the association between message characteristics (e.g. frequency) and user population (e.g. number of active users)

Message

User

Network

Figure 3.5: Studies that were mapped onto the 'message–characteristic' and 'user–characteristic' quadrants

In addition, the review also identified several studies that focused on the combination of the analysis of users' characteristics and users' networks. Figure 3.6 presents the aim of these studies as well as the different approaches to a combined analysis of users' characteristics and networks.

Aim
Understand the associations between users' networks and their characteristics

Characteristic

6 studies include
- Combination of the analysis of users position in the network and their communication behaviour
- Combination of the analysis of the characteristics of users' individual online social networks and their perceptions of the online community
- Analysis of the roles that people take on based on their posting characteristics as well as structural position in the network

Message

User

Network

Figure 3.6: Studies that were mapped onto the 'user–network' and 'user–characteristic' quadrants

Finally, 4 out of the 80 relevant studies were mapped onto three quadrants of MOSuC, one study being mapped onto the quadrants 'message-characteristic', 'user-characteristic' and 'user-network' (see Figure 3.7), and three studies being mapped onto the quadrants 'message-characteristic', 'user-characteristic' and 'message-network' quadrants (see Figure 3.8). This means that they focus on users as well as messages in their analysis and study a combination of characteristics and network patterns.
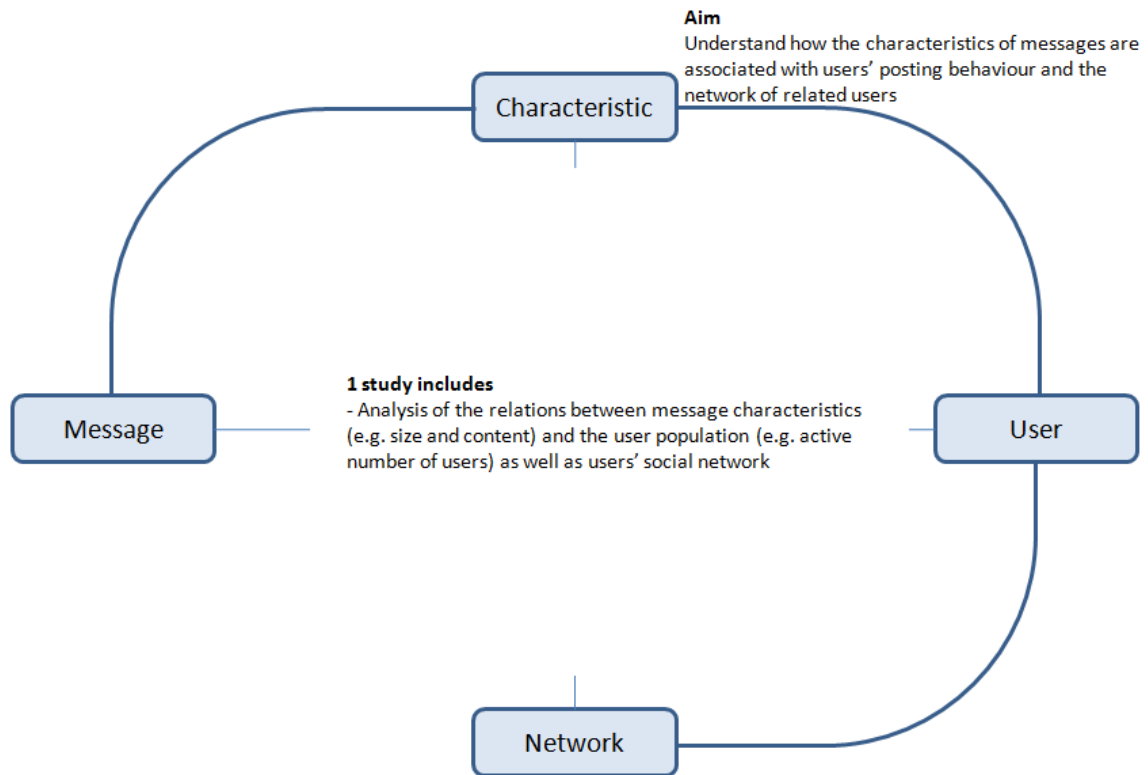
Figure 3.7: Studies that were mapped onto the 'message-characteristic', 'user-characteristic', and 'user-network' quadrant of MOSuC
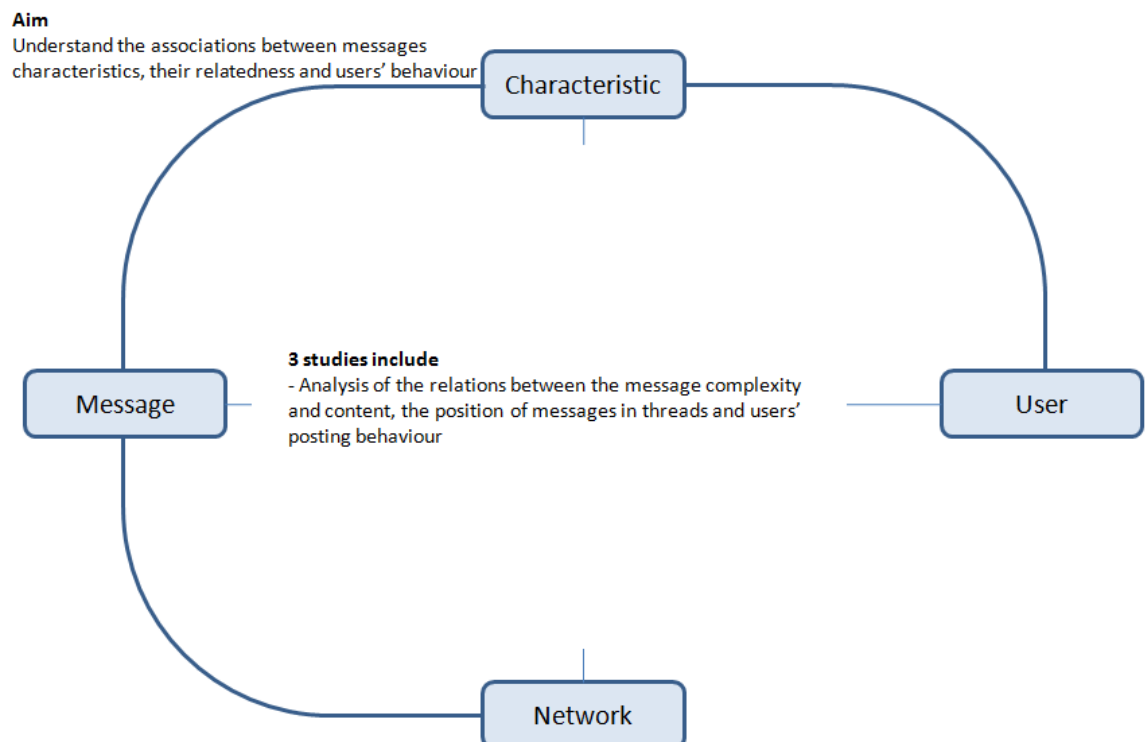
Figure 3.8: Studies that were mapped onto the 'message-characteristic', 'user-characteristic', and 'message-network' quadrant of MOSuC

In summary, all relevant studies of the review can be mapped onto MOSuC. This indicates that MOSuC provides a sound basis for describing online support

communities from multiple perspectives. In addition, as the results show, some studies are mapped onto only one quadrant of MOSuC, whereas others are mapped onto two or three quadrants of MOSuC. This indicates that all relevant studies miss one or more perspectives in their analysis, and thus do not provide holistic descriptions of the settings. In the following, I discuss how I utilise MOSuC in this thesis in order to conduct a holistic analysis and provide a comprehensive understanding of the case study community.

3.3 Utilisation of MOSuC in this thesis

MOSuC is taken as a basis for the analyses in this thesis. As the aim of this thesis is to gain a comprehensive understanding of an online support community, it is necessary to investigate the community from different perspectives. To this end, several independent studies are conducted, each addressing a different aspect of the case study community. The four quadrants of MOSuC are taken as a basis to guide the analyses and combine the findings of individual studies into a holistic description of the case study community.

In the following section, I map the research questions of this thesis onto MOSuC and describe how the model is utilised in order to integrate the individual research questions in order to allow for a comprehensive understanding of the case study community. Figure 3.9 shows the mapping of the research questions (see section *1.3*) onto MOSuC.
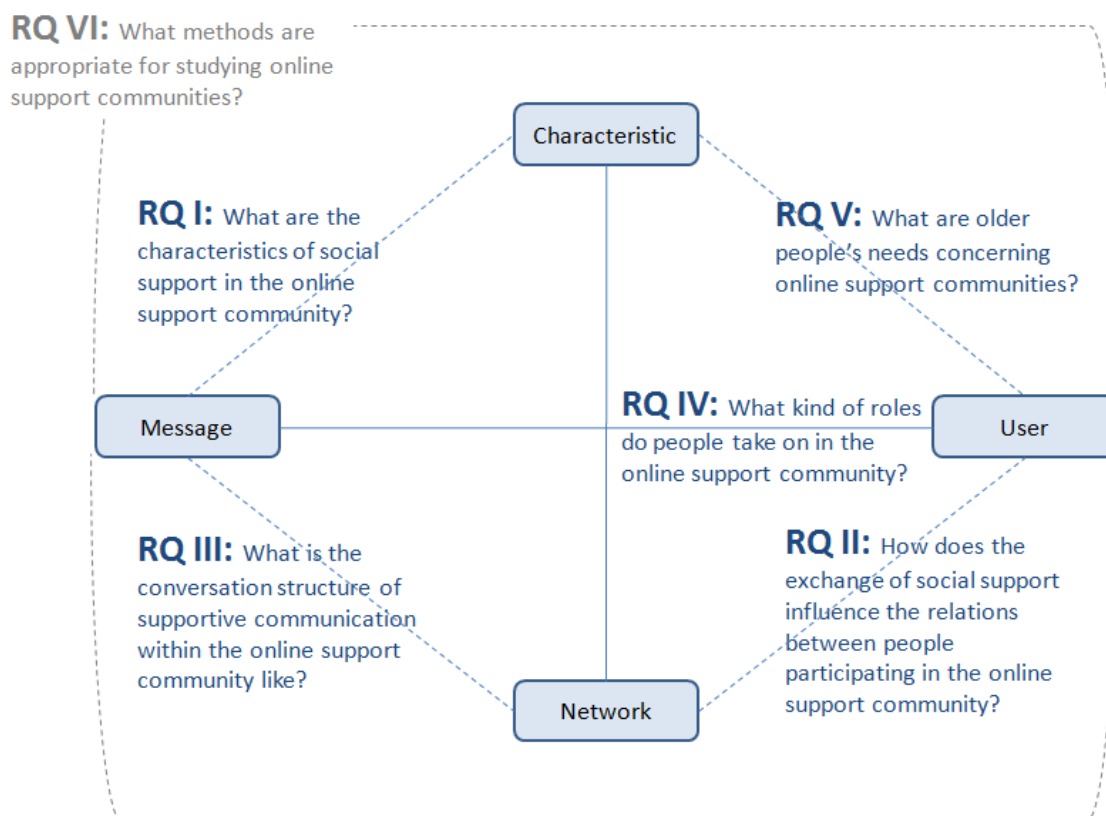
Figure 3.9: Mapping the research questions onto MOSuC

As Figure 3.9 shows, research questions I, II, III, and V are each mapped onto one of the four quadrants of MOSuC. Research question IV is placed on the interplay between the 'user-characteristic' and 'user-network' quadrants, as the investigation of social roles in this thesis includes the analysis of users' characteristics as well as the network of related users. Research question VI is depicted outside the quadrants of MOSuC as it deals with the methodological challenges of the individual analyses rather than the investigation of the online support community itself. Each of the research questions I-V covers an important area of MOSuC and the answers to these questions offer insight into the respective aspects of the case study community. In addition to the detailed descriptions of the different aspects of the case study community, MOSuC provides an opportunity to combine the descriptions of these aspects in order to provide a holistic and comprehensive understanding of the case study community.

3.4 Conclusion

This chapter reported the development of MOSuC based on the reviewed CMC theories as well as the discussed theoretical perspectives on social support. Then, existing studies were mapped onto the model. This was in order to analyse whether MOSuC provides an appropriate model for existing research studies and to investigate

whether existing research studies cover all quadrants of MOSuC. Results show that none of the relevant studies addresses all quadrants of MOSuC. In order to present the research questions of this thesis in the context of MOSuC, I mapped them onto the model. This mapping showed that all quadrants of MOSuC are addressed by the research questions. Thus, the combination of the findings of the individual studies within this thesis provides a holistic description of the case study community.

In the following chapters 4-8, each of the research questions I-V is addressed individually. Each chapter focuses on one research question and presents one or two studies that were conducted to answer the respective question. In chapter *9,* findings of the individual studies are combined in the context of MOSuC.

4 Analysing the characteristics of online social support

In this chapter, an online support community for older people is identified as the case study community for this thesis. Furthermore, this chapter presents how a code scheme was selected and further developed in order to analyse the content of the discussion messages in this community. The code scheme and its application explain the components and characteristics of social support as exchanged in the case study community. This study addresses research question I (What are the characteristics of social support in the online support community?).

This chapter presents the first study in this thesis and addresses research question I (What are the characteristics of social support in the online support community?). Figure 4.1 visualises the focus of this study in the context of MOSuC. As the study investigated the messages that are exchanged in the case study community in order to analyse the characteristics of social support, it is mapped onto the 'message – characteristic' quadrant of MOSuC.
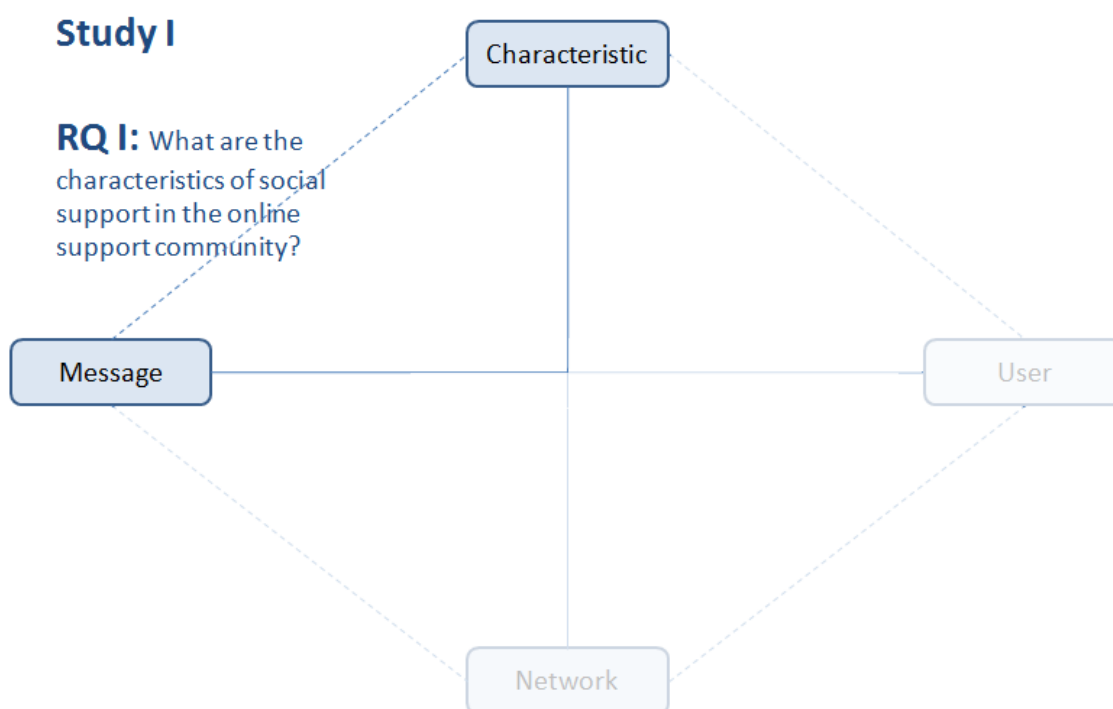
Figure 4.1: Research question I in the context of MOSuC

In the following, I first present and describe the case study community that I focus on in this thesis. Then, after a discussion of ethical issues, I report a code scheme that I developed in an earlier study (Pfeil & Zaphiris, 2007) in order to describe the exchange of social support. This initial code scheme was taken as the starting point for the analysis of the characteristics of social support exchanged in the case study community. Two studies were conducted in order to test the initial code scheme: firstly, content analysis was applied to messages of two additional communities using the code scheme. This was done in order to test the code scheme's generalisability. Secondly, a focus group was conducted in order to analyse the code scheme's applicability to describe the exchange of social support. Based on the results of these studies, the initial code scheme was revised. Four hundred messages from the case study community were analysed using this revised code scheme. Results of this analysis describe the

components and characteristics of social support exchanged in the case study community. The findings of this chapter serve as a basis for the subsequent analyses in this thesis.

4.1 Choosing the case study community

In order to investigate the exchange of social support in an online support community for older people, I selected the discussion board about depression within Seniornet (www.seniornet.org) (SeniorNet, 2009). Based on a review of available online communities targeted at older people, I chose to analyse this community in an earlier study (Pfeil & Zaphiris, 2007) and decided to continue working with this discussion board in this thesis. SeniorNet is a non-profit organisation that was founded 1986 by Dr. Mary Furlong in the context of a research project. Its website is targeted at older people (aged 50+) and includes many discussion boards about various topics. Each discussion board has a moderator, who watches over the discussion and encourages people to take part. Social interaction is an important characteristic of SeniorNet and previous studies about its discussion boards describe it as a supporting and caring environment (Ito et al., 2001). In the following, ethical considerations in the context of SeniorNet are discussed ad the selected case study community is described in more detail.

4.1.1   Ethical considerations

As some studies in this thesis involved online data collection, I discuss the ethical considerations that apply in the context of analysing messages of online communities, especially regarding the issue of informed consent. Researchers agree that not every research project involving data collection in online communities requires the consent of community members, as the distinction between whether the collected data is private or public has a great influence on the need for informed consent (Eysenbach & Till, 2001; Frankel & Siang, 1999). If the setting in which the data is collected is private, informed consent needs to be obtained; however, if the setting is regarded as public, informed consent is not required. King (1996) argues that it is difficult in online communities to distinguish between public and private. Frankel and Siang (1999) claim that the internet is a public domain and messages posted on the internet are thus intended for the public. They see the internet as a public space, because the access to online communities is often open and people should know and expect that their

messages are be read by a wide audience. The ProjectH Research Group worked on ethical issues for internet research and voted in favour of an ethical policy that does not require researchers to get permissions for collecting and analysing messages posted in publicly accessible online communities (Paccagnella, 1997).

SeniorNet was considered to be a suitable online community to be studied in this thesis for several reasons. Firstly, at the time of data collection (September, 2006), the discussion boards within SeniorNet were publicly available to all internet users and there was no need to register in order to read the messages. Furthermore, SeniorNet is a well-known organisation that educates older people about computers and the internet. Therefore, it can be safely assumed that the members are knowledgeable about the internet and are aware of the fact that their contribution is public. Also, members of discussion boards in SeniorNet have participated in research before (Ito et al., 2001; Timmermann, 1998; Wright, 2000a; Wright, 1999; Wright, 2000b). Thus, I regarded the messages in the message boards as public contributions and no consent was obtained before analysing them. This procedure was approved by City University's ethical research committee (see *Appendix B*).

4.1.2   Description of the online support community

In this thesis, I focus on the discussion board about 'depression' within SeniorNet. Based on previous research (Pfeil & Zaphiris, 2007) in which I investigated the discussion board about depression, I decided to continue working with this community. The availability of a rich data-set (including messages from 2000 to 2006) and the fact that a high level of emotional and supportive content is exchanged in this discussion board made it an appropriate choice. Figure 4.2 shows a screenshot of the discussion board about 'depression' (members' user names and message IDs are disguised).

As can be seen in Figure 4.2, the discussion is not organised into threads, but posts are displayed in the time order in which they were written, with the first post at the top of the page. The messages are open to the public to read, but members must sign in to write messages. When signing in, each member can choose a username and is allocated a profile-page, where (s)he can give further information about him/herself. The communication within the discussion board is text-based, although pictures can be attached to the messages.

For this thesis, I assumed that all members participating in the discussion board about depression are of older age (50+ as specified on the main homepage of SeniorNet) and have some relation to depression. The narrow focus of the online community in addressing older people (SeniorNet) and the clear description of the topic of the discussion board (depression) justify these assumptions.

Figure 4.2: Screenshot of the discussion board about depression within SeniorNet

4.2 Eliciting the characteristics of social support

After describing the case study community and elaborating on the ethical considerations, the focus is now shifted to the development of a code scheme that describes the characteristics of social support as exchanged in the case study community. As a starting point, I focus on an initial code scheme that I developed in a previous study (Pfeil & Zaphiris, 2007) in order to analyse the communication content in the discussion board about depression within SeniorNet. In this chapter, this initial code scheme is tested and revised accordingly. Then, the revised code scheme is used to

analyse the characteristics of social support in the case study community (see research question I). This analysis is broken down into the following steps:

I. Present the initial code scheme.

II. Investigate the generalisability of the initial code scheme to other online support communities for older people.

III. Analyse the initial code scheme's applicability to capture the exchange of social support in online support communities for older people.

IV. Based on the findings, revise the initial code scheme and apply the revised version to the case study community.

In the following, these steps are described in detail.

4.2.1   Presentation of the initial code scheme (Pfeil & Zaphiris, 2007) (step I)

In an earlier study (Pfeil & Zaphiris, 2007), I investigated the exchange of social support within the discussion board about depression in SeniorNet. Qualitative content analysis was applied to 400 messages in order to determine how social support is facilitated in the community. Special emphasis was placed on determining the characteristics of the communication content and the exchange of empathic messages. The study resulted in the development of a code scheme which forms a basis for this thesis. The methodology and results of this previous study are described below (for a full report of the study, please refer to Pfeil and Zaphiris (2007)).

4.2.1.1   *Methodology*

I investigated the first 400 available messages (posted from 6th August 2000 to 14th February 2002) from the discussion board about depression within SeniorNet. The messages were posted by 47 members of SeniorNet. The aim of this study was to find characteristics of social support and empathy as they occur in the case study community. Thus, qualitative content analysis was preferred over quantitative methods, as it allows for a descriptive interpretation of the communication content. In coding the messages, I followed an inductive approach. Therefore, the categories are data-driven and the code scheme inherently describes the patterns and content of the messages.

In order to familiarise myself with the data and to get a first impression about the context of the depression discussion board, I first read all messages thoroughly. This helped me to view the data from an insider's point of view during analysis and to take its context into account. In coding the data, consecutive sentences within one message that share the same meaning were taken as one text unit and coded into a single category. This ensures that the coding captures the necessary detail, while the data is still seen in its context. I developed a detailed procedure as a guide for determining the unit of analysis and an inter-coder reliability test with a sample of 15 messages revealed that two independent coders agreed on the segmentation in 84% of the cases (for a detailed description of this process, see Pfeil and Zaphiris (2007; 2010)).

In the second step, I analysed the first 400 messages of the depression board in chronological order, extracting key words and themes observed in the communication. This resulted in a collection of themes and patterns that described the data appropriately and completely. Subsequently, I sorted and grouped the notes and used them to develop the code scheme. This procedure was repeated iteratively, until a final code scheme was developed. Saturation was reached, when no new categories were necessary and the data-set could be sorted into the existing categories without any discrepancies. To measure the inter-coder reliability, a sample of 15 messages was coded by two independent researchers. Cohen's KAPPA was calculated to be 0.64, which according to Stemler (2001) is considered substantial. Once the inter-coder reliability concerning both the segmentation and the categories was established, the messages were separated into text units with the same meaning and sorted into one of the 23 sub-categories.

4.2.1.2   *Findings: the code scheme*

The code scheme that was derived from the data-set consists of 23 sub-categories sorted into seven high-level categories (see Table 4.1):

Table 4.1: The original code scheme describing the communication content in the
depression discussion board (Pfeil & Zaphiris, 2007)

High-level category	Sub-categories
Self disclosure	**Narration:** Text units about the poster's current situation presented in a narrative way (not emotional or medical). **Medical situation:** Text units that reveal information about the medical situation (illness, medication etc.) of the poster. **General feeling:** Text units about the feelings that the poster currently has (often in connection to what situation he/she has experienced). **Ask for support:** Text units in which the poster explicitly asks for support in form of prayers, suggestions, and advice (not medical questions). **Similar situation:** Text units that contain descriptions of a problem similar to one that another person posted before, to show that the posters are or have been in the same situation.
Community building	**Different channel:** Text units referring to a communication via another channel (email, chat, phone). **Own activity:** Text units that reflect on the degree of a poster's own activity within the discussion board. **Activity of others:** Text units that refer to the degree of activity from a specific other poster or from the whole community. **Togetherness:** Text units that stress the perceived value of the community and welcome and encourage others to post. **Thanks:** Text units in which the poster thanks specific others or the whole community for help, support and understanding.
Deep support	**Reassurance:** Text units that reassure that the information, action and feelings reported from others in former messages are right and/or appropriate. **Give help:** Text units containing recommendations and advice concerning the situation of a specific other. **Deep emotional support:** Text units that offer emotional support, sympathy and compassion towards a specific other.
Light support	**Best wishes:** Text units containing casual blessings and wishes for luck for particular others or for the whole community. **Encouragement:** Text units containing generic encouragement and support of others without further going into detail. **Humour:** Humorous text units that contain jokes, or references to games. **Interest:** Text units that contain questions that refer to the general wellbeing of others or ask for more detailed information to clarify the situation of the other.
Medical facts	**Medical information:** Text units giving answers to medical questions that have been raised earlier or giving medical information without being asked for. **Medical question:** Text units that include questions about medical issues (e.g. concerning drugs).
Slightly off	**Third person story:** Text units that contain information about third persons who are not members of the discussion board. **Off topic chit-chat:** Text units with content that is not related to the topic of the discussion board (e.g. weather).
Technical issues	**Technical problems:** Text units that report problems with the technology (e.g. Internet or SeniorNet in particular). **Technical suggestions:** Text units that contain recommendations on how to solve technical problems.

One message contained 2.57 categories on average. *Self disclosure* was the most frequent category, present in 71% of the messages. This shows how important it is for the members of the online community to tell others about themselves. The category *Community building* (61.5%) as well as the supportive categories *Light support* (42.75%), and *Deep support* (38.25%) also occurred frequently, whereas off-topic communication (*Slightly off* (22.5%)) and the more factual categories *Medical facts* (14.5%) and *Technical issues* (4.5%) were least frequent. The frequencies of the sub-categories and high-level categories are shown in Figure 4.3.
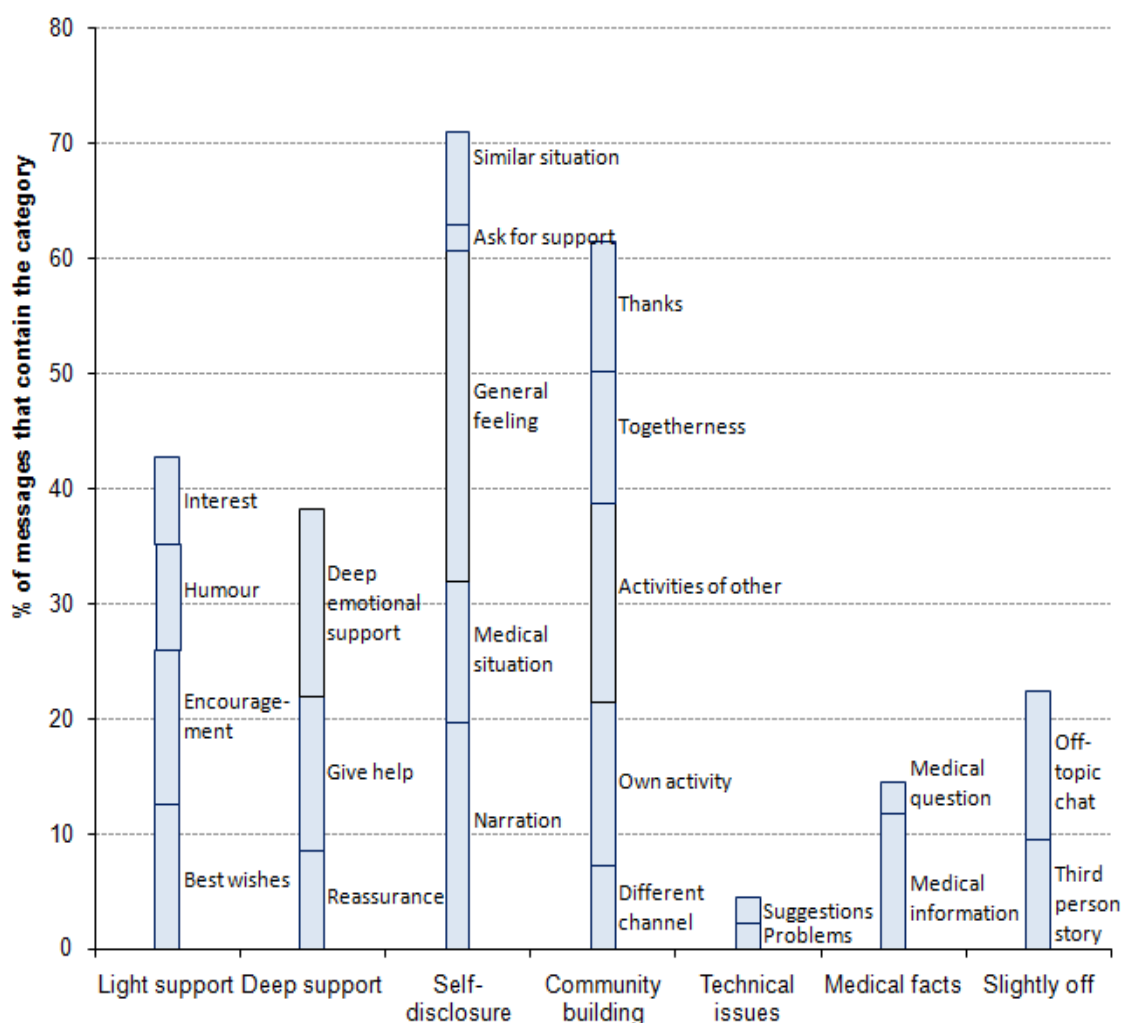
Figure 4.3: Frequencies of the categories as they occurred within the data-set from the SeniorNet depression discussion board (Pfeil & Zaphiris, 2007)

4.2.2 Generalisation of the code scheme (step II)

As the code scheme was developed based on the investigation of only one community, it was difficult to gauge its generalisability to other online support communities for older people. Thus, I analysed the generalisability of the code scheme

by applying it to two additional online support discussion boards for older people within SeniorNet.

4.2.2.1   Methodology

The online discussion board about 'depression', the online discussion boards about 'back pain' and 'ageing issues' within SeniorNet were selected in order to analyse the generalisabiltiy of the code scheme. Two hundred messages from each of these communities were coded using the code scheme. Again, the messages were separated into text units with the same meaning and sorted into one of the 23 sub-categories. During this process, I mainly focused on the appropriateness of the code scheme to capture the communication content. Text units that fitted into one of the categories of the code scheme were coded as such and new categories were developed for each discussion board for text units that did not fit into the existing code scheme.

Based on this activity, I created a separate code scheme for each of the two additional discussion boards that were found to partly overlap with the original code scheme. Table 4.2 shows the code schemes for each of the three discussion boards and describes the applicability of the original code scheme to the two additional communities (see objective II).

4.2.2.2   Results

As Table 4.2 shows, the seven high-level categories that were developed in the investigation of the depression discussion board could be applied to the two additional online discussion boards as well. Only two small changes had to be made: the category *Medical facts* was renamed as *Factual information* to take the emphasis off medical issues. In addition, the high-level category *Slightly off* was renamed into the more explanatory term *Off topic*. In summary, the seven high-level categories were found to be generalisable across all three investigated communities.

In contrast to the seven high-level categories, the 23 sub-categories were not found to be fully applicable to the messages of the two additional discussion boards. Table 4.2 provides an overview over similarities and differences in the communication content between the three discussion boards. Categories that are common across all three discussion boards are highlighted in green and categories that are not generalisable across the three discussion boards are highlighted in red.

Table 4.2: Similarities and differences in communication content between the three communities

High-level categories	Depression	Ageing issues	Back pain
Self disclosure	Narration	Narration	Narration
	Medical situation	Medical situation	Medical situation
	General feeling	General feeling	General feeling
	Ask for support	Ask for support	Ask for support
	Similar situation		Similar situation
			Help based on own experiences
Community building	Different channel		
	Own activity	Own activity	Own activity
	Activity of others		Activity of others
	Togetherness	Togetherness	Togetherness
	Thanks	Thanks	Thanks
		Reference to other discussions within SN	Reference to other discussion boards within SN
		Organise SN activities beyond the internet	
Light support	Best wishes	Best wishes	Best wishes
	Light encouragement		
	Humour	Humour	Humour
	Interest	Interest	
Deep support	Reassurance	Reassurance	
	Give help	Give help	Give help
	Deep emotional support	Deep emotional support	Deep emotional support
Factual information	Medical information	Medical information	Medical information
	Medical questions		Medical question
		Link to information	Link to information
			Same opinion
Off topic	Third person story	Third person story	Third person story
	Off-topic chitchat	Off-topic chitchat	Off-topic chitchat
Technical issues	Technical problems	Technical problems	
	Technical suggestions	Technical suggestions	Technical suggestions

4.2.2.3   *Discussion*

As shown in Table 4.2, the results provided sub-categories within the seven high-level categories for each discussion board that were sometimes overlapping but also showed differences. Overall, the 23 sub-categories elicited from the discussion board about depression were not found to be appropriate to describe the communication content of the two additional communities ('ageing issues' and 'back pain'). Thus, the detailed code scheme is not generalisable across different online support communities. However, the high-level categories were found to be applicable to all three communities and only two subtle amendments had to be made.

4.2.3 Applicability of the code scheme to analyse the exchange of social support (step III)

In addition to the analysis of the generalisability of the original code scheme reported in the previous section, this section analyses the applicability of the original code scheme (see Table 4.1) to describe the exchange of social support. Based on a combination of the findings of these two studies, the original code scheme is subsequently revised.

In order to test the applicability of the original code scheme to appropriately describe the exchange of social support in online support communities for older people, a focus group with 5 researchers/PhD students in the area of HCI and/or CMC was conducted. A sample of messages from the three discussion boards was coded together by all participants in the group and the applicability of the original code scheme to analyse the exchange of social support was discussed. The discussion raised three main problems with the code scheme, namely (i) the level of detail of the categories, (ii) the focus of analysis, and (iii) the incorporation of complementary methods. These problems are described in detail in section *4.2.3.2*. Solutions for these problems were found and suggestions for revising the original code scheme were made to ensure its applicability to capture the exchange of social support within online support communities for older people.

4.2.3.1   *Methodology*

A focus group is a method that facilitates a discussion about a predefined topic in which a group of stakeholders takes part. The aim of a focus group is to reach consensus about the topic under discussion. I conducted a focus group in order to discuss the applicability of the original code scheme (see Table 4.1) to describe the content of social support exchanged within online support communities for older people. Five participants (all researchers/ PhD students in the area of HCI and/or CMC) took part in the focus group. At the beginning of the focus group, I presented the development of the original code scheme. Questions that arose during the presentation were answered to ensure that every member of the focus group was familiar with the code scheme.

After the presentation, several randomly chosen text units from the three SeniorNet discussion boards ('depression', 'back pain' and 'ageing issues') were

considered consecutively. For each text unit, the focus group discussed how to code it with the original code scheme. Discrepancies were identified and the appropriateness of the code scheme to examine the exchange of social support in online support communities for older people was discussed. The outcome was a collection of problems with the code scheme.

At the end, the focus group went back to the identified problems, this time with a specific focus on how to address them through possible changes to the original code scheme. For each problem, the group discussed whether it could be solved by revising the code scheme. The focus group lasted around 90 minutes and was summarised in a protocol.

The outcome of the focus group was a collection of problematic issues that were discovered in the coding process and suggestions regarding how to address them. In my analysis, I summarised these issues into three main problems that I present below.

4.2.3.2   Results and discussion

In this section, I present the problematic issues that were discovered in the focus group and elaborate on suggestions on how to solve them.

The level of detail of the categories

Problem: When asked to code the selected text units using the categories of the code scheme, focus group participants easily agreed on the high-level categories. However, they had problems agreeing on specific sub-categories. For example, they agreed that a text unit should be coded into the high-level category *Self disclosure*, but there was disagreement on whether this self-disclosing text unit should be further defined as, for example, emotional or narrative self-disclosure. Thus, similar to the findings of the previous study (see section *4.2.2*), the seven high-level categories were found to be appropriate for the coding process, whereas a further refinement into sub-categories was considered to be problematic.

Solution: Discussing whether it was necessary to refine the high-level categories into sub-categories, the focus group concluded that it was best to focus on the seven high-level categories only. The consequence of this decision for the code scheme was that it was reduced to the seven high-level categories and any further decomposition into sub-categories was discarded. However, participants also agreed that the seven

categories on their own might not be sufficient to fully understand the communication content within the case study community. Thus, further analysis was considered to be necessary in order to describe in detail the characteristics of social support as exchanged in the case study community. Therefore, it was suggested to incorporate and use the seven categories of the code scheme in subsequent analyses in order to further analyse the characteristics of social support in the case study community (see chapters *5, 6, 7,* and *8*).

Focus of analysis

   Problem: Focus group participants discussed whether the code scheme should describe all communication that is going on within the case study community, or whether it would make more sense to focus on supportive communication content only. For example, some participants argued that the category *Technical issues* does not really contribute to the understanding of the exchange of social support in the community and should thus be discarded. However, others stated that the category *Technical issues* describes an essential part of the communication as text units coded into this category show how people report and solve technical problems in the community. Knowing how to use the online community was considered to be a fundamental requirement for the exchange of any messages in the community including the exchange of social support. Summarising, some participants argued that all communication content needs to be analysed in order to understand what is going on within the online community and how support is exchanged. Others preferred to focus on only a subset of messages (e.g. supportive messages).

   Solution: The focus group concluded that it was best to keep all seven high-level categories in the code scheme in order to describe all communication content within the case study community. Focusing on a subset of the communication would reduce the understanding of the community and thus inhibit the description of social support in this setting. However, the focus group also suggested that special emphasis should be placed on the exchange of social support in the subsequent analyses (e.g. by comparing supportive and non-supportive categories, or focusing on conversation that results in the exchange of social support in the community). In order to implement this solution, the code scheme did not need to be changed.

The incorporation of complementary methods

Problem: Another problem identified by the focus group was the question of whether the analyst's interpretation of the data was in line with the intentions of the posters and the perceptions of the receivers of the messages. While participants agreed on the category into which a text unit should be coded, they were concerned as to whether this also reflected the perceptions of the online community members. For example, focus group participants considered a text unit should be coded into the category *Deep support*, but at the same time had doubts as to whether this message was really perceived to be supportive by the receiver. It was agreed that a solution to this problem would go beyond the analysis of message content.

Solution: The focus group agreed that in order to derive valid conclusions, it was necessary to combine the analysis of the messages with data from interviews or questionnaires that asked community members about their perception of the communication content. Such an additional query-based analysis would give further insight into the interpretation of the messages by members of the community and could also help to incorporate members' perception of the communication into the analysis of the message content. Thus, the code scheme did not need to be amended, but additional studies were considered necessary to provide further insight into the characteristics of the seven categories. In order to address this issue, chapter *8* reports a study in which interviews were conducted in order to analyse older people's perceptions of supportive online communication.

4.2.4 Using the revised code scheme to analyse the characteristics of social support in the case study community (step IV)

4.2.4.1   The revised code scheme

Based on the analysis of the generalisability and the results of the focus group, the original code scheme was revised. As discussed above, the revised code scheme was reduced to the seven high-level categories and the sub-categories were discarded. Table 4.3 lists the seven categories of the final code scheme and provides a description and example for each of them. Furthermore, the two categories *Medical information* and *Slightly off* were renamed as *Factual information* and *Off topic*.

Table 4.3: The final code scheme

Category	Description	Examples
Self disclosure	Text units in which people post information about themselves. This can be done in different ways (e.g. emotional, narrative, medical)	"I yawn all the time. I want to go to bed. I know you're supposed to get out, but I don't have the energy to do that much."
Community building	These text units include people's opinions about the online community and meta-information about the communication activities.	"Thank God for this board, as I can sit here and cry and rattle on---you are the only ones who understand."
Deep support	Supporting text units that are often emotional and customised towards the unique situation of the person that the message is for.	"Words are so hard right now. So I place my hand gently over yours and let love and sweetness flow through to you."
Light support	These text units are supportive and uplifting. They are written in a generic way, for another person or the whole community.	"Hang in there" , "I am thinking about you"
Factual information	These text units include questions and answers about factual information concerning the topic of the community (e.g. medication).	"So in "both cases" situational depression and bipolar depression they alter chemicals in the brain?"
Technical issues	These text units are concerned with technical problems or suggestions regarding how to solve them.	"Read in your browser screen and have Notepad or Wordpad minimised…"
Off topic	Text units that are about others or about topics that strayed away from the theme of the online community.	"Sorry to hear Iowa's weather yesterday. Minnesota is much too cold and damp."

4.2.4.2   Inter-coder reliability

One week after the focus group, I did an inter-coder reliability check of the final code scheme (see Table 4.3) with the focus group participants. Each participant was given a different, random set of 15 messages from one of the three discussion boards and was asked to code the data independently. This coding was then compared to my own and Cohen's Kappa was calculated.

The mean Cohen's Kappa for all 5 code-comparisons was 0.67 (standard deviation: 0.15) ranging from individual code-agreements of 0.51 to 0.93. Based on Stemler (2001) the results of this inter-coder reliability test are satisfactory. Thus, the code scheme is considered to provide a solid description of the communication content in the case study community as well as to serve as a sound basis for further analyses.

4.2.4.3   The application of the revised code scheme to the case study community

The revised code scheme was applied again to the same data-set that was used for the development of the original code scheme (see section *4.2.1* (Pfeil & Zaphiris, 2007)). Thus, the 400 consecutive messages that were posted over a period of 1.5 years (from 6th August 2000 to 14th February 2002) in the discussion board about

'depression' within SeniorNet were investigated and content analysis was undertaken. MAXqda (2007), a qualitative data analysis tool which facilitates the segmentation and categorisation of text was used for the coding procedure. Each message was entered into the software as a distinct text document, and different text units within one message were coded separately. The messages were posted by 47 members of SeniorNet. Consecutive sentences within one message that share the same meaning were taken as one text unit and coded into a single category. The 400 messages were segmented into 869 text units and each text unit was coded into one of the seven categories of the revised code scheme (see Table 4.3).

Figure 4.4 shows the frequencies and distribution of the categories in the dataset. Please note that this diagram is different from Figure 4.3, as it shows the number of text units coded into a specific category rather than the percentage of messages containing a category.
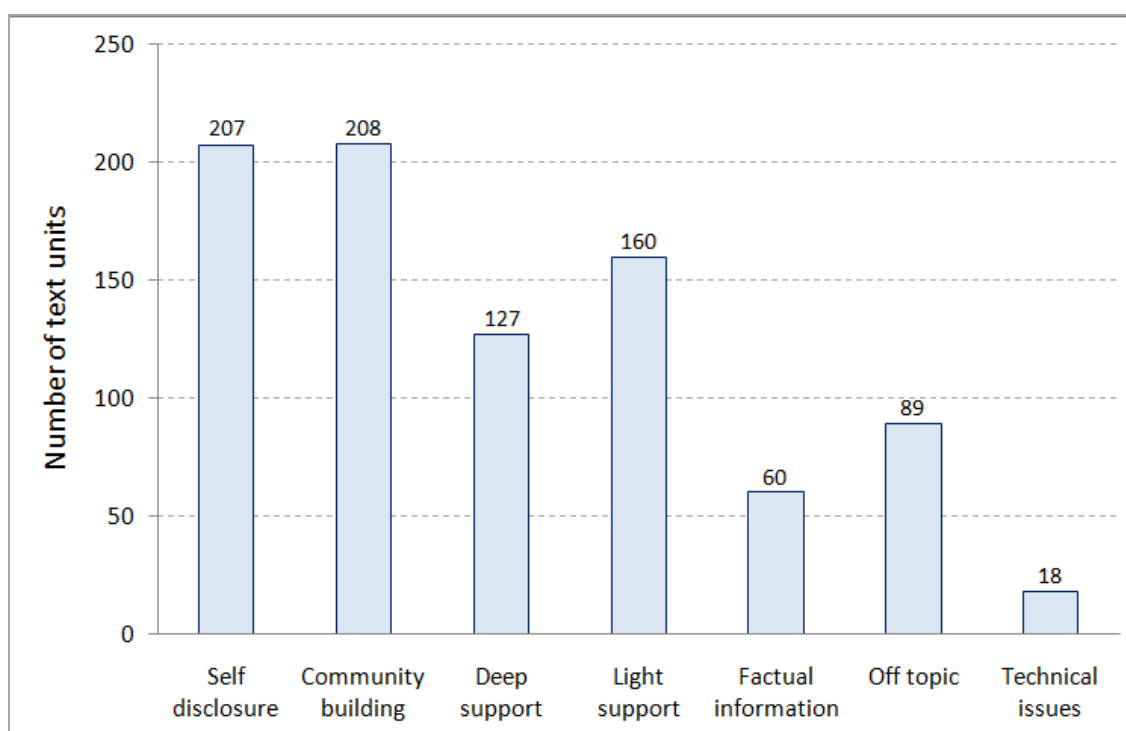
Figure 4.4: Frequencies of text units within specific categories

4.3 Conclusion

The aim of this chapter was to address research question I (What are the characteristics of social support in the online support community?). After describing the case study community for this thesis (the discussion board about 'depression' within SeniorNet), I presented an initial code scheme that I developed in a previous study

(Pfeil & Zaphiris, 2007) in order to analyse the communication content in the case study community. This code scheme consisted of seven high-level categories decomposed into 23 sub-categories and included a description of each of them (see Table 4.1).

After identifying the code scheme, I described two studies: one that aimed to analyse the generalisability of the code scheme and one that studied its applicability for investigating the exchange of social support. Findings of the first study revealed difficulties in applying the detailed code scheme with its 23 sub-categories to an additional two discussion boards. The problems were noted in a table summarising the similarities and differences of the content between the three investigated discussion boards (see Table 4.2). In a second study, a focus group was conducted that discussed the utilisation of the original code scheme to describe the exchange of social support.

Based on the results of these two tests, the initial code scheme was revised in order to yield an appropriate tool for analysing and describing components of social support within the case study community. Table 4.3 lists the seven categories of the revised code scheme and provides a short description and example for each of them. The categories describe the characteristics and components of the communication content exchanged in the case study community. The revised code scheme is applicable beyond the online discussion board about 'depression' within SeniorNet. In addition, focus group participants agreed that revised code scheme is a valuable tool for analysing the exchange of social support in the case study community.

Then, the revised code scheme was used to analyse the characteristics of social support in the case study community. Findings showed the distribution of the different kinds of communication content in the case study community (see Figure 4.4). Summarising, the refined code scheme (see Table 4.3) was found to appropriately describe the components of social support as exchanged in the case study community and thus answers research question I (What are the characteristics of social support in the online support community?)

Building on the code scheme, I now describe a study which investigated the association between the communication content and the relationships that people develop and maintain through their communication (see research question II).

5 Characteristics of social network structures

This study presents an analysis of the relations between members of the case study community based on their communication activities. In particular, it describes the associations between the content of the communication and the characteristics of the social network of related community members. Results show how the exchange of social support is linked to the relations between online community members and thus answer research question II.

After identifying the components of social support exchanged in the depression discussion board (see chapter *4*) by coding the content of messages, this chapter addresses research question II (How does the exchange of social support influence the relations between people participating in the online support community?). Figure 5.1 visualises research question II in the context of MOSuC. As the focus of the research question is on the relations between online community members and how they form a social network, it is mapped onto the 'user – network' quadrant of MOSuC.
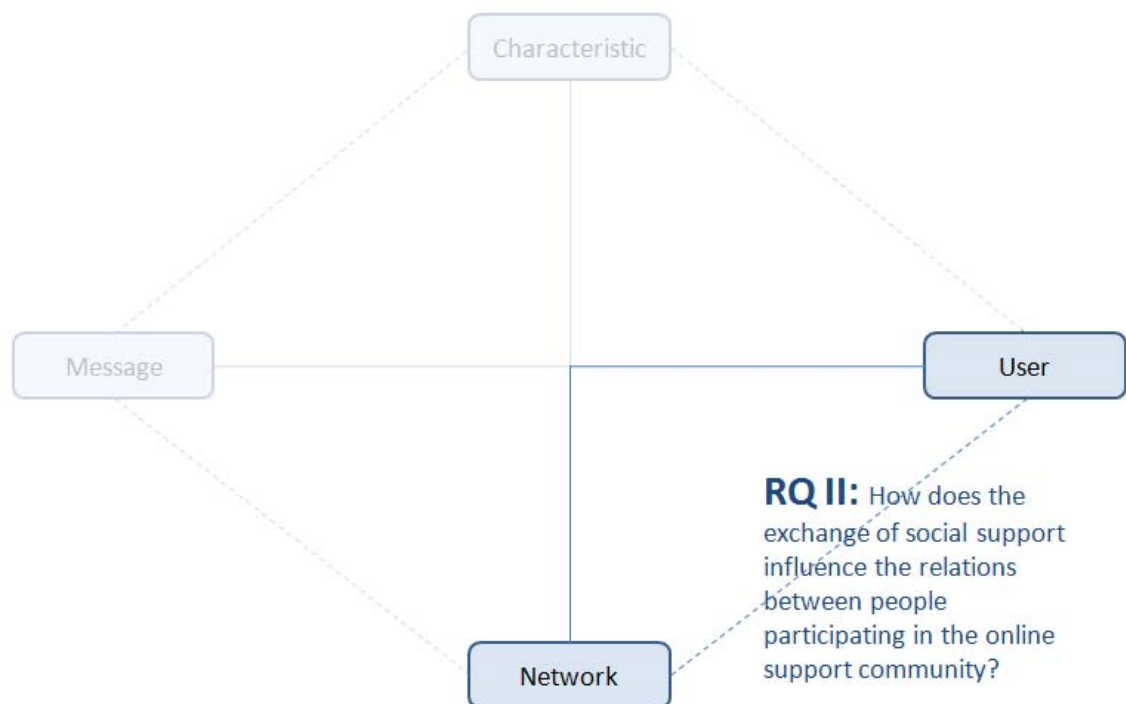
Figure 5.1: Research question II in the context of MOSuC

In the following, I state the aim of the study undertaken to address research question II and break it down into three research objectives. Then, I review related work in which social network analysis (SNA) has been applied in order to investigate online communities in general and online support communities in particular. This is done in order to set this study in the context of related literature. In the methodology section, I describe the procedures that were taken to address the aim of this study. The results are reported and the discussion identifies associations between the communication content and the relations between members of the community. In the conclusion, I explain how the findings of this study answer research question II.

5.1 Aim and objectives

This study aimed to analyse how the exchange of social support is linked to the relations between members of the case study community (see research question II). Relations between members were investigated based on the social network that is formed through their communication activities (e.g. who talks to whom). In order to address this aim, I formulated the following research objectives:

I.   Investigate whether and how the exchange of emotional communication content, as compared with factual communication content, is associated with specific characteristics of the social network structure.

II.   Analyse whether the two opposing components of supportive communication (seeking and giving support) are associated with specific characteristics of the social network structure.

III.   Investigate whether the different kinds of support that people exchange in the online support community are associated with specific characteristics of the social network structure.

Understanding the links between communication content and the social network that is based on that communication can help us better understand the development of the social network in online support communities. Depending on the content of the communication, different social network structures might emerge. This sheds light on the association between the exchange of social support in online communities and the relations that exist between the communicators. The basis of this study is the coding of the message content of the discussion board (see Table 4.3 and Figure 4.4).

5.2 Related work

This section summarises studies that have applied SNA in order to investigate different aspects of online (support) communities. This is done in order to set the current study in the context of existing research and clarify the applicability of SNA for analysing online communities.

5.2.1   Online communities and social networks

SNA has mainly been used to investigate offline social networks, but some studies have also analysed the impact of online communication on offline networks. For example, Kavanaugh and Patterson (2001) investigated how social networks within a geographic offline community are influenced by the opportunity to reinforce existing relations and expand the social network through participation in an online community. Surveys and interviews were conducted with residents of the city of Blacksburg in Virginia over a period of three years (1996–1999) in order to analyse the influence and impact of the computer-mediated network on the social network of the 'real', offline life. Similarly, Hampton and Wellman (2000) studied the influence of CMC on offline life by comparing the social network of wired residents with the social network of non-wired residents in a village in Canada. Findings from these two studies show that computer-mediated communication helps members of a geographic community to reinforce their relations with other members of the community and is even used to expand members' current social networks. The opportunity to communicate online leads to an increased density and strength of already existing offline relationships. Thus, the internet can be used to reinforce and maintain local relationships among members of a geographic community (Hampton & Wellman, 2000). Furthermore, engagement in the online community was also found to increase the involvement of the members in the corresponding offline community (Kavanaugh & Patterson, 2001).

In addition to investigating the interrelation of online and offline social networks, SNA is also increasingly used to study online settings independently, for example in the area of e-learning (Aviv et al., 2003; Haythornthwaite, 2000; Laghos & Zaphiris, 2006). In order to investigate the differences between online and offline learning, Haythornthwaite (2000) compared the social networks of online distance learning classes with those of offline learning classes. Overall, she concludes that social networks in online learning classes are similar to their offline counterparts. The sizes of the students' networks (e.g. the number of their friends) positively correlate with the size of the class, but the larger the size of the class, the lower the strength of the relationships. Furthermore, the members that communicate more frequently have more social and emotional interactions that form a basis for strong relationships (Haythornthwaite, 2000).

Similarly to Haythornthwaite's (2000) study, Aviv et al. (2003) also applied SNA in order to compare two different settings for learning. However, they focused solely on online settings, as they compared the network characteristics of a structured and a non-structured asynchronous e-learning community. The structured community facilitated a formal debate amongst a small number of students who committed to the participation, whereas the non-structured community facilitated an informal discussion which was open to all students and did not follow a predefined schedule. They applied SNA to investigate the development of cliques, the centrality of certain members and the distribution of roles within the respective networks. They found that members of the structured e-learning community developed a higher level of critical thinking and cognitive activities, formed more interconnected cliques and more of them took on leading roles as compared to members of the unstructured e-learning community. Investigating the development of the social network in an online learning community over a course of 15 lessons, Laghos and Zaphiris (2006) found that the connectivity and inclusiveness among community members increased with time.

In addition to e-learning communities, SNA has also been used to study social interactions and communication patterns in other online communities. For example, Paccagnella (1998) applied a combination of content analysis and SNA in order to investigate the social network of members of a computer conference called 'cyber_punk'. He analysed the link between members' use of language and their structural positions in the social network. He concluded that the centrality of a member was positively correlated with an increased use of terms that indicate a collective identity of the community and also an increased use of computer network slang (Paccagnella, 1998). Concerning online communities for older people, Zaphiris and Sarwar (2006) applied SNA in order to compare an online community for teenagers with an online community for older people. They investigated differences between these communities concerning the message characteristics and the overall network structure. Whereas the online community for teenagers was found to have a higher number of visitors, messages per person, and longer messages on average, the online community for older people was found to have a higher degree of interactivity, responsiveness and reciprocity. Overall, the online community for older people was found to show more consistencies and stability in the activity and behaviours of its members (Zaphiris & Sarwar, 2006).

5.2.2   Application of SNA to investigate online support communities

Up to now, SNA has rarely been used for studying online support communities. Several studies, however, have investigated concepts that are related to those of SNA. For example, Maloney-Krichmar and Preece (2005) investigated communication patterns within an online support community by applying multiple research methods. They found that members within the online support community are densely interconnected through the exchange of messages. Furthermore, they distinguished between 'key members' who frequently post messages over a long period of time, 'community members' who show less activity in the community, and 'lurkers' who only read but never write any messages. Based on the characteristics of the relationships between members, they concluded that some relationships resemble strong ties. This is especially the case for relationships that develop within subgroups of the online support community (Maloney-Krichmar & Preece, 2005). Similarly, Fisher et al. (2006) applied SNA in order to investigate social roles in Usenet newsgroups. The members' social networks and connections to other members were taken as a basis for characterising the social roles that they took on in these communities.

Furthermore, characteristics of members' social networks in online support communities (e.g. the number of relationships to other members) have been examined in relation to the quality and perception of the exchanged support. For example, Nahm et al. (2003) developed a structural equation model of social support in CMC for older people. Results show that the time that older people spend in the online community and their level of computer knowledge correlate positively with the number of relationships that they have with other members of the online community (network size). Furthermore, the network size decreases with increasing age, and correlates positively with the amount of support that members receive in the online community. In addition, difficulties in accessing and using the online community due to physical constraints were found to have a negative influence on the network size of older online community members. Similarly, Wright (2000a; 1999) found that the amount of time older people spend in an online support community has a positive impact on their network size and their satisfaction with the received support. Correspondingly, older people who spend less time communicating with online community members rate their satisfaction with support from their offline network higher. Eastin and LaRose (2005) developed a model of online support based on social cognitive theory. In addition, they conducted

questionnaires with 213 online support community members. Their results show that the more socially efficacious people are online and the more active they are in seeking support, the larger is the size of their online social network. Also, the size of the online social network is positively related with the perception of the received support. They conclude that "the more socially efficacious people are online the more likely they are to view the Internet as an important support outlet, spend time seeking support and finally increase the number of people in their online support network" (Eastin & LaRose, 2005) (p.989).

5.3 Methodology

In this study, SNA was used to analyse the social network structures that are formed in the discussion board about depression within SeniorNet. It focused on the social network based on the communication between members of the community. In particular, the link between the communication content and the network characteristics was investigated. In order to do so, the coding of the message content with the revised code scheme (see Table 4.3) was taken as a basis (see chapter *4*). In the following, I briefly describe the data-set that was used in this analysis and explain how the social network was constructed and analysed in order to address the research objectives.

5.3.1   Data source

In this study, the coding of the messages of the case study community (see *4.2.4*) was taken as a basis. Thus, this study investigated the same data-set as the study reported in chapter *4*: 400 consecutive messages that were posted over a period of 1.5 years (from 6th August 2000 to 14th February 2002) in the discussion board about 'depression' within SeniorNet. The messages were posted by 47 members of SeniorNet. The number of messages was chosen to be large enough to conduct a meaningful analysis and the number of messages per day was fairly constant over the sampling period. This indicates that the findings are not dependent on sudden changes in the posting frequency within the online community. Furthermore, the data-set covers a sufficient number of messages and period of time to be able to claim that the sample is representative of the whole online community.

5.3.1.1   Coding of the content

As reported in section *4.2.4*, the 400 messages were segmented into 869 text units and each text unit was coded into one of the seven categories (see Table 4.3). Figure 5.2 shows the frequencies and distribution of the categories in the data-set.

5.3.1.2   Establishment of the social network

In order to create a social network of the communication within the community, the following procedure was followed: All 400 messages were read in chronological order and for each text unit it was noted who sent it to whom. This was easy for the cases in which the author of the message wrote down whom the text units were meant for. Even if the authors did not mention who the text units were for, this was in most cases easy to determine from the context of the messages. In the cases in which the author targeted one text unit to two or more other specific people, each of the combinations (sender-receiver) was noted. For those text units that were not specifically targeted to anybody, the whole community was noted as the receiver and treated like a separate node. In addition to the sender and receiver of the text unit, the category used to code its content was noted as well.

The result of this first step was a list of all text units, with their senders, receivers and content code categories. For the social network based on all 400 messages, a matrix was created, in which all members (N=47) of the discussion board were listed in the first column (sender) and first row (receiver) of the matrix. The number in the cells of the matrix indicated the number of text units that the particular sender sent to the particular receiver. An additional row and column was added and named 'all'. This was done in order to account for the text units that were addressed to all community members and not to specific others.

In this study, I focused specifically on the link between the content of the communication and the structure of the social network. Therefore, for each category, a sub-network that is based on the communication of the respective category was developed and studied separately. For example, all communication activities that were coded into the category *Self disclosure* were modelled to create a social sub-network structure that is based on the communication activities within this category only. This category-specific sub-network therefore represents relationships that are formed by the exchange of text units coded into the category *Self disclosure*. Thus, the category-

specific sub-network can give an indication about the link between the specific type of communication content and the network structure of the online community. The characteristics of the category-specific sub-networks were then related to the communication content in order to identify links between the content of the communication and the network structure it creates.

In order to investigate the category-specific sub-networks, separate lists were created for the communication within each category. These lists were then transformed into matrices. As a result of this procedure, seven matrices were constructed (one for each category) that included the number of text units that were sent from the senders to the receivers within the respective category. These matrices formed the basis of the analysis of the category-specific social sub-networks.

In the following section, the methods that were applied in order to address the objectives are presented. I describe the measurements that were used to analyse the social network of the discussion board and to study the differences and commonalities of the structures of the seven category-specific sub-networks.

5.3.2   Data analysis

In this analysis, the boundaries of the social network were defined by the members that participated in the discussion board. This approach considered the occurrence of ties as well as the non-occurrence of ties between people that were active within the time period of the collected data, where a tie is defined as a relation between two people in the social network. As the data in this study only included the active members of the online community, I did not include passive members and members that might have been active before or after the time of the sample period. Instead, the network structure was based solely on the communication activities that took place in the 400 messages of the data-set. This approach is similar to the application of SNA in other studies (Turner et al., 2005; Welser et al., 2007; Zaphiris & Sarwar, 2006) that have analysed social networks based on a sample of messages in online communities. These studies investigated a sub-set of online community members and analysed the relationships between them. Based on the structure of these sub-networks, conclusions about the whole online community were drawn. I adopted the same approach in this study. In the following, I refer to 'social network' when talking about the relationships

that are based on all 400 message exchanges. When talking about the networks based on category-specific communications, I refer to them as 'sub-networks'.

5.3.2.1 *Measurements*

For this analysis, I used the social network analysis software Cryam NetMiner II, version 2.5.0 (Netminer, 2009) to calculate the social network properties and visualise the respective sociograms. In the following, I describe the network-properties that I analysed in order to compare the seven category-specific sub-networks.

Number of text units sent to the whole community: I investigated to what extent text units within a category-specific sub-network are addressed to the whole community instead of specific members. If the majority of text units within a category-specific sub-network are addressed to specific members, it is proposed that these text units include personalised content that takes into account the situation, feelings and thoughts of the specific persons that the text units are meant for. On the other hand, if the majority of text units within a category-specific sub-network are addressed to the whole community, it indicates that these text units are including all members of the online community and encouraging them to take part in the ongoing conversation.

Density: The density of a network is a commonly analysed network property. It can be described as the ratio of existing ties within the network in contrast to the possible number of ties in the network (de Nooy et al., 2005; Wasserman & Faust, 1994). Density in a directed network is defined as:

$$\Delta = \frac{L}{g(g-1)}$$

where Δ is the measure of density, L is number of unvalued ties present in the network and g is the number of nodes in the network (Wasserman & Faust, 1994) (p.129). An unvalued tie exists if one or more text units are sent from one person to another person in the network.

The more dense a network is, the more interconnected are the members of the network and the more the members of the network have direct contact to each other (Garton et al., 1997). If all ties are present within a network (i.e. every person communicates with every other person in both directions) the density of the network is

Δ=1. If no ties are present, the density is Δ=0. The denser a network is, the better are the members within this network connected to each other and the stronger is the connectivity of the whole network. A dense category-specific sub-network indicates that the category is associated with strong connections among community members, whereas a less dense or more loosely-bound category-specific sub-network indicates that this category is not associated with strong connections between the members.

The density of a directed social network can be further investigated by looking at the degree centralities of specific members (in- and out-degree centrality). In-degree centrality measures the fraction of people in the network that an individual is connected to through receiving text units. Out-degree centrality measures the fraction of people in the network that an individual is connected to through sending text units. According to Wasserman and Faust (1994), the density is proportional to the average degree centrality of all nodes in the network. Thus, both density and average degree centrality can be used as a measure of the density of the complete network.

When investigating the individual behaviour of people, in-degree centrality and out-degree centrality can be distinguished. The in-degree centrality of any node j is defined as:

$$c_{ID}(n_j) = \frac{\sum_i x_{ij}}{g-1}$$

Where $c_{ID}(n_j)$ is the in-degree centrality for node j, and i ranges from 1 to the total number of nodes g. x_{ij} is 1 when there is a tie from node i to node j and 0 otherwise. The out-degree centrality of any node is defined as:

$$c_{OD}(n_i) = \frac{\sum_j x_{ij}}{g-1}$$

Where $c_{OD}(n_i)$ is the out-degree centrality for node i, and j ranges from 1 to the total number of nodes g. x_{ij} is 1 when there is a tie from node i to node j and 0 otherwise. The degree centrality for the whole network investigates the average of in- and out-degree centralities of all nodes in the network.

Inclusiveness: The inclusiveness of a network measures the fraction of nodes that are connected to at least one other node in the network (Garson, 2008). This analysis focuses on the individual nodes of the network and investigates whether they are connected to the network or isolated. The inclusiveness of a network is defined as:

$$I = \frac{\sum_i x_i}{g}$$

where I defines the inclusiveness of the network, g is the total number of nodes, and x_i is 1 when there is a tie coming from node i or going into node i, and 0 otherwise.

People are included in the network by either sending a text unit to a specific other person, or by receiving a text unit that was specifically addressed to them. A category-specific sub-network with high inclusiveness indicates that communication within this category is general and many members are included. On the other hand, category-specific sub-networks with low inclusiveness indicate that only a few, specific members are included in the communication within this category.

Closeness (in- and out-closeness): Closeness measures the average degree to which a person is close to all other people within the network either through a direct or through an indirect tie (de Nooy et al., 2005). Thus, closeness is defined as:

$$Cl(n_i) = (g-1)\left(\sum_{j=1}^{g} d(n_i, n_j) \right)^{-1} \quad j \neq i$$

where CL is the closeness of the network, g is the total number of nodes and $d(n_i, n_j)$ is the geodesic distance between node i and node j.

Closeness gives an indication of the accessibility of the network to a person. If a person has a high out-closeness value, (s)he has good access to all other people in the network. Respectively, in-closeness indicates whether the other members of the network have easy access to him/her (de Nooy et al., 2005).

Reciprocity: Reciprocity describes the ratio of the number of existing ties to the number of ties that are reciprocated. A tie is reciprocated if there is another tie between the same two nodes pointing in the opposite direction. Reciprocity is calculated as follows:

$$R = \frac{\sum_{ij} x_{ij}}{L}$$

where R is the reciprocity of the network, L is the total number of ties within the network, and x_{ij} =1 if there is a tie from node i to node j and a tie from node j to node i and 0 otherwise.

Reciprocity emphasises the direction of the ties. In a network with a high reciprocity, people tend to respond to each other often and the relations between them are balanced, whereas in a network with low reciprocity, more one-directional ties exist and the relations between members are more unbalanced.

Cliques: Social network analysis investigates relationships between members and can thus be utilised to identify sets of members that are highly interconnected. These densely-knit and tightly-bound sets of members are called cliques (Hanneman & Riddle, 2005). In a clique, each member is connected to each other member of the clique (Scott, 2000). In this study, a clique consists of at least three members and each of the members in a clique is connected to all other members within that clique. Furthermore, no other member of the network is connected to all members of the clique. Note that the ties within a clique do not need to be reciprocated (Wasserman & Faust, 1994). A category-specific sub-network with many cliques indicates that dense sub-groups are formed through the kind of communication that is coded into the specific category. This means that the communication coded into the specific category is associated with strong friendships between sets of members who form cliques.

5.3.2.2   *Analysis procedure*

In order to investigate the differences and similarities between the seven category-specific sub-networks, I applied each of the above mentioned measurements to each of the sub-networks and compared the results. Specifically, I was interested in:

- comparing the sub-networks based on emotional communication (sub-networks based on the categories *Self disclosure*, *Community building*, *Deep support*, and *Light support*) and factual communication (sub-networks based on the categories *Factual information*, *Technical issues*, and *Off topic*) (objective I).

- comparing the sub-networks based on the category *Self disclosure* (seeking support) and the categories *Light support* and *Deep support* (giving support) (objective II).

- comparing the sub-networks based on the categories *Light support* and *Deep support* (different kinds of support) (objective III).

Due to the fact that the data generated during social network analysis violates one of the key assumptions (independence of observations) of standard hypothesis testing techniques, a permutation test was calculated (Borgatti et al., 2002) in order to test the compared differences for significance. For the permutation test, the observed difference in means is compared to the difference found when members are randomly exchanged between categories. The results are significant if most of the randomly generated results show a difference in means that is smaller than the observed one. Thus, significance was only tested for the network measurements that are based on the means of network members' individual measurements (in/out-degree centrality, and in/out-closeness). For the measurements inclusiveness, reciprocity and number of cliques, the significances of the differences were not tested, as these measurements are calculated on the network level and not based on individual members' network measurements.

5.4 Results

The frequencies of the categories are displayed in Figure 5.2. In addition to the frequencies of the categories, Figure 5.2 shows the percentage of text units (TU) that are addressed to the whole community instead of specific others for each category.
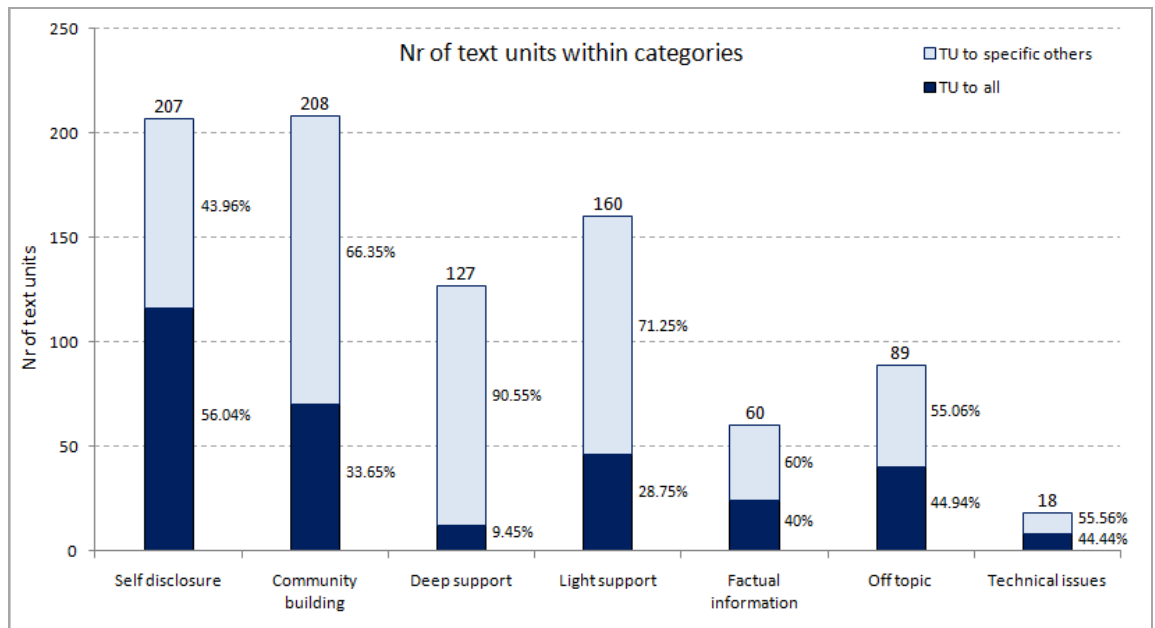
Figure 5.2: Frequencies of text units within specific categories

5.4.1   Network properties of the discussion board

Figure 5.3 shows the sociogram of the communication activities between community members. Messages to the whole community have been discarded for this analysis. This explains the fact that the sociogram shows five isolated members. These members have only posted text units to the whole community instead of sending them to specific others. Also, no text unit was specifically addressed to them.
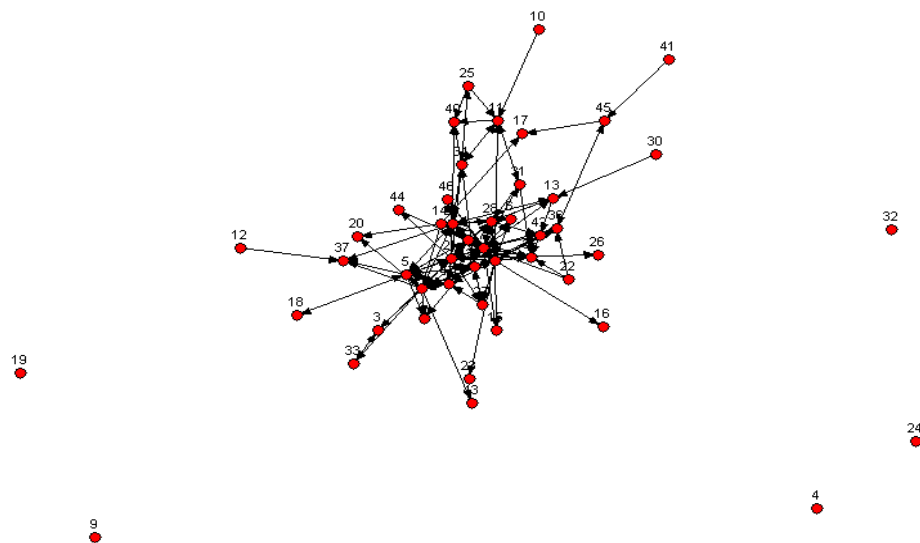
Figure 5.3: Sociogram of the communication activities within the case study community
(Display algorithm: Spring-FR)

Overall, the network that is based on the messages that are sent to specific others within the community has a density score of 0.07. As can be seen in Figure 5.3, many people are highly connected to the network (the nodes in the centre of the network), with a few people being connected through only one tie, and five members being not connected at all. Overall, the network shows an inclusiveness of 0.894 and a closeness of 0.186 (in-closeness) and 0.194 (out-closeness). The reciprocity score of the network is 0.539 which means that 53.9% of the ties are reciprocated.

5.4.2 Network properties for category-specific networks

5.4.2.1   Density

Table 5.1 shows the density and average in/out-degree centrality for all seven category-specific sub-networks.

Table 5.1: Density and average in/out-degree centrality scores for the individual category-specific sub-networks (standard deviations in parentheses)

	Community building	Self dis-closure	Deep support	Light support	Off topic	Factual information	Technical issues
Average in-degree centrality	0.037 (sd: 0.042)	0.032 (sd: 0.04)	0.037 (sd: 0.048)	0.033 (sd: 0.041)	0.014 (sd: 0.023)	0.014 (sd: 0.021)	0.003 (sd: 0.01)
Average out-degree centrality	0.037 (sd: 0.064)	0.032 (sd: 0.058)	0.037 (sd: 0.055)	0.033 (sd: 0.052)	0.014 (sd: 0.027)	0.014 (sd: 0.03)	0.003 (sd: 0.013)
Density	0.037	0.032	0.037	0.033	0.014	0.014	0.003

In order to facilitate the comparison of network characteristics of emotional and factual communication, the seven categories were divided into two groups: emotional communication (the combination of the category-specific sub-networks of *Self disclosure, Community building, Deep support, and Light support*) and factual communication (the combination of the category-specific sub-networks of *Factual information, Technical issues*, and *Off topic*). Then, two additional sub-networks were created: one based on all communication activities that were coded into emotional categories; and one sub-network based on all communication activities that were coded into factual categories. Table 5.2 shows the average in/out-degree centrality and density scores for the sub-networks of emotional and factual communication.

Table 5.2: Density and average in/out-degree centrality scores for the sub-networks based on emotional and factual communication (standard deviations in parenthesis)

	Emotional communication	Factual communication
Average in-degree centrality	0.067 (sd: 0.065)	0.028 (sd: 0.034)
Average out-degree centrality	0.067 (sd: 0.094)	0.028 (sd: 0.049)
Density	0.067	0.028

As the in- and out-degree centralities of the individual members could be extracted, it was possible to investigate whether there were any significant differences in the degree centrality between the seven category-specific sub-networks and between sub-networks based on emotional and factual communication.

The p-values for significant differences concerning the in-degree centrality and out-degree centrality are shown in Table 5.3 and Table 5.4 (identified with the abbreviations 'in' and 'out'). P-values that indicate significant differences are marked (**$p < 0.01$; *$p < 0.05$).

Table 5.3: P-values for the comparisons of the degree centrality scores of all category-specific sub-networks

p-values	Self disclosure	Deep support	Light support	Off topic	Factual information	Technical issues
Community building	in: 0.607 out: 0.745	in: 0.904 out: 0.912	in: 0.661 out: 0.726	in: 0.002** out: 0.02*	in: 0.001** out: 0.023*	in: 0.000** out: 0.000**
Self disclosure	-	in: 0.586 out: 0.676	in: 0.998 out: 0.948	in: 0.007** out: 0.04*	in: 0.004** out: 0.048*	in: 0.000** out: 0.000**
Deep support		-	in: 0.598 out: 0.659	in: 0.002** out: 0.007**	in: 0.002** out: 0.008**	in: 0.000** out: 0.000**
Light support			-	in: 0.005** out: 0.026*	in: 0.007** out: 0.024*	in: 0.000** out: 0.000**
Off topic				-	in: 1.000 out: 0.968	in: 0.006** out: 0.028*
Factual information					-	in: 0.004** out: 0.038*

Table 5.4: P-values for the comparisons of the degree centrality scores of the sub-networks based on emotional and factual communication

p-values	Factual communication
Emotional communication	in: 0.001** out: 0.016**

5.4.2.2   *Inclusiveness*

Table 5.5 lists the inclusiveness scores for all category-specific sub-networks and Table 5.6 shows the inclusiveness scores for the sub-networks based on emotional and factual communication.

Table 5.5: Inclusiveness scores for the individual category-specific sub-networks

	Community building	Self disclosure	Deep support	Light support	Off topic	Factual information	Technical issues
Inclusive-ness	0.681	0.66	0.681	0.702	0.447	0.426	0.106

Table 5.6: Inclusiveness scores for the sub-networks based on emotional and factual communication

	Emotional communication	Factual communication
Inclusiveness	0.872	0.617

5.4.2.3   *Closeness*

Table 5.7 lists the in-closeness and out-closeness scores for all category-specific sub-networks and Table 5.8 shows the in- and out-closeness scores for the sub-networks based on emotional and factual communication.

Table 5.7: Closeness scores for individual category-specific sub-networks

	Community building	Self disclosure	Deep support	Light support	Off topic	Factual information	Technical issues
In-closeness	0.091 (sd: 0.075)	0.075 (sd: 0.073)	0.088 (sd: 0.09)	0.077 (sd: 0.071)	0.031 (sd: 0.04)	0.023 (sd: 0.034)	0.004 (sd: 0.012)
Out-closeness	0.092 (sd: 0.119)	0.076 (sd: 0.095)	0.088 (sd: 0.1)	0.079 (sd: 0.103)	0.03 (sd: 0.055)	0.023 (sd: 0.048)	0.004 (sd: 0.016)

Table 5.8: Closeness scores for the sub-networks based on emotional and factual communication (standard deviations in parentheses)

	Emotional communication	Factual communication
Closeness	in: 0.179 (sd: 0.104) out: 0.187 (sd: 0.17)	in: 0.067 (sd: 0.061) out: 0.066 (sd: 0.106)

A permutation test for significance revealed the p-values for the comparisons of the in- and out-closeness across the seven sub-networks (see Table 5.9) and across the sub-networks based on emotional and factual communication (see Table 5.10). P-values that indicate significant differences are marked (**$p < 0.01$; *$p < 0.05$).

Table 5.9: P-values for the comparisons of the closeness scores of all category-specific sub-networks

p-values	Self disclosure	Deep support	Light support	Off topic	Factual information	Technical issues
Community building	in: 0.308 out: 0.462	in: 0.905 out: 0.846	in: 0.379 out: 0.591	in: 0.000** out: 0.003**	in: 0.000** out: 0.000**	in: 0.000** out: 0.000**
Self disclosure	-	in: 0.421 out: 0.557	in: 0.875 out: 0.878	in: 0.001** out: 0.005**	in: 0.000** out: 0.001**	in: 0.000** out: 0.000**
Deep support		-	in: 0.521 out: 0.676	in: 0.000** out: 0.000**	in: 0.000** out: 0.000**	in: 0.000** out: 0.000**
Light support			-	in: 0.000** out: 0.005**	in: 0.000** out: 0.001**	in: 0.000** out: 0.000**
Off topic				-	in: 0.345 out: 0.560	in: 0.000** out: 0.003**
Factual information					-	in: 0.000** out: 0.014*

Table 5.10: P-values for the comparison of the closeness scores of the sub-networks based on emotional and factual communication

p-values	Factual communication
Emotional communication	in: 0.000** out: 0.000**

5.4.2.4   Reciprocity

The scores for reciprocity in the category-specific sub-networks are shown in Table 5.11.

Table 5.11: Reciprocity scores for the individual category-specific sub-networks

	Community building	Self disclosure	Deep support	Light support	Off topic	Factual information	Technical issues
Reciprocity	0.481	0.286	0.222	0.366	0.333	0.2	0.286

Table 5.12: Reciprocity scores for the sub-networks based on emotional and factual communication

	Emotional communication	Factual communication
Reciprocity	0.33	0.245

5.4.2.5   Cliques

Table 5.13 lists the number of cliques for each category-specific sub-network.

Table 5.13: Number of cliques in the category-specific sub-networks

	Community building	Self disclosure	Deep support	Light support	Off topic	Factual information	Technical issues
Nr of cliques	17	17	23	15	5	4	2

Table 5.14: Number of cliques in the sub-networks based on emotional and factual communication

	Emotional communication	Factual communication
Nr of cliques	35	14

5.5 Discussion

In this section, I discuss the findings from some of the key comparisons between the seven category-specific sub-networks. In particular, I elaborate on the different characteristics of the sub-networks based on emotional and factual communication (objective I). In addition, findings show interesting differences between the social sub-networks based on support-seeking and supportive communication (objective II) and between the social sub-networks based on the two supporting categories *Deep support* and *Light support* (objective III). For each of the three research objectives, the network measurements that best show the differences between the respective sub-networks are highlighted.

5.5.1   Differences between the sub-networks based on emotional and factual communication

As discussed above, the categories can be divided into two groups: categories describing emotional communication and categories describing factual communication. Emotional communication is characterised by a high level of emotional content and is of a more personal than factual nature. Please refer to chapter *4* for a more detailed description of the content and characteristics of the categories.

Concerning the density, it can be seen that the sub-networks based on the categories *Community building, Self disclosure, Deep support*, and *Light support* (emotional communication) have a higher density than the sub-networks based on the categories *Off topic, Factual information*, and *Technical issues* (factual communication) (see Table 5.1). For example, the sub-network based on the most personal, emotional and supportive category *Deep support* has a high density (0.037). This indicates that

people who exchange support are personally connected to each other. Furthermore, the high density of the sub-network based on the category *Community building* (0.037) shows that the exchange of text units that aim to nurture the community feeling and build a sense of togetherness among the members is strongly associated with the development and maintenance of dense relations among individual members. In contrast, the low densities of the sub-networks based on the categories *Factual information* (0.014), *Technical issues* (0.003), and *Off topic* (0.014) show that factual communication is not linked to dense relationships among members of the community. The differences in the density between the sub-networks based on the emotional and factual categories are all significant (see Table 5.3).

The same tendency is also visible when the sub-network based on emotional communication is compared to the sub-network based on factual communication. As Table 5.2 shows, the sub-network based on emotional communication shows a higher network density (0.067) compared to the sub-network based on factual communication (0.028). Table 5.4 shows that this difference is significant.

As an example, Figure 5.4 and Figure 5.5 illustrate the difference in the density between an emotional and a factual category-specific sub-network. Figure 5.4 shows the sub-network based on the category *Deep support* (emotional communication) and Figure 5.5 shows the sub-network based on the category *Factual information* (factual communication). Comparing the two sub-networks we can see that the sub-network based on the category *Deep support* has much more connections between members than the sub-network based on the category *Factual information*.
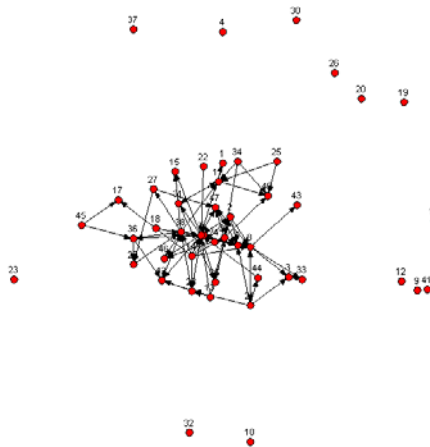
Figure 5.4: Sociogram of the *Deep support* sub-network (Display algorithm: Spring-KK)
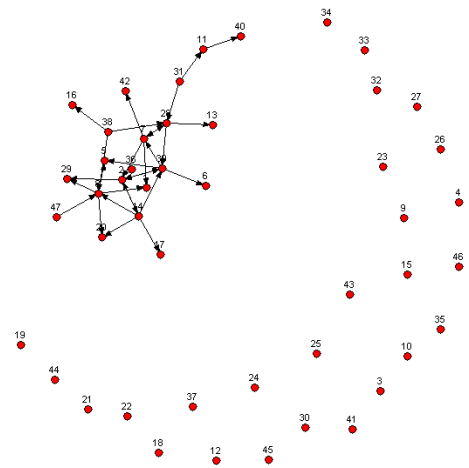
Figure 5.5: Sociogram of the *Factual information* sub-network (Display algorithm: Spring-KK)

This finding indicates that emotional communication is linked to a dense network of related community members, unlike factual communication which does not seem to be associated with strong connections between individual members within the community.

Furthermore, it was found that emotional communication is linked to a stronger inclusiveness within the social network as compared to factual communication. The sub-network based on the category *Light support* has the highest score in inclusiveness (0.702) (see Table 5.5). In addition, the sub-networks based on the categories *Community building* and *Deep support* also have high inclusiveness scores (0.681). Thus, nurturing a feeling of togetherness and exchanging support seem to be inclusive activities that a lot of members of the online community engage in, either as a sender or as a receiver (or both). On the other hand, the sub-networks based on the categories *Factual information* (0.426), *Off topic* (0.447) and *Technical issues* (0.106) have much lower inclusiveness scores. Especially the rather low score of the sub-network based on the category *Factual information* is surprising, as it might have been expected that the exchange of factual information about depression would comprise a major part of the conversation and include the majority of members.

Figure 5.6 and Figure 5.7 illustrate the difference concerning the inclusiveness between an emotional and a factual category-specific sub-network. Figure 5.6 shows the sub-network based on the category *Light support* (emotional communication) whereas

Figure 5.7 shows the sub-network based on the category *Off topic* (factual communication). As can be clearly seen, the sub-network based on the category *Off topic* has many more isolated members than the sub-network based on the category *Light support*.
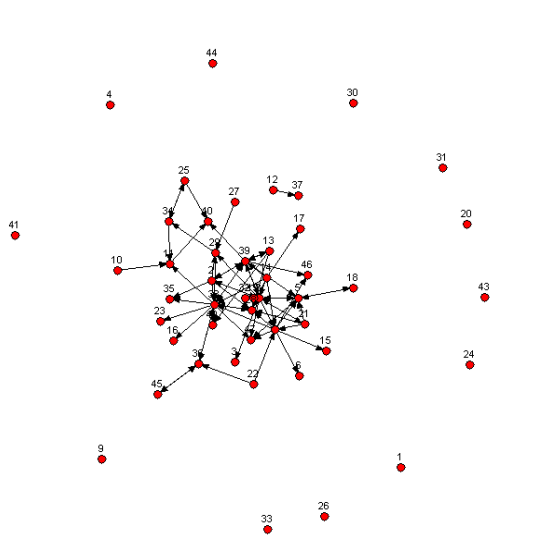
Figure 5.6: Sociogram of the *Light support* sub-network (Display algorithm: Spring-KK)
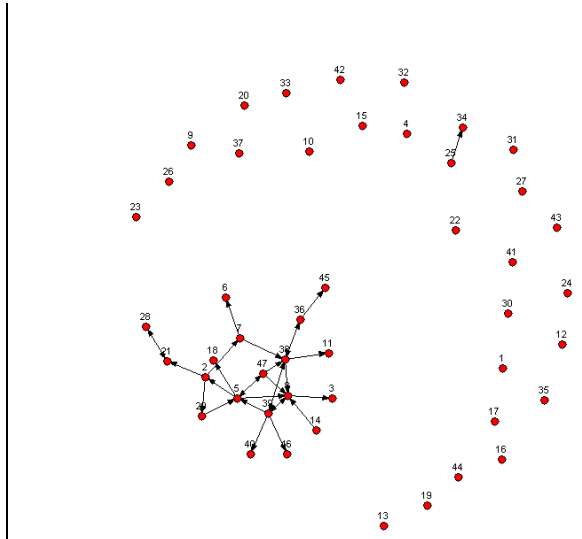
Figure 5.7: Sociogram of the *Off topic* sub-network (Display algorithm: Spring-KK)

A clear difference was also found between the inclusiveness score of the sub-network based on emotional communication (0.872) and the inclusiveness score of the sub-network based on factual communication (0.617) (see Table 5.6). This finding highlights that it is the emotional communication activities that include the most members of the online community.

Furthermore, Table 5.7 shows that there is a big difference between the emotional and factual category-specific sub-networks concerning the closeness of the networks. The closeness score measures the average degree to which people within a network are close to each other. A high closeness score indicates that it is easy for members to access resources of other members as the path from one member to the other members is short. The sub-network based on the category *Community building* has the highest in-and out-closeness scores (0.091/0.092 see Table 5.7) among all category-specific sub-networks. Therefore, the exchange of text units coded into this category provides a good opportunity for community members to relate and get close to each other. Text units coded into the category *Community building* are linked to a network structure that provides easy and quick access to other members of the online

community. In addition to the sub-network based on the category *Community building*, the sub-networks based on the remaining emotional categories *Deep support* (0.088/0.088), *Light support* (0.077/0.079) and *Self disclosure* (0.075/0.076) also have high closeness scores. When comparing the sub-networks based on all emotional and factual communication (see Table 5.8), we can again see that the sub-network based on emotional communication has much higher in- and out-closeness scores (0.179/0.067) than the sub-network based on factual communication (0.067/0.066). These differences are significant (see Table 5.10). It can therefore be concluded that emotional communication is linked to a high closeness within the network. In contrast, factual communication is linked to a low closeness within the network. This is also supported by the low closeness scores of the sub-networks based on the factual categories *Off topic* (0.031/0.03), *Factual information* (0.023/0.023), and *Technical issues* (0.004/0.004). Concerning in-closeness and out-closeness, all of the differences between the sub-networks based on emotional and factual categories are significant (see Table 5.9).

In summary, emotional communication content is linked to a dense social network of related community members. In addition, a lot of members are included in the exchange of emotional messages, as both senders and receivers. Also, emotional communication is associated with a high closeness between the members of the online community. In contrast, the sub-network based on factual communication was found to be loosely connected and to include only a few members of the community. Furthermore, the distances between members are much greater in the sub-networks based on the factual categories compared to the sub-networks based on the emotional categories. It can thus be concluded that the exchange of emotional messages is associated with a dense, inclusive and close network, which can form a basis for the development of friendships among community members.

5.5.2   Differences between the sub-networks based on seeking and giving support

In order to investigate the association between support-seeking/giving communication and the characteristics of the social network, differences in the sub-network based on the category *Self disclosure* (text units posted in order to seek support) and the sub-networks based on the categories *Deep support* and *Light support* (text units posted in order to give support) were identified.

As shown in Figure 5.2, there is a substantial difference in the percentage of text units that are sent to the whole community instead of specific others between the text units coded into the category *Self disclosure* and the text units coded into the supportive categories *Light support* and *Deep support*. Of all text units coded into the category *Self disclosure*, a relatively high percentage (56.04%) is addressed to the whole community. This finding can be explained by considering the nature of the content of these text units. Text units coded into the category *Self disclosure* consist mainly of information that people offer about themselves. This includes their medical situations and histories, their feelings, and the things that they experience in their daily life. Often, messages that contain self-disclosing text units introduce a new topic into the discussion. Text units coded into the category *Self disclosure* are also often written in order to ask for support. This explains why the majority of people address self-disclosing text units to the whole community instead of to specific others. In contrast, the percentage of text units that are sent to the whole online community instead of specific others is low for the text units coded into the supportive category *Light support* (28.75%) and even lower for the category *Deep support* (9.45%). As support is in most cases targeted to a specific person, the percentage of text units that are sent to the whole community is much lower for support-giving text units compared to the text units that are written in order to seek support. This finding reflects the characteristics of the text units, as self-disclosing text units are intended to reach as many people as possible in order to get a supportive response, and supportive messages are aimed towards the specific people that the support is meant for. In order to illustrate this difference, Figure 5.8, Figure 5.9, and Figure 5.10 show the sociograms of the sub-networks based on the categories *Self disclosure* (Figure 5.8), *Deep support* (Figure 5.9), and *Light support* (Figure 5.10) including the 'all'-node (the node that represents the whole discussion board). The 'all'-node is marked in blue, and all other nodes that are connected to the respective 'all'-node are marked orange. It is clear from these figures that the 'all'-node has a much more important and central position in the sub-network based on the category *Self disclosure* than in the sub-networks based on the supportive categories *Light support* and *Deep support*.
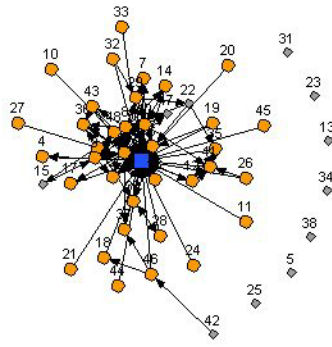
Figure 5.8: Sociogram of the *Self disclosure* sub-network including the 'all'-node (Display algorithm: Spring-KK)
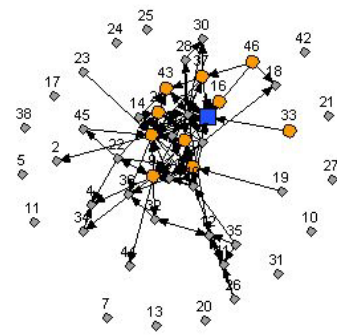
Figure 5.9: Sociogram of the *Deep support* sub-network including the 'all'-node (Display algorithm: Spring-KK)
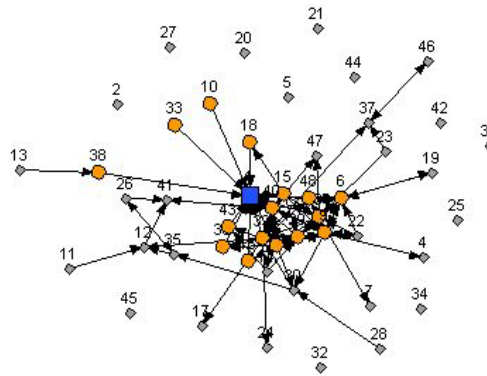
Figure 5.10: Sociogram of the *Light support* sub-network including the 'all'-node (Display algorithm: Spring-KK)

5.5.3 Differences between the sub-networks based on the categories Light support and Deep support

Focusing on the two sub-networks based on the supportive categories *Light support* and *Deep support*, we can see that more nodes are connected to the 'all'-node in the sub-network based on the category *Light support* compared to the sub-network based on the category *Deep support* (see Figure 5.9 and Figure 5.10). Similarly, only 9.45% of all text units coded into the category *Deep support* are addressed to the whole community compared to 28.75% of all text units coded into the category *Light support* (see Figure 5.2). This indicates that light support is more often sent to the whole community whereas deep support tends to be sent to specific others.

Text units coded into the category *Deep support* are often specifically tailored to the person that the support is meant for. This means that this person is specifically addressed at the beginning of the text unit, as shown in the following excerpt:

"[NAME], I really do feel for you. I've been in a similar situation. What I finally concluded is that I don't learn as quickly as I used to but what I learn is pretty much there to stay. It can be awkward, very awkward, but I have great respect and faith in your abilities."

In contrast, text units coded into the category *Light support* are more general and not as specifically tailored to the situation of a specific other than those coded into the category *Deep support*. For example, encouraging text units coded as *Light support* include *"Hang on..."*, and *"Best wishes..."* which are commonly addressed to the whole community. Therefore, it can be concluded that the degree to which text units are sent to specific others instead of the whole community reflects the degree to which they include personalised content. Hence, the differences in the characteristics of the sub-networks based on the categories *Light support* and *Deep support* reflect the different characteristics of the content of the text units that are coded into these two supportive categories.

Another difference between the sub-networks based on the categories *Light support* and *Deep support* concerned their reciprocity scores. The sub-network based on the category *Light support* has a much higher reciprocity score (0.366) compared to the sub-network based on the category *Deep support* (0.222) (see Table 5.11). Figure 5.11 and Figure 5.12 visualise this finding, as they show all ties between members for the two sub-networks with the reciprocated ties marked in yellow. Although there are many more ties between individual members within the sub-network based on the category *Deep support* (81) compared to the sub-network based on the category *Light support* (71), only 18 ties are reciprocated in the *Deep support* sub-network (9 two-arrowed lines are highlighted in yellow in Figure 5.12), whereas 26 ties are reciprocated in the *Light support* sub-network (13 two-arrowed lines are highlighted in yellow in Figure 5.11).
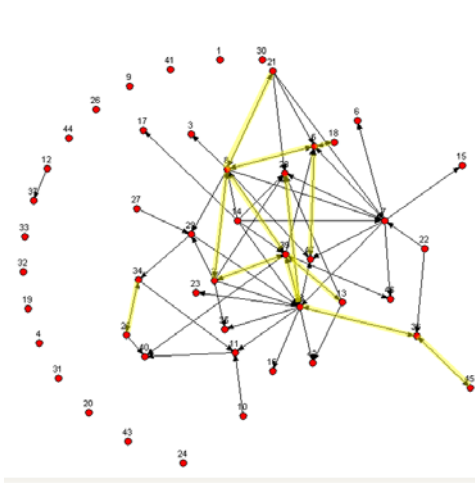
Figure 5.11: Reciprocity in the *Light support* sub-network
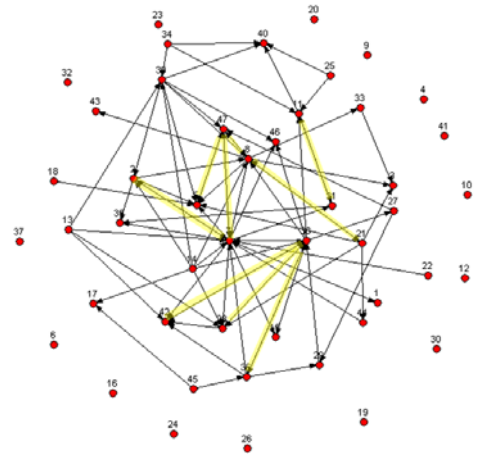
Figure 5.12: Reciprocity in the *Deep support* sub-network

This finding provides valuable information about the relation between the content of the two categories and the characteristics of their sub-networks. The text units coded as *Deep support* were found to be associated with one-directional relationships between community members. People send deep support to others, but do not receive deep support back in response. On the other hand, the exchange of text units coded as *Light support* is associated with a highly reciprocal network structure. This might be due to the fact that the text units coded as *Light support* are often included as summarising remarks at the end of messages ("I hope it goes well", "I wish you all the best", etc.). Whereas the content of text units coded as *Deep support* is highly personalised towards the recipient of the message, text units coded as *Light support* can be sent to anyone.

In addition, a large difference between the sub-networks based on the categories *Light support* and *Deep support* was found concerning the number of cliques. As Table 5.13 shows, the sub-network based on the category *Deep support* has a lot of cliques (23). This indicates that the formation of subgroups by members of the community is related to the exchange of deep supportive messages. Thus, text units coded as *Deep support* are exchanged in small, personal and densely-knit subgroups. They are sent to support specific members of the community and the content of these text units is specifically tailored to the situation or problem of the respective person. In contrast, the sub-network based on the category *Light support* has fewer cliques (15). This indicates that light support is freely exchanged among community members without being linked to the formation of subgroups. The content of the text units coded as *Light support*

invites others to join in the conversation. This is associated with the development of fewer cliques in the social network as everyone gets involved. Personal, small, and densely-knit subgroups that are formed through the exchange of deep support do not occur when exchanging light support. This finding fits into the characteristics of the two categories, as text units coded as *Deep support* are more personalised and tailored to the receiver's situation than text units coded as *Light support* that contain uplifting and more general content.

In summary, I conclude that the difference in the content between text units coded into the categories *Deep support* and *Light support* is reflected in the characteristics of the two respective category-specific sub-networks. In chapter *4*, deep support is defined to be personalised towards the situation of the person that the support is meant for. In contrast, light support is defined to be more general. Although text units coded as *Light support* can still be addressed to a specific person, the content of these text units is not specifically tailored to the situation of the person that the support is meant for. This is reflected in the characteristics of the respective sub-network, as the sub-network based on the category *Light support* contains a higher percentage of text units that are sent to the whole community instead of to specific others, shows a higher reciprocity and fewer sub-cliques compared to the sub-network based on the category *Deep support*.

5.6 Conclusion

The aim of this chapter was to investigate the social network of case study community members. In particular, I aimed to study the link between the characteristics of the social network and the content of the messages that the members of this online support community exchange (see research question II: How does the exchange of social support influence the relations between people participating in the online support community?).

In order to address this aim, research question II was broken down into three objectives: Firstly, I analysed whether the exchange of emotional communication content is associated with specific characteristics of the social network opposed to the exchange of factual communication content (objective I). Investigating the differences and commonalities of the category-specific sub-networks, I found that emotional communication is linked to clearly different network characteristics as compared to

factual communication. People are more connected, closer to each other, and include more members in the sub-networks based on the exchange of emotional communication compared to sub-networks based on the exchange of factual communication. This shows that emotional communication is an essential part of the conversation in the case study community and should not be underestimated. It is the exchange of emotional text units that is associated with a strong connection between community members.

The second objective focused on the question of whether the two opposing components of supportive communication (seeking and giving support) are associated with specific characteristics of the social network. Results show interesting differences between the sub-networks based on self-disclosing (seeking support) and supportive communication. Text units coded as *Self disclosure* are often sent to the whole community. In contrast, text units coded into the supportive categories *Light support* and *Deep support* are mostly directed towards specific members of the online community. Thus, text units coded into a supportive category (*Light support* or *Deep support*) have a very important role in the development of relationships as they are associated with direct contacts between individual members of the community. However, self-disclosing text units also play an important role in the community. The fact that they are often sent to all members of the community shows that they are very inclusive and act as prompts that trigger responses from other community members. This means that even members who are currently not very active are approached by self-disclosing text units which could encourage them to reply.

Differences were also found between the sub-networks based on the two different kinds of supportive communication (*Light support* and *Deep support*) (objective III). The sub-network based on the category *Light support* includes a lot of reciprocal ties between members of the case study community. This means that a lot of relationships that are developed based on the exchange of light support are bi-directional and balanced. In contrast, the exchange of deep support is linked to an imbalanced network structure that distinguishes more between the role of the support-giver and the role of the support-receiver. In addition, text units coded as *Deep support* are exchanged within sub-groups (cliques) in the online community rather than within the online community as one group.

The findings of this study address research question II as they show how members of the case study community form a social network based on their

communication activities and identify the associations between the content of the communication and the characteristics of the social network. This knowledge can help practitioners and scholars to better understand how relationships between older people within online support communities develop out of the communication that they engage in. This study is published in 'Computers in Human Behaviour' (Pfeil & Zaphiris, 2009).

Up to now, I have studied the characteristics of the communication content (see chapter *4*) and investigated how it facilitates relationships between the case study community members (see chapter *5*). Although findings of these studies describe the content of supportive communication and its influence on the relationships between community members, they do not explain how the individual messages form a supportive conversation. Thus, I now proceed to address this issue by investigating the development and evolution of supportive conversation. To this end, the next chapter reports two studies in which I analysed the conversation structure within the case study community.

6   Analysis of the conversation structure

This chapter presents two studies investigating the conversation structure of online supportive communication within the online support community for older people. The first study focuses on the relations between pairs of messages (trigger-response). The second study goes beyond sequences of two messages, and looks at a larger network of related messages to investigate the association between the content of messages and the network patterns that they form. Again, messages from the discussion board about depression within SeniorNet were analysed in these studies but the data-set was enlarged by including more messages. The findings of these two studies address research question III.

After an initial analysis of the aspects of support that are exchanged in the discussion board about depression within SeniorNet (addressing research question I – see chapter *4*), I investigated how the exchange of these aspects facilitates and supports the formation of relations between community members (research question II – see chapter *5*). These two studies give a sufficient overview of the basic concepts of online support in the case study community. I now build on this knowledge to investigate the structure of supportive conversation within the community in more detail.

The next two studies aimed to address research question III (What is the conversation structure of supportive communication within the online support community like?). Figure 6.1 visualises this research question in the context of MOSuC. As the question focuses on the structure of related messages and how they form a supportive conversation, it is mapped on the message-network quadrant of MOSuC.
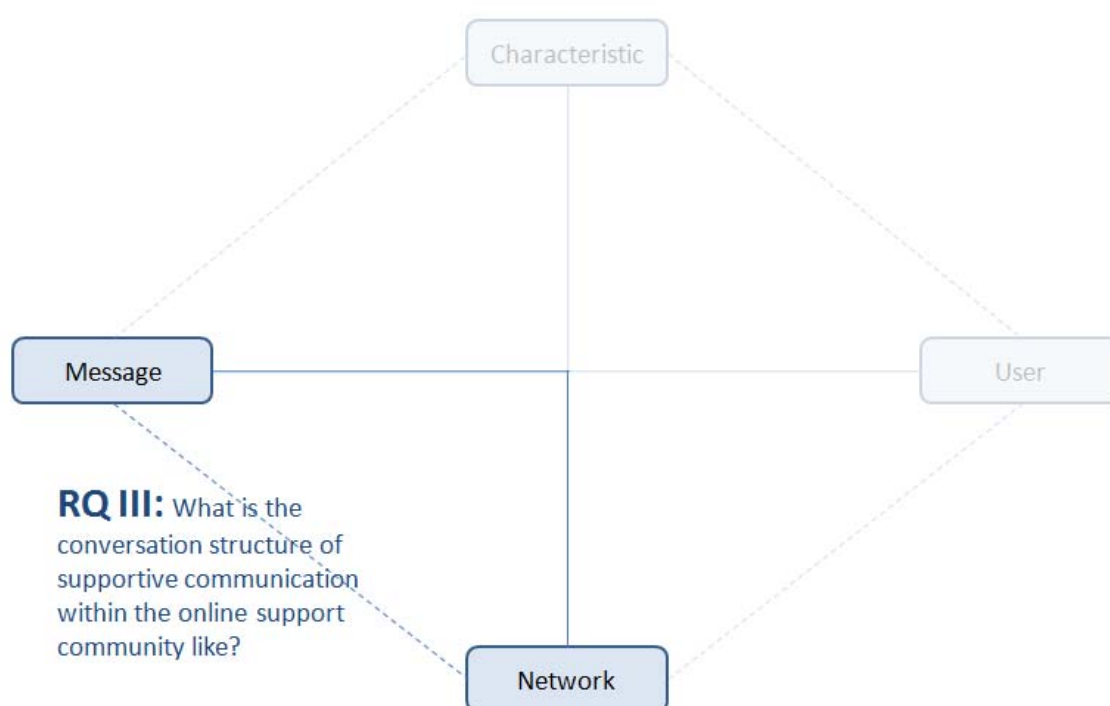
Figure 6.1: Research question III in the context of MOSuC

This chapter is divided into two main parts: In section *6.1*, I report a study investigating message-sequences within the online support community where a message-sequence is defined as a pair of related messages (trigger-response). In section *6.2*, I build on this knowledge and study patterns of a larger number of related messages, aiming to identify associations between the message content and the patterns that related messages form. In these studies, I focused again on the discussion board

about depression, but extended the data-set to include more messages posted over a period of six years. Findings of both studies together give insight into the conversation structure within the online support community and thus answer research question III.

6.1 Investigation of message-sequences and their influence on the level of activity within the community

Up to now, I have investigated the content of the communication within the discussion board about depression within SeniorNet (see chapter *4*) and the patterns of relationships and communication activities in the community (see chapter *5*). While these studies provide useful insights into the characteristics of the online support community, they only show a snapshot view of the community, not taking into account the dynamic changes and conversation patterns over time.

In this section, I present an investigation of the discussion board about depression within SeniorNet, analysing a data-set of messages posted over a period of six years. I studied 'message-sequences'; these are two related messages (one message referring to a previous one). I investigated the content of message-sequences and linked the findings to the level of activity within the online support community over time. I showed how certain message-sequences within the online community were related to the level of activity thus providing valuable insight into the role of message-sequences in sustaining online support communities for older people.

6.1.1   Aims and objectives

In this study, I aimed to provide insight into the patterns of message-sequences and their relationship to overall activity within the depression board. I identified patterns of message-sequences and related the findings to the level of activity within the online support community. Please refer to section *2.4.3* for background information concerning the methods used for the analysis of the conversation structure. In order to address this aim, I broke it down into the following two research objectives:

I.   Identify patterns of message-sequences within the online support community.

II.   Investigate the relationship between message-sequences and the level of activity within the online support community.

Identifying not only the content of supportive communication, but also its dynamics and conversational patterns helped me understand what drives and what hinders the exchange of messages in the discussion board about depression within SeniorNet.

6.1.2 Related studies

Researchers are increasingly interested in investigating the development of online communities over time. The focus often lies on factors that raise and maintain the sustainability of online communities. In doing so, many studies focus on the responsiveness and interactivity of messages in the community (Jones et al., 2004; Kalman et al., 2006; Rafaeli & Sudweeks, 1997), where responsive messages are defined as message referring to a previous message and interactive messages are defined as messages referring to the relatedness of two or more previous messages (Jones & Rafaeli, 2000). These are important characteristics as online communities containing a high level of responsive and interactive messages are believed to be more engaging and beneficial for their members (Rafaeli & Sudweeks, 1997). But what constitutes and encourages responsive and interactive messages?

Himelboim (2008) investigated the distribution of replies among members in political and health Usenet discussion boards. He found that both types of discussion boards showed an unequal distribution of replies among their members, with a few members attracting a disproportionately high number of replies. This tendency was stronger for health-related discussion boards than for political-oriented ones. He also found that the skewedness of the response distribution increased with the size of the community (Himelboim, 2008). Focusing on the characteristics of messages, Berthold et al. (1997) found that messages of medium length, with an appropriate subject line and a statement of a fact have a high possibility of triggering a response. Joyce and Kraut (2006) found that long initial posts or posts that include a question are very likely to trigger a response. If an initial message contains a question, it is very likely that it will trigger an answer. Also, responding messages are reported to be similar in style and form to the initial post (Becker-Beck et al., 2005), e.g. initial messages that sound negative trigger a negative response and longer initial posts trigger longer replies (Joyce & Kraut, 2006). However, these findings are based on the investigation of generic online communities about various topics. Fisher et al. (2006) as well as Joyce and Kraut (2006) state that the likelihood of people responding to initial messages is dependent on

the topic and purpose of the online community. Both studies suggest that online support communities usually contain a high level of responsive messages and are thus most likely to be sustained over longer periods of time. Table 6.1 shows a summary of research studies focusing on responsive and interactive messages in online communities in order to provide an overview over the main findings.

Table 6.1: Summary of studies focusing on responsive and interactive messages in online communities

Reference	Type and date of online community	Main findings
Berthold et al. (1997)	- 3000 postings from over 30 randomly selected discussion groups on Internet, Bitnet and Compuserve (ProjectH).	- A message triggering a lot of replies has a medium length and an appropriate subject line. A statement of a fact also enhances the chances of being followed-up. - If during an already ongoing thread one introduces a completely new topic, the chances of getting a response are slim. - A message which does not refer to any other message is less likely to be referred to. Being followed-up when one already participates in a thread is much easier.
Rafaeli and Sudweeks (1997)	- 10 random Bitnet lists; - 12 random Usenet newsgroups; - 10 random CompuServe SIGs (all collected in 1993).	- 10% of messages were coded as interactive; 52.2% were coded as reactive. - Interactive messages were found to be longer, more humorous, contained more self-disclosure, displayed a higher preference for agreement, were more opinionated, and contained many more first-person plural pronouns than other messages. - Listserv mediated messages were found to be significantly less interactive than either Usenet or Compuserve SIG messages.
Jones et al. (2004)	- 2.65 million messages to 600 random Usenet newsgroups posted over a 6-month period in 1999-2000.	- Users were more likely to respond to simpler messages in overloaded mass interaction. - Users were more likely to end active participation as the overloading of mass interaction increased. - Users were more likely to generate simpler responses as the overloading of mass interaction grew.
Kalman et al. (2006)	- 15,815 email responses by 144 employees of the Enron Corporation (1998-2002); - 115,416 responses in a discussion groups for university students (1999 -2002); - 40,072 responses posted to answers.google.com (2002-2004).	- Around 80% of the responses were sent within the average response latency of that group. - Around 97% of the responses were sent within 10 times that average response latency. This tendency was found to be the same for all three data-sets.
Joyce and Kraut (2006)	- Initial messages posted by 2,777 newcomers to six public newsgroups.	- Approximately 61% of newcomers received a reply to their initial post, and those who got a reply were 12% more likely to post to the community again. - Newcomers were more likely to receive a response if they asked a question or wrote a longer post. -The quality of the response they received did not influence the likelihood of the newcomer's posting again.
Himelboim (2008)	- 15 groups of each of the topics "politics", "health" and "support" within Usenet discussion forums between 2000 and 2005 were randomly selected. In each group, only threads that started in October 2004 were selected.	- The structure of a discussion network is affected by the type of information exchanged within it. Factual information invites a more centralised and hierarchical discussion, whereas an opinionated discussion invites relatively more egalitarian patterns.

As Table 6.1 shows, several studies have investigated the content and characteristics of responsive and interactive messages. However, these studies have looked at online communities in general, rarely taking into account the target population

or the topic of the community. As Fisher et al. (2006) and Joyce and Kraut (2006) suggest, the amount of responsive and interactive messages in online communities varies and largely depends on the topic of the community as well as the target population. Investigating message-sequences within the discussion board about depression allows for a detailed investigation of how messages are related to each other.

6.1.3   Methodology

6.1.3.1   Data collection

As the current analysis also focused on the level of activity over time, I decided to extend the data-set in order to sufficiently cover times of low, medium and high level of activity. Thus, for this study, I used all messages from the discussion board about depression that were available at the time of data collection. This resulted in a total of 961 messages posted over a period of six years (August, 2000 until August, 2006) by 86 users (including the 400 messages that were analysed in the studies reported in chapter *4* and chapter *5*). Within this time period, the online community had gone through various levels of activity (see Figure 6.2) making it an appropriate online community to study the relationship between conversation patterns and level of activity.

6.1.3.2   Data preparation

Message coding. As in the previous studies, I again applied the code scheme described in chapter *4* (see Table 4.3), focusing on the seven categories. Due to the enlarged data-set, additional coding had to be done. I applied the same procedure as reported in section *4.2.4.3* in order to analyse the remaining messages of the communication within the online community.

Analysis of the level of activity. When investigating the level of activity within online communities, researchers often look at pre-defined time-units (e.g. weeks or months) and investigate the level of activity by comparing them. I decided against such a method, as grouping the messages into chunks of weeks or months would have forced the data into pre-defined groups and might have led to a biased interpretation of it (e.g. if there was a period of high level of activity that stretched over two half-months, an analysis looking at posts per month would have missed this trend). However, when looking at each day individually, I found that there were huge differences between the days and no clear tendency was visible when plotting the level of activity for each day

individually (e.g. even in times of high level of activities there were days when no single message was sent). Thus, I decided to calculate a 'running average', in which the value for each day is calculated by not only taking into account the number of messages sent on the individual day, but also the number of messages sent on the days prior to and subsequent to that day. In my case, I calculated a '31 day running average' of the number of messages per day (for a similar approach see Gloor (2005)). This was done for every day in the analysed period, by averaging the number of messages sent per day in a time period ranging from 15 days before the current day to 15 days after the current day and assigning the average to this date. By doing this, I avoided separating the data into pre-defined time-units (e.g. months) yet still obtained a curve that was smooth enough to identify clear phases of high and low activity. I then plotted the data and this diagram was taken as a basis for identifying periods of increasing, decreasing, high and low activity within the community (see Figure 6.2).
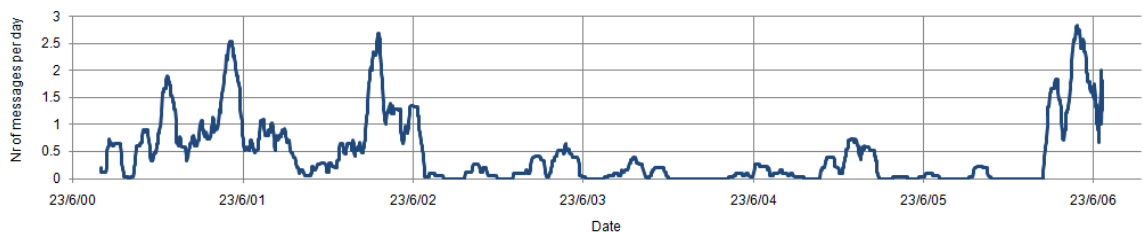
Figure 6.2: The level of activity within the case study community over time

6.1.3.3   *Identification of message-sequences*

In SeniorNet, messages are presented in time order without being sorted into threads. This is different to many other online communities, in which messages either open a new thread or are represented within an existing thread as a response to a previous message. The design of the discussion board about depression within SeniorNet does not give any indication about the relationship of messages other than their content.

I investigated two different kinds of message-sequences. Firstly, I was interested in sequences of two consecutive messages irrespective of whether these two messages referred to each other or not. I analysed the content of consecutive messages by looking at the categories that the text units within these messages were coded as. This means that messages containing more than one text unit belonged to more than one message-sequence. For example, a message containing only one text unit coded as *Light support* followed by a message containing two text units coded as *Deep support* and *Community*

building resulted in the message-sequences *Light support – Deep support* and *Light support – Community building*. As the most recent message is always displayed at the top of the page and is the one that members see when they compose a new message, I expected that the content of the current message would be influenced by the content of the message preceding it.

However, as previous research has shown (Herring, 1999), messages that are posted in consecutive order might not reflect accurately the structure of the conversation, as these two messages might not refer to each other. This is especially true for the depression discussion board as it is not threaded and therefore two messages that refer to each other might not be posted after each other but would be a few messages apart from each other. Also, messages might refer to (or be referred to by) several other messages. Thus, I also investigated the sequences of messages that referred to each other. I judged that two messages referred to each other when either or both of the following cases were true: (1) a message (or a text unit within a message) would refer explicitly to a previous message by addressing it directly or (2) a message (or a text unit within a message) would follow up a conversation without explicitly addressing it but by assuming knowledge that could only be gained by reading the previous message.

Messages (or a text unit within a message) could also be addressed to the whole online support community. This means that for each text unit in a message, I determined whether it referred to i) one or several other messages (if yes, which message(s)), or ii) the whole community. Again, messages containing more than one text unit could belong to more than one message-sequence. Consider the following example: message A consisted of two text units coded as *Self disclosure* and *Community building*. Message B consisted of two text units coded as *Light support* and *Deep support*. The text unit coded as *Deep support* in message B referred to message A, the text unit coded as *Light support* referred to the whole community. This resulted in the message-sequences *Self disclosure – Deep support* and *Community building – Deep support*.

Having identified message-sequences both for consecutive as well as related messages, I applied event sequence analysis (Bakeman & Gottman, 1997). Using Jeong's (2005a) 'Discussion Analysis Tool', I calculated the frequency of two categories occurring in a message-sequence. A transition probability matrix was calculated that contained the probability that the first category would be followed by the

second. Then, Z-scores were calculated based on the overall probabilities of each category pair occurring. A Z-score of 2.32 (equivalent to a significance level of 0.01) has been used to determine whether a sequence of categories occurs significantly more or less often than the random value based on the probability of the individual categories (Jeong, 2005a). The results are presented in state transition diagrams that visualise the message-sequences that occur significantly more or less often than random (see Figure 6.3 and Figure 6.4).

6.1.3.4   *Relationship to online community lifecycle*

In order to find out if and how specific patterns of communication relate to the general activity of the discussion board, I analysed whether specific message-sequences occurred at specific points in time during the 6 years. I focused on message-sequences that occurred significantly more often than random. In order to link the occurrence of these message-sequences to the general level of activity on the discussion board, the following methods were used:

Interpretation of frequency visualisation. I plotted the frequency of messages and the occurrence of the separate message-sequences under investigation per day in separate diagrams (see Figure 6.5). Comparing the visualisations allowed me to get an initial indication of the general connection between the level of message frequency and the level of occurrences of the investigated message-sequences.

Correlations. I calculated Pearson's correlation coefficient in order to investigate the relationship between the occurrence of the message-sequences and the general level of activity within the online community. For my data analysis I only used the message-sequences that came up as appearing significantly more often than random in the previous analysis. I then correlated the occurrence of each of these message-sequences with the number of text units posted per day. I also correlated the occurrence of the investigated message-sequences with each other. I then used a standard t-test to check the correlations for significance (see Table 6.3).

6.1.4   Results

6.1.4.1   *Content and evolution of the online community*

Over the period of six years, 961 messages were posted. On average, 0.44 messages a day were sent. The message frequency varied greatly in the sample, as it

ranged from 11 messages a day to 2.5 months in which no message was posted. The 961 messages were sorted into 2119 different text units (on average 2.2 text units per message). Table 6.2 shows the frequencies of the categories within the data-set.

Table 6.2: Frequencies of categories within the data-set

Category	% of messages containing this category	# of text units coded in this category
Self disclosure (SD)	56.61%	662
Community building (CB)	38.81%	453
Deep support (DS)	24.66%	280
Light support (LS)	29.55%	318
Factual information (FI)	16.34%	172
Off topic (OT)	15.92%	170
Technical issues (TI)	6.45%	64

6.1.4.2   Message-sequence

Figure 6.3 shows the state transition diagram for consecutive messages in the online community and Figure 6.4 shows the state transition diagram for one message referring to another. An arrow pointing from one category (a) to another category (b) indicates the occurrence of a message-sequence where category (a) is followed by category (b). A dashed line indicates that the observed value of this message-sequence is significantly lower and a continuous line indicates that the observed value is significantly higher than the random value. To ease interpretation, only those values that are significantly different from the random value are included in the diagrams. Pairs of categories that are not significantly different are not shown in the figures. For example, the solid arrow pointing from *Self disclosure* to *Deep support* in Figure 6.3 indicates that *Self disclosure* is followed by *Deep support* significantly more often than the random value. In contrast, the dashed arrow pointing from *Self disclosure* to *Technical issues* shows that *Self disclosure* is followed by *Technical issues* significantly less often than the random value. The numbers on the arrows show the transition probabilities from a given category to another. The probabilities of all arrows pointing away from any code would add up to 1 if all transitions were included. For example, in Figure 6.3, the value .15 on the line from *Self disclosure* to *Deep support* shows that 15% of text units coded as *Self disclosure* are followed by *Deep support* and the value .02 on the line from *Self disclosure* to *Technical issues* shows that 2% of text units coded as *Self disclosure* are followed by *Technical issues*. The remaining 83% of text units coded as

Self disclosure are followed by the five remaining categories, but at a frequency that is not significantly different from the random value.
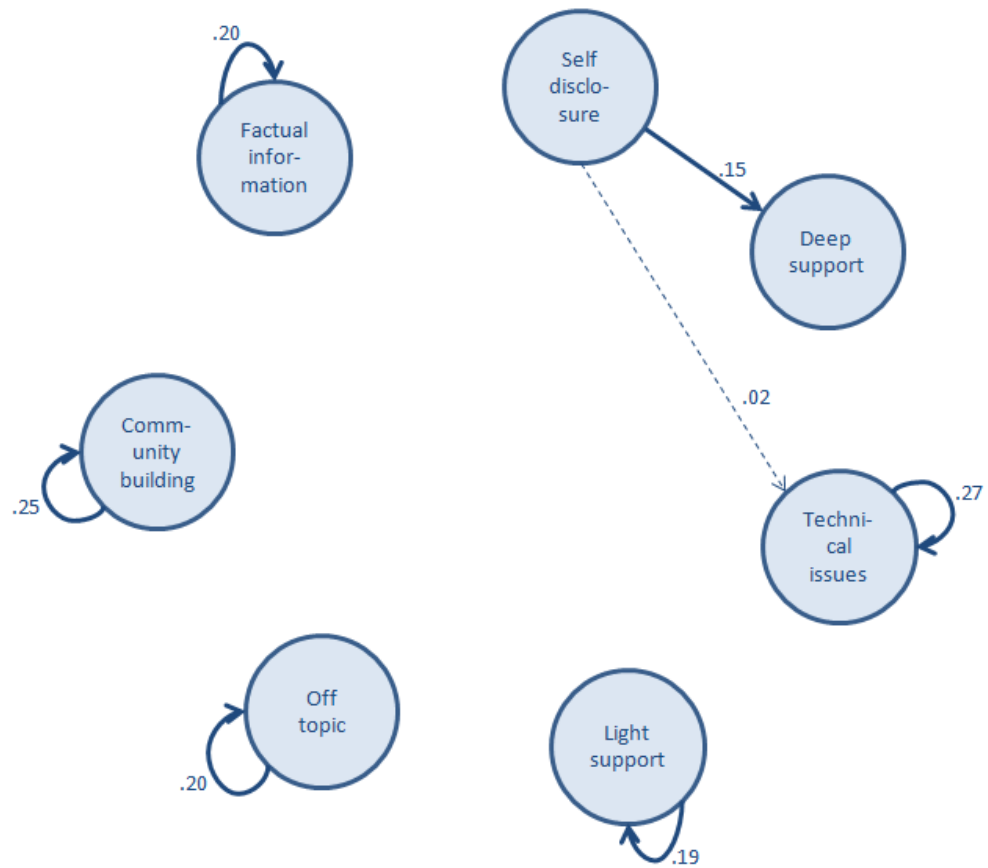
Figure 6.3: State transition diagram for consecutive messages (p<.01)
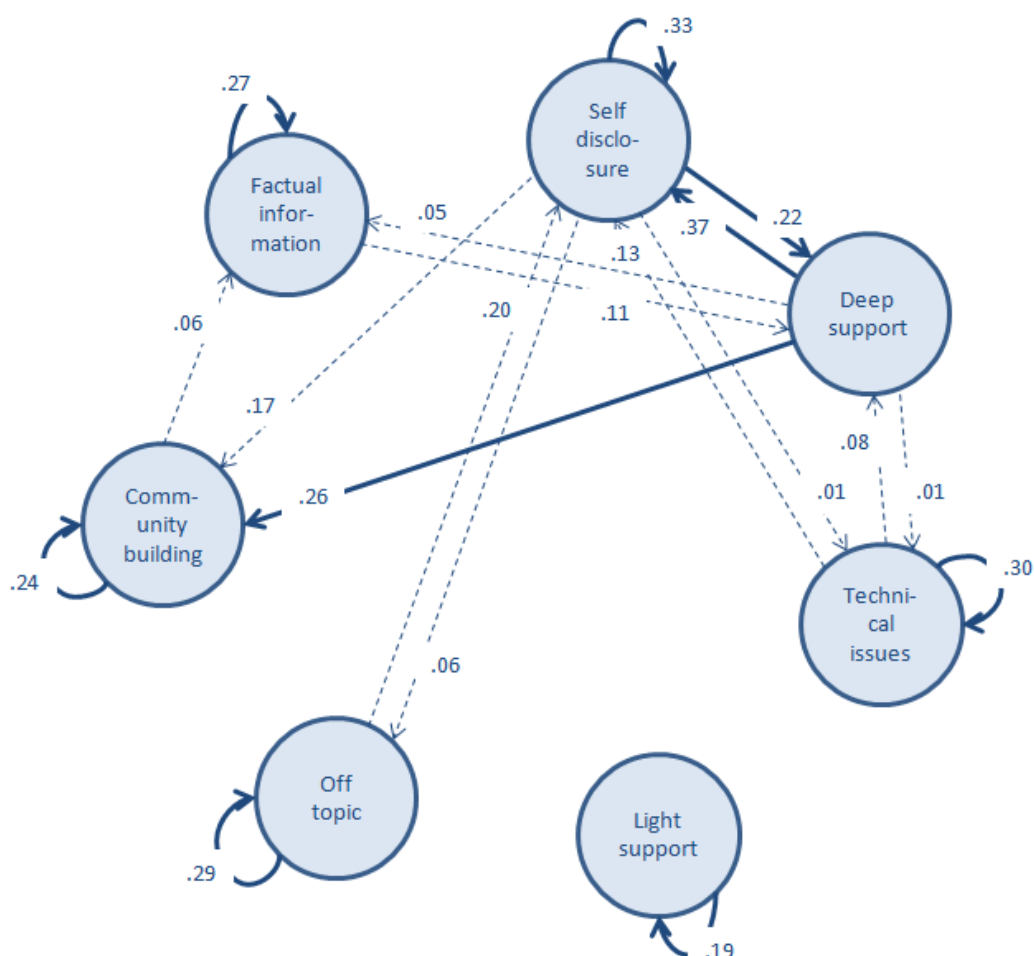
Figure 6.4: State transition diagram for related messages (p<.01)

The state transition diagram investigating the related messages (see Figure 6.4) shows more distinctive patterns than the one analysing consecutive messages. This difference supports Herring's (1999) claim that two consecutive messages within a CMC setting might not automatically relate to each other. Both of these results give valuable insight into conversation patterns within the online support community. The state transition diagram of two consecutive messages (Figure 6.3) gives insight into the influence of the previous message on a current message irrespective of whether these two messages refer to each other or not. The state transition diagram of related messages (Figure 6.4) shows adjacency pairs of a conversation as they are intended. This will be further addressed in the discussion.

6.1.4.3   *Relationship to online community lifecycle*

In order to relate patterns of message-sequences to the level of activity within the online community, I focus on the pairs of categories that came up as appearing significantly more often than random in related messages (see the pairs connected via solid arrows in Figure 6.4). Namely, these sequences are: *Self disclosure–Self disclosure*

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(SD-SD), *Self disclosure–Deep support* (SD-DS), *Deep support–Community building* (DS-CB), *Deep support–Self disclosure* (DS-SD), *Community building–Community building* (CB-CB), *Light support–Light support* (LS-LS), *Factual Information–Factual Information* (FI-FI), *Off topic–Off topic* (OT-OT), *Technical issues–Technical issues* (TI-TI).

Figure 6.5 shows the level of activity within the online community (lower part) and the frequency of occurrence of the message-sequences in the related messages (upper part). The frequency of message-sequences is visualised by the size of circles. The smallest circle represents one occurrence of the message-sequence at the time the circle is shown. The diameter of each circle scales with the number of occurrences of the sequences. The larger the circle of a message-sequence at a specific time, the more incidences of this message-sequence were posted at that point in time.
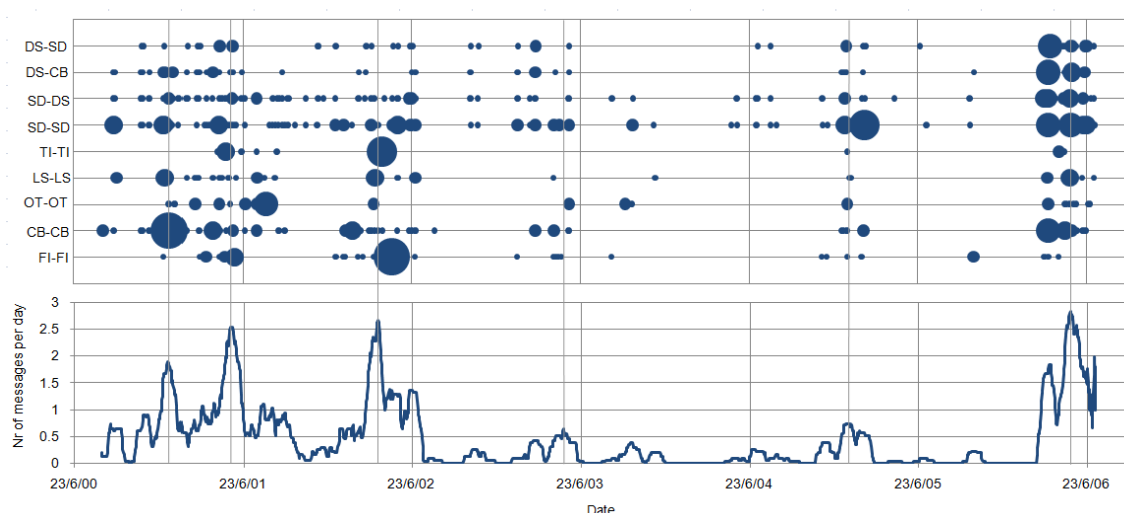
Figure 6.5: Relationship between the level of activity within the online community and the occurrence of message-sequences

In addition, I calculated the correlation of the occurrence of message-sequences and the frequency of text units in order to investigate the relationship between the message-sequence and the level of activity within the online community. Also, the occurrences of message-sequences were correlated with each other. The values are presented in Table 6.3. Correlation values greater than 0.3 (bold) and significant values (*) are marked.

Table 6.3: Correlation values between message-sequences and the number of text units per day (significance level of p < 0.01 is indicated with *)

[per day]	#text units	SD-SD	FI-FI	CB-CB	OT-OT	LS-LS	TI-TI	SD-DS	DS-SD
SD-SD	0.51*	-							
FI-FI	0.23*	0.10	-						
CB-CB	0.47*	0.23*	0.03	-					
OT-OT	0.22*	-0.01	-0.05	0.10	-				
LS-LS	0.30*	0.19*	-0.03	0.07	0.05	-			
TI-TI	0.14*	-0.03	-0.01	0.07	-0.01	0.05	-		
SD-DS	0.47*	0.50*	0.08	0.26*	-0.01	0.16*	-0.08	-	
DS-SD	0.46*	0.48*	-0.01	0.17*	-0.01	0.14*	-0.04	0.38*	-
DS-CB	0.42*	0.28*	0.01	0.47*	0.06	0.16*	-0.03	0.33*	0.38*

In the interpretation, I mainly focus on the correlation of the message-sequences with the frequency of text units. In general, a high correlation value indicates that the sequence occurs in proportion to the frequency of the text units (e.g. occurs very often in times of high level of activity and less often in times of low level of activity). A low value indicates that the sequence does not closely follow the frequency of text units.

6.1.5   Discussion

For almost all related message-sequences (see Figure 6.4) and most of the consecutive message-sequences (see Figure 6.3), pairs of the same category occur as a sequence. An explanation for this phenomenon in two consecutive messages could be that people tend to imitate the behaviour of others. People might read through the previous messages on the page, end up looking at the last message when they post their own message and thus imitate the message that they see on the screen. However, the fact that this tendency is also true for messages that are related (not necessarily posted in consecutive order) shows that people also tend to answer messages with like replies irrespective of what kind of message they see on the screen. Looking at the data-set, I could for example see that when people add a paragraph of light support to their messages (e.g.: "Also, hope all youse guys are doing well and feeling good, too. I hope [name] and [name] will turn the corner and feel better.") others tend to imitate this behaviour in their messages and also add a paragraph of light support to their own message (irrespective of the content of the rest of the message and whom they are writing to).

The fact that similar content is sent in two messages that are related to each other (not necessarily posted in two consecutive messages) shows that posters also tend to refer to another message by writing content that is of the same category as the one it refers to. This finding could be an indication for rapport building in the online support community and is also in line with previous research that shows that two related messages are likely to be similar (Becker-Beck et al., 2005; Joyce & Kraut, 2006).

In the following sections, I discuss the nature and characteristics of each of the message-sequences that occurred significantly more often than random in the online community (see the message-sequences connected via a solid arrow in Figure 6.4) and also look at their role in relation to the level of activity within the community. Based on my results, I interpret the function of these message-sequences within the online support community (objective I) and also discuss their relation to the level of activity within the online community (objective II).

6.1.5.1   *Community building – Community building*

The results show (see Figure 6.4) that the sequence *Community building – Community building* occurs significantly more often than random in the data-set. The following excerpt shows an example of two related text units that are coded as *Community building*:

Msg 1: *"Today is the first day I have returned to SN, hope to be around a little more, but not as regular as I was. It's good to be able to be here."* (CB)

Msg 2: *"Hey, hey...[NAME]! It's good to see you back, Girl, […]. We'll all be here whenever you can get here. […] Whatever is convenient for you is just fine."* (CB)

As this example shows, text units that are coded as *Community building* in related messages are often posted in order to reassure each other about the fact that the online support community is a place of togetherness and caring. Thus, it seems that the sequence of *Community building – Community building* is a vital component in building an atmosphere of trust and understanding within the online support community.

The sequence of *Community building – Community building* is among the sequences that correlate highly with the number of text units (correlation value .47), indicating that the occurrence of this sequence is positively associated with the level of activity within the online community. Looking at Figure 6.5, we can see that this

message-sequence seems most prevalent in times when the level of activity is increasing (shortly before the peak). These two results suggest that the sequence *Community building – Community building* is related to an increase in the level of activity.

6.1.5.2   *Self disclosure – Self disclosure*

The results show that, in general, members of the online support community respond to messages containing *Self disclosure* by posting messages that also contain *Self disclosure* (see Figure 6.4). The following examples of related text units show this.

Msg 1: *"My husband, [NAME], passed away [...] exactly 3 weeks to the day after being diagnosed with lung cancer. [...[I'm so sad that he is not here.[…]" (SD)*

Msg 2: *"I understand how you feel. I've been widowed a number of years, now, and it's still difficult." (SD)*

This message-sequence externalises the commonalities between people and is thus used to build a sense of togetherness. It seems that this sequence is posted in order to externalise that the posters are in a similar situation and to build a basis of common experiences. Having experienced a similar situation is vital for the exchange of support, when people know that others have similar experiences, the support exchanged tends to be perceived as better and more trustworthy (Pfeil et al., 2009).

Looking at the relation of this sequence to the level of activity within the online support community, we can see that the sequence *Self disclosure – Self disclosure* shows the highest correlation with the frequency of text units within the online community (.51; see Table 6.3). In addition, as Figure 6.5 shows, this sequence seems to be constantly present, irrespective of the level of activity. These results indicate that text units coded into the category *Self disclosure* are a basic component of the conversation, where a basic component is a part of the conversation that occurs also at times when the level of activity is generally low and thus serves as the basis for further conversation. When exchanging text units coded as *Self disclosure*, people talk about themselves, mutually opening up towards each other, often discovering that they have a lot in common. This is then used as the basis for further conversation to happen.

6.1.5.3   Self disclosure and Deep support

Both state transition diagrams (Figure 6.3 and Figure 6.4) show that text units coded as *Self disclosure* are also often followed by text units coded as *Deep support*. Thus, posters talking about their problems often trigger responses by others who want to help them. The following example illustrates such a sequence:

Msg 1: *"It's been a bad day today, I can't stop crying & I feel so sick & panicky. I thought I could fight this off but it looks as though I'll have to go to the doc. next week.[…]" (SD)*

Msg 2: *"[name]--- This is such a hard loss to go through. I send you longdistance hugs. Crying is so good for you. And it is also a good idea to see your doctor. Just for a check-up. […]" (DS)*

As Figure 6.4 shows for related messages, this connection is also very strong in the opposite direction with *Self disclosure* following *Deep support*. Looking at these instances in the data-set, the exchange of *Deep support* and *Self disclosure* is often a process that exceeds the sequence of two messages. This is also supported by the high correlation of message-sequences coded *Self disclosure – Deep support* and *Deep support – Self disclosure* (.38). Often, this kind of conversation is initiated by a message containing self-disclosing text which is then followed up by text coded as *Deep support*. But the conversation does not stop here, as people tend to refer back to the supportive message, often by giving an update about their new situation. Also, sequences that include text units coded as *Self disclosure* and *Deep support* seem to be fairly disconnected to all other categories (see dashed arrows in Figure 6.4).

Investigating the relation between the sequence *Self disclosure – Deep support* and the level of activity within the online community, a fairly high correlation value (.47) indicates that the occurrence of the sequence is positively associated with the level of activity within the online community. The same is true for the sequence *Deep support – Self disclosure* (correlation value with the level of activity: .46). As Figure 6.5 shows, the sequences *Self disclosure – Deep support* and *Deep support – Self disclosure* occur in times of low, as well as medium and high level of activity, suggesting that these sequences are a fundamental part of the communication activity within the online support community. This tendency is similar to that for the sequences *Self disclosure – Self disclosure* and *Community building – Community building*. The similarity to the

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sequence *Self disclosure – Self disclosure* (see Figure 6.5) indicates that the sequences *Self disclosure – Deep support* and *Deep support – Self disclosure* are follow-ups to the initial exchange of text units coded as *Self disclosure*. This suggests that the exchange of *Self disclosure* and *Deep support* is the next step of a basic conversation within the online support community after an initial exchange of *Self disclosure*. This is also supported by the high correlation of *Self disclosure – Self disclosure* with *Self disclosure – Deep support* (.50) and *Deep support – Self disclosure* (.48). The correlation values show that these three sequences have a very similar pattern of occurrence. Thus, it seems that at the beginning of a conversation, *Self disclosure* is exchanged mutually in order to establish common ground. Once this is successfully done, members start to provide each other with *Deep support* as a follow up to *Self disclosure*. After support is given, members tend to refer back to the conversation by providing an update to the situation and thus answer the *Deep support* with further *Self disclosure*.

6.1.5.4   *Deep support – Community building*

As Figure 6.4 shows, text units that are coded as *Community building* tend often to refer to messages containing text units coded as *Deep support*. Investigating the occurrences of the sequence *Deep support – Community building* in related messages from the data-set, I found that community building text units often refer to messages containing text units coded as *Deep support* in order to comment on the kind of support given, as the example illustrates:

Msg 1: *"Look for a local support group, get involved […]. This and friends are great for whipping depression. Don't forget medication. If one doesn't work, try, try again." (DS)*

Msg 2: *"[Your advice] is a good place to start to "help yourself" and Senior Net is a safe place to share whatever is troublesome to [us]." (CB)*

Also, sometimes people that received the deep support tend to reply and voice their gratitude.

Msg 1: *"Do try to remember that natural sunshine is an EXCELLENT source of Vitamin D!!! Try to spend at least 20 minutes in the sun each and every day. Don't get sunburned, of course, but it's very good both for your body and your moods." (DS)*

Msg 2: *"Thanks for that suggestion about the sunshine. People are SO NICE in this discussion! So caring and understanding. Thanks […] for your kindness and interest."* (CB)

Looking at the relation between the sequence *Deep support – Community building* and the level of activity within the online community, the results show that the occurrence of this sequence is quite highly correlated with the level of activity (.42), indicating that the sequence is a basic component of communication within the online community. Also, the results show a high correlation of the sequence *Deep support – Community building* with the sequences *Community building – Community building* (.47), *Self disclosure – Deep support* (.33) and *Deep support – Self disclosure* (.38) and a moderate correlation with the sequence *Self disclosure – Self disclosure* (.28).

These results together with findings discussed in previous sections, suggest that the sequence *Deep support – Community building* might be part of a conversation structure consisting of a series of sequences: After establishing common ground (message-sequence *Self disclosure – Self disclosure*) and giving initial support as a response to self disclosure (*Self disclosure – Deep support*), community building text units tend to be added (*Deep support – Community building*) in order to reflect on the activity and support given, often resulting in positive statements about the activity within the online community. As the high correlation between the sequence *Deep support – Community building* and the sequence *Community building – Community building* (.47) indicates, the sequence *Community building – Community building* might be the last of a series of sequences within the online community that constitute the basic conversation pattern within the online community. However, the sequence *Community building – Community building* seems to also be slightly detached from the self disclosing and supportive communication as the moderate significant correlations with the sequences *Self disclosure – Self disclosure* (.23) and *Self disclosure – Deep support* (.26) and a low correlation with the sequence *Deep support – Self disclosure* (.17) show.

6.1.5.5   *Light support – Light support*

As Figure 6.4 shows, the mutual exchange of text units coded into the category *Light support* also occurs very often in the data-set. This sequence only shows a moderate correlation (.30) with the number of text units, indicating that the occurrence of the sequence is not strongly associated with the level of activity. Looking at Figure

6.5, we can see that the message-sequence of *Light support – Light support* is hardly found in periods of low and medium activity and is prevalent only in times of high activity indicating that a certain level of activity is associated with the mutual exchange of this kind of support. *Light support* consists of the exchange of general, uplifting comments (e.g: "Good luck and blessings to you both"). The fact that light support is only exchanged in times of a high level of activity suggests that this message-sequence is not part of the basic conversation within the online community. This claim is further strengthened by the fact that the sequence *Light support – Light support* shows significant but low correlations with the sequences of basic conversation, namely *Self disclosure – Self disclosure* (.19), *Self disclosure – Deep support* (.16), *Deep support – Self disclosure* (.14), and *Deep support – Community building* (.16).

6.1.5.6   Factual information – Factual information

The results show that sequences of two related text units categorised as *Factual information* are also prevalent in the data-set. As the next example shows, this sequence often consists of a question and an answer:

Msg 1: *"My one question to [name] and [name] is what is the difference between chemical depression, since I am BiPolar, and situational depression." (FI)*

Msg 2: *"Depression can be triggered by an event. Once the depression sets in, the chemicals in the brain actually alter. […]." (FI)*

The sequence shows only a low correlation value with the number of text units (.22) indicating that it occurs fairly independently from the level of activity within the online community. Also, as Figure 6.5 shows, the message-sequence of *Factual information – Factual information* occurs in a concentrated manner, as it either does not occur at all, or it occurs extensively at once. People exchange text units categorised as *Factual information* independently of the level of activity within the online support community, often resulting in the exchange of more message-sequences of this kind, before it drops and this sequence does not occur anymore for quite a while. The fact that the sequence *Factual Information – Factual information* is neither equally distributed nor highly correlated with the level of activity suggests that the exchange of *Factual information* is not part of the communication contributing to the sustainability of the online support community. This is also supported by the very low correlation between this sequence and the sequences of *Self disclosure – Self disclosure* (.10), *Self disclosure*

– *Deep support* (.08), *Deep support – Community building* (.01) and *Community building – Community building* (.03).

6.1.5.7   *Off topic – Off topic*

As Figure 6.4 shows, a text unit coded as *Off topic* is often related to another *Off topic* text unit. Sometimes a thread of conversation drifts away from the actual topic of the discussion, resulting in a sequence of *Off topic* text units, like the following example:

Msg 1: *"It's still wintertime here...lots of snow around and temps still in the 30s...may get into 40s this weekend which will seem WARM!" (OT)*

Msg 2: *"I am sick of this weather, too...Tomorrow we get yet another storm here on the rocky coast of Maine...I quess that I am just going to have to lite a candle to the Spring Fairy!" (OT)*

A low correlation value between the sequence *Off topic – Off topic* and the number of text units (.22) show that this sequence is not strongly associated with the level of activity within the online community. Looking for more details in Figure 6.5, we can see that the sequence occurs mostly when the level of activity is decreasing or when the level of activity is medium. Also, the sequence *Off topic – Off topic* does not often occur in times when the level of the *Self disclosure-*, *Deep support-* and *Community building*-sequences is high as very low correlation values between the sequence *Off topic – Off topic* and the sequences *Self disclosure – Self disclosure* (-.01), *Self disclosure – Deep support* (-.01), *Deep support – Community building* (.06) and *Community building – Community building* (.10) show. *Off topic* sequences occur mainly when the level of activity is decreasing which might be at times when no serious emotional and supportive message exchange is taking place. This suggests that this message-sequence is related to a decrease in activity within the online community.

6.1.5.8   *Technical issues – Technical issues*

As Figure 6.4 shows, text units coded as *Technical issues* are often followed by text units coded as *Technical issues* as well. Like the sequence of *Factual information – Factual information*, the sequence *Technical issues – Technical issues* often consists of question-answer sequences concerning technical problems and tips on how to use the online community.

Analysing the relation between the sequence *Technical issues – Technical issues* and the level of activity within the online community, a very low correlation value (.14) indicates that the sequence is not related to the level of activity within the online community. Looking at Figure 6.5, we can see that - like the message-sequence *Light support – Light support* - the message-sequence *Technical issues – Technical* issues only occurs in times of high activity. Also, it seems like there are either a lot of *Technical issues – Technical issues* sequences at once or none at all. This finding suggests that the exchange of text units coded as *Technical issues* is not part of the basic conversation structure within the online community, as it never occurs in times of low or medium message activity. Similar to the mutual exchange of *Light support*, members post sequences of *Technical issues – Technical issues* only when there is already a basis of other conversations going on at the same time. Text units coded as *Technical issues* are focused on getting help regarding how to post or how to use the discussion board. Regular participation and enough conversation about other things is the basis for this exchange to happen.

6.1.6   Conclusion of the message-sequence analysis

This study has identified message-sequences that occur significantly more often than the random value within the online support community. By extracting these sequences, I have identified important components of conversation within the online community (research objective I.). Furthermore, the findings show the associations between the message-sequences and the level of activity within the community (research objective II.).

I believe that the findings of this study are of significance as I have identified the association between the message-sequences and the sustainability of the online community. By revealing the various characteristics of conversation, I investigated in depth the components that are related to a high level of activity within the community. I conclude that the basic conversation within the community consists of an initial mutual exchange of self disclosing messages in order to build common ground among members of the community. Once this is achieved, it seems that the basis is laid for answering self disclosing messages with text units coded as *Deep support*. The exchange of *Self disclosure* and *Deep support* can go on for a while, but *Deep support* is also often followed up with text units coded as *Community building* in order to appreciate the support given. This sequence of *Self disclosure – Deep support – (Self disclosure –*

Deep support) – *Community building* was found to be the basis of communication within the online support community as it occurs equally in all stages of the evolution of the online community, and also often starts a conversation after a quiet period.

In addition, I also identified message-sequences that only occur when the level of activity within the online community is high (*Light support – Light support* and *Technical issues – Technical issues*), indicating that these message-sequences are only occurring when there is enough other communication going on at the same time. The exchange of factual information, however, showed a clearly different relationship to the level of activity within the online community, as it seems to be independent of the level of activity within the online community. The message-sequence *Off topic – Off topic* was found to be related to a decreasing activity-level within the online community.

These findings show patterns of message-sequences and their relation to the level of activity and thus address research question III (What is the conversation structure of supportive communication within the online support community like?). The study is published in the Journal for Commuter-Mediated Communication (Pfeil et al., 2010).

However, the findings also suggest that there might be message-sequences which go beyond a pair of two messages, but actually consist of a series of three or more messages or form clusters of several messages. This issue is addressed in the next study that provides further analysis in order to investigate patterns of related messages that go beyond a pair of messages. A combination of the findings of these two studies fully addresses research question III.

6.2 Investigating topologies of message relations

After looking at sequences of two related messages in the previous study, I now build on this knowledge and investigate patterns of several related messages (messages responding/referring to each other) in the discussion board about depression within SeniorNet. Thus, I not only investigate the content of the communication, but also how the exchange of this content is structured in order to build a conversation. This provides a deeper understanding of supportive conversation structures and addresses research question III (What is the conversation structure of supportive communication within the online support community like?).

In particular, I focus on messages that form lines (messages only responding to one previous message), triangles (three interconnected messages) and cliques (four or more interconnected messages). My findings show that off-topic conversation consisting of small messages is often structured in lines, and the mutual exchange of experiences is represented by messages that form cliques. In addition, I show that the exchange of support within the community is structured in related messages forming triangles. I conclude that different structures of message relations are associated with different communication processes. By studying the structure of related messages, I provide insight into the fundamental parts that drive online supportive conversation within the community.

6.2.1 Aims and objectives

The previous study (see section *6.1*) focused on message-sequences composed of two related messages, not taking into account the whole conversation structure of all related messages. This study aimed to fill this gap by looking at topologies of related messages, where topologies are distinct forms taken by the network of related messages. Then, I investigated the characteristics and roles of these topologies within the online support community. This aim can be broken down into the following research objectives:

I. Identify different topologies of related messages within the online support community

II. For each of the topologies identify differences in the characteristics of messages that they are composed of (e.g. the size and content of messages)

III. Based on the analysis of message characteristics, identify the role of the topologies in the communication process within the online support community

I believe that by investigating the topologies, I gain a comprehensive overview of the structure of related messages and the findings will thus answer the remaining aspects of research question III. (What is the conversation structure of supportive communication within the online support community like?).

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In the following, I first identify topologies that are formed by related messages (see objective I). Then, I explain the methods and procedures that I applied in order to analyse the characteristics of messages that the different topologies are composed of (see objective II). Based on the findings, I discuss the roles of the topologies in the communication process of the online support community (see objective III) and conclude with a summary of the findings and a discussion of how they address research question III.

6.2.2 Methodology

In this study, I analysed the same data-set as I used in the previous study (see section *6.1*). This consisted of a total of 961 messages posted over a period of six years (August, 2000 until August, 2006) by 86 users. For the analysis, I used the categorised messages (see section *6.1.3.2*) as well as the message relations (identified in section *6.1.3.3*) with the following simplification: Whenever one or more text unit within a message referred to another message, these two messages were considered to be related. Thus, for this analysis, two messages could be related or not related, but did not have multiple relations based on the individual text units.

Based on these relations between messages (e.g. one message responding/referring to a previous one), I distinguished between different topologies of related messages. Then, I analysed the differences in message characteristics (e.g. size and content) between messages belonging to different topologies and compared these with each other. These procedures are explained in more detail in the following.

6.2.2.1   *Identification of message topologies*

In order to visualise the relations between messages, I imported all 961 messages and their relations (as defined above) into UCINET (Borgatti et al., 2002), a tool for social network analysis. Figure 6.6 shows a part of the visualisation of the data. Please note that only a sub-section of 45 messages of the data-set is shown in this picture for clarity. The nodes in Figure 6.6 represent single messages and an arrow between two nodes represents the relation between two messages. Also, one message can refer to several other previous messages (see for example node 72) or be referred to by several other messages (see for example node 80). Node 101 (the one in the middle) represents the whole online support community; messages linking to this node did not

refer to specific other messages but were directed to the whole online community. The nodes marked red exemplify the three topologies that I focused on (explained below).
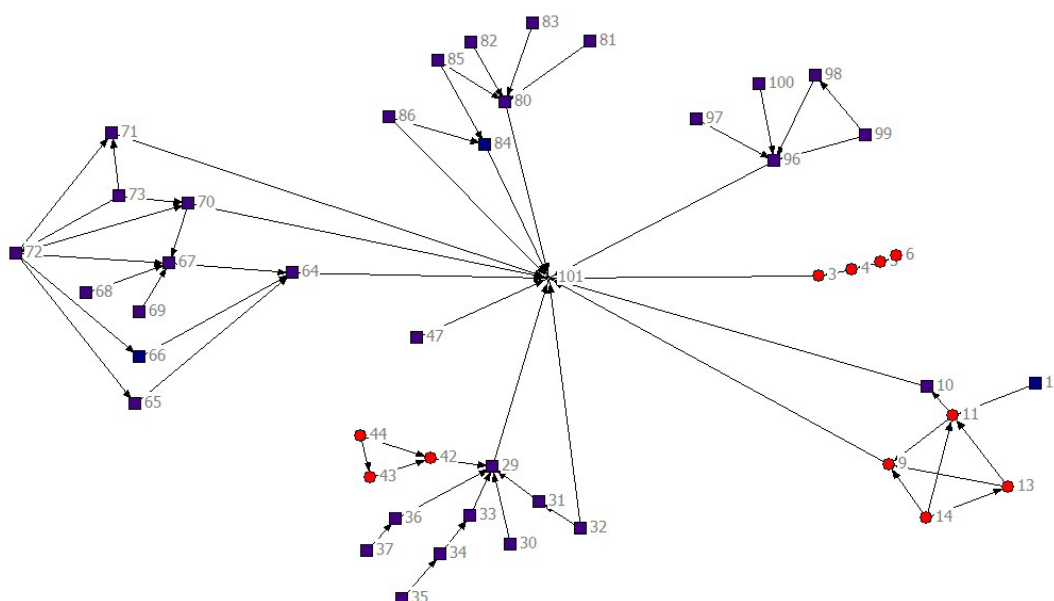
Figure 6.6: Visualisation of related messages for a sample of 45 messages from the data-set

This representation of related messages helped me to identify the scope of conversations within the online support community. I defined a conversation as one set of interconnected messages (e.g. nodes 9-14 in Figure 6.6). Furthermore, the representation also helped me to identify structures of message relations which are characterised by different levels of interactivity, where interactivity is defined as the level to which messages relate to several other previous messages (Jones & Rafaeli, 2000). For example, a linear sequence of responses (one message referring to only one previous message) was considered to be non-interactive and a set of interconnected messages where one message refers to all previous messages was considered to be highly interactive. I took the visualisation of related messages (see Figure 6.6 as an example) as a basis to identify different structures of message relations, and decided to focus on three topologies: lines, triangles, and cliques. These are described in the following.

The topology of lines was defined as a composition of at least three messages, where each message referred to only one previous message. Lines were thus similar to a series of responsive messages and were non-interactive. Nodes 3, 4, 5 and 6 in Figure 6.6 show an example of a line.

The second topology was triangles. A triangle was defined as three interconnected messages, in which one message responded to a previous message and a third message responded to both previous ones. This topology was considered to represent a medium level of interactivity, as one message referred to two previous messages. Nodes 42, 43 and 44 in Figure 6.6 show an example of a triangle.

The third topology was cliques, defined as a set of at least four messages that were fully interconnected. This topology was similar to the triangle topology, but instead of only three interconnected messages, it was comprised of at least four interconnected messages. Cliques represented an interactive conversation. Nodes 9, 11, 13 and 14 in Figure 6.6 show an example of a clique.

In order to extract the messages that belonged to triangles and cliques, I used the 'clique'-function within UCINET 6 (Borgatti et al., 2002). This function identifies a set of interconnected nodes of at least three nodes. For triangles, I set the required number of interconnected nodes to 3 and for cliques I set it to 4 or more. As UCINET 6 does not offer a function to identify lines, I inserted the data into Excel and implemented a visual basic macro, identifying the messages that form lines that consist of at least three messages.

In summary, the data-set contained 92 lines, with the smallest line consisting of 3 messages and the largest line consisting of 14 messages. A total of 358 messages belonged to a line. In addition, I identified 102 triangles and a total of 306 messages belonging to triangles. As for cliques, the data-set contained 8 cliques, consisting of either four or five messages. A total of 33 messages were part of cliques. Please note that one message can belong to several topologies (e.g. see node 29 in Figure 6.6 – it is the first message of two lines: 29, 36, 37 and 29, 33, 34, 35).

6.2.2.2   Analysis of the topologies

For each of the three topologies, I investigated differences in the messages that the topology was composed of in order to elicit the role that the topology played in the communication process within the online support community. For this analysis, I inserted all the messages in the data-set into an excel spreadsheet together with following information:

- the size of the message in bytes (quoted text from previous messages was not considered to be part of the message)

- the categories that the text units in the message were coded as

- the number of different categories within the message

- the size of the conversation that the message belonged to (defined by the number of interconnected messages)

- whether the message was part of a line and, if so, where the message was positioned within the line (e.g. the first, second, third, ... message within the line)

- whether the message was part of a triangle and, if so, where the message was positioned within the triangle (e.g. the first, second or third message within the triangle)

- whether the message was part of a clique and, if so, where the message was positioned within the clique (e.g. the first, second, third, forth, ... message within the clique)

- In addition, I analysed how many authors were involved in each line, triangle, and clique. Based on this number and the number of messages that were included, I calculated the average authors/message-ratio for each topology.

6.2.2.3   *Comparison of topologies*

I then analysed whether there were any differences in message characteristics depending on the topology that the messages belonged to. More specifically, I compared the size of the messages, the number of different categories per message, and the size of the conversation that the message belonged to for messages within lines, triangles, cliques and messages that did not belong to any of the three topologies. Also, I compared the authors/message-ratio for lines, triangles, cliques. As the data was not normally distributed, I applied non-parametric tests in order to test for significance. In particular, I used the Kruskal-Wallis test for the comparisons of message characteristics between messages belonging to different topologies and Mann-Whitney post tests with Bonferroni correction to test whether the differences were significant.

In addition, I analysed whether there were any differences in message content depending on the topology that the messages belonged to. More specifically, I calculated the percentage of messages that included a specific category for all messages belonging to lines, triangles, cliques, and messages that did not belong to any of the three topologies separately. This was done for all seven categories. Then, I compared

the percentages of messages that included a specific category between messages belonging to lines, triangles, cliques and messages that did not belong to any of the three topologies. In order to test for significance, I calculated Pearson's Chi-square.

6.2.2.4   *Investigation of composition of topologies*

When investigating the composition of individual topologies, I made separate excel worksheets for each of the topologies in which I only included messages belonging to that topology. For each topology, I then distinguished between messages holding different positions within the topology, e.g. for lines, I compared the characteristics of all 1st messages in lines, all 2nd messages in lines and so on. In order to investigate the differences, I focused on differences in the size of messages and in the number of different categories per message. Again, I calculated Kruskal Wallis tests and Mann-Whitney post tests (with Bonferroni correction) in order to test for significance.

In addition, I compared the content of messages depending on the position they held within each of the three topologies. For each of the positions within a topology, I calculated the percentage of messages that contained each of the seven categories. Again, I used Pearson's Chi square to test whether the differences were significant.

6.2.3   Results

6.2.3.1   *Comparison of topologies*

For messages belonging to each of the three topologies, Table 6.4 shows the mean size of messages, the mean number of different categories per message, and the mean size of the conversation (the number of interconnected messages) that messages belonged to. The size of the conversation often exceeds the size of the topology, as one topology can be part of a conversation existing of a larger number of messages (e.g. nodes 9-14 in Figure 6.6). In addition, for each topology, the mean authors/message-ratio is given. I compared the mean values of these characteristics for four groups (N=4): messages belonging to lines, messages belonging to triangles, messages belonging to cliques, and messages that do not belong to any of the three topologies. The last row shows the results of the Kruskal-Wallis test for each of the characteristics and the p-values show that the differences in all of the characteristics between the four groups are significant.

Table 6.4: Comparison of message characteristics (means) for messages that belong to different topologies

Topology	Size of msg (in byte)	Nr of different cat/msg	Author/msg ratio	Size of conversation
Lines	675	1.68	0.73	13.54
Triangles	1027	2.25	0.96	25.25
Cliques	873	1.94	0.97	20.21
No topology	677	1.85	1	10.60
Kruskal-Wallis Test	H=82.6 (p=8.33e-18)	H=53.47 (p=1.5e-11)	H=385.52; (p=3.0E-83)	H=201.46; (p=2.0e-43)

I calculated Mann-Whitney post tests with Bonferroni correction (meaning the level of significance is 0.05/6=0.008). Table 6.5 shows the results of the post-tests.

Table 6.5: Test for significance - characteristics of messages belonging to different topologies (* indicates significance)

SIZE OF MSG	Lines	Triangles	Cliques	No topology
Lines	-	-	-	-
Triangles	4.4e-16*	-	-	-
Cliques	0.003*	0.74	-	-
No topology	0.09	7.44E-14*	0.008*	-

NR OF DIFFERENT CAT/MSG	Lines	Triangles	Cliques	No topology
Lines	-	-	-	-
Triangles	9.5e-13*	-	-	-
Cliques	0.09	0.12	-	-
No topology	0.004*	5e-7*	0.59	-

AUTHOR/MSG RATIO	Lines	Triangles	Cliques	No topology
Lines	-	-	-	-
Triangles	0*	-	-	-
Cliques	0.0006*	0.85	-	-
No topology	0*	3.53051E-14*	3.95239E-13*	-

SIZE OF CONVERSATION	Lines	Triangles	Cliques	No topology
Lines	-	-	-	-
Triangles	1.7e-13*	-	-	-

Cliques	0.06	0.07	-	-
No topology	1.3e-15*	0*	1.5e-6*	-

Table 6.6 shows the differences in content between messages belonging to lines, triangles, cliques, and no topology. For each category, it shows the percentage of messages within the four groups that contain this category. The last column shows the results of Pearson's Chi-square for the respective category with the p-value identifying whether the differences are significant.

Table 6.6: Comparison of message content for messages belonging to different topologies (* indicates significance)

% of msg including	Lines	Triangles	Cliques	No topology	Sig testing (Pearson's CHI-sq)
Self disclosure	46	70	81	56	Chi-sq:45.8 (p=6.2e-10*)
Deep support	16	37	33	23	Chi-sq:39.3 (p=1.5e-8*)
Light support	21	35	27	32	Chi-sq: 18.4 (p=0.003*)
Community building	31	43	36	41	Chi-sq:12.0 (p=0.0.007*)
Factual information	20	20	6	12	Chi-sq: 16.41(p=0.0009*)
Off topic	24	17	0	14	Chi-sq:21.03 (p=0.0001*)
Technical issues	10	5	9	6	Chi-sq: 9.5(p=0.02*)

6.2.3.2   *Investigation of the compositions of topologies*

Detailed analysis of the line-topology: Table 6.7 shows the differences in the mean size of messages as well as the mean number of different categories per message for messages in different positions within lines. As Table 6.7 shows, the differences in the mean values are significant for both the size of messages and the number of different categories per message.

Table 6.7: Comparison of message characteristics (means) for messages at different positions in lines

	Size of msg (in byte)	Nr of different cat/msg
1st position	1097.29	2.07
2nd position	658.73	1.76
3rd position	443.64	1.49
4th + position	487.6	1.39
Kruskal-Wallis test	H=49.09 (p=1.25037E-10)	H=36.46 (p=5.99069E-08)

Table 6.8 shows the results of the Mann-Whitney post-tests with Bonferroni correction (meaning the level of significance is 0.05/6=0.008).

Table 6.8: Test for significance - characteristics of messages at different positions in lines (* indicates significance)

SIZE OF MSG	1st position	2nd position	3rd position	4th position
1st position	-	-	-	-
2nd position	9.33072E-05*	-	-	-
3rd position	4.61037E-10*	0.005*	-	-
4th + position	2.67146E-08*	0.06	0.29	-
NR OF DIFFERENT CAT/MSG	1st position	2nd position	3rd position	4th position
1st position	-	-	-	-
2nd position	0.009	-	-	-
3rd position	2.80595E-06*	0.07	-	-
4th + position	3.47224E-08*	0.006*	0.27	-

Table 6.9 shows the differences in content between messages in lines depending on whether they are in the first, second, third, or fourth+ position within a line. For each category, Table 6.9 shows the percentage of messages within the four groups that contain this category. The last column shows the Chi-square with the p-value indicating whether the differences are significant.

Table 6.9: Comparison of message content for messages at different positions in lines (* indicates significance)

% of msg including	1st position	2nd position	3rd position	4th+ position	Sig testing (Pearson's Chi-sq)
Self disclosure	71	44	48	20	Chi-sq: 47.10 (p= 3.30456E-10*)
Deep support	14	26	12	11	Chi-sq: 10.41 (p= 0.02*)
Light support	27	27	18	11	Chi-sq: 10.81 (p= 0.013*)
Community building	45	23	34	21	Chi-sq: 15.31 (p= 0.002*)
Factual info	29	25	15	9	Chi-sq: 13.00 (p= 0.005*)
Off topic	13	21	14	49	Chi-sq: 41.09 (p= 6.25E-09*)
Technical issues	7	9	8	18	Chi-sq: 7.34 (p=0.06)

Detailed analysis of the triangle-topology: Table 6.10 shows the mean size of messages and the mean number of different categories per message for messages in different positions within triangles. As Table 6.10 shows, the differences are significant for the number of different categories per message only.

Table 6.10: Comparison of message characteristics (means) at different positions in
triangles

	Size of msg (in byte)	Nr of different cat/msg
1st position	1075.01	2.09
2nd position	987.88	2.11
3rd position	1030.28	2.57
Kruskal-Wallis test	H=1.4 (p=0.5)	H=15.41 (p=0.0004)

Table 6.11 shows the results of the Mann-Whitney post-tests with Bonferroni correction (meaning the level of significance is 0.05/3=0.017) for the number of different categories per message.

Table 6.11: Test for significance – number of different categories per message for
messages at different positions in triangles (* indicates significance)

NR OF DIFFERENT CAT/MSG	1st position	2nd position	3rd position
1st position	-	-	-
2nd position	0.6	-	-
3rd position	0.0004*	0.001*	-

Table 6.12 shows the differences in content between messages in triangles depending on whether they are in the first, second, or third position within a triangle. For each category, Table 6.12 shows the percentage of messages within the three groups that contain this category. The last column shows the Chi-square with the p-value indicating whether the differences are significant.

Table 6.12: Comparison of message content for messages at different positions in
triangles (* indicates significance)

% of msg including	1st position	2nd position	3rd position	Sig testing (Pearson's Chi)
Self disclosure	74	60	70	Chi-sq: 1.68 (p= 0.43)
Deep support	19	38	52	Chi-sq: 24.42 (p= 4.98E-06*)
Light support	28	30	48	Chi-sq: 10.51 (p= 0.005*)
Community building	41	40	48	Chi-sq: 1.39 (p= 0.5)
Factual information	26	17	18	Chi-sq: 3.04 (p= 0.22)
Off topic	17	16	17	Chi-sq: 0.03 (p= 0.99)
Technical issues	4	4.8	4.95	Chi-sq: 0.12 (p= 0.94)

Detailed analysis of the clique topology: Table 6.13 shows the mean size of messages as well as the mean number of different categories per message for messages

in different positions within cliques. As Table 6.13 shows, the differences for both characteristics are not significant.

Table 6.13: Comparison of message characteristics (means) for messages at different positions in cliques

	Size of msg (in byte)	Nr of different cat/msg
1st position	759	1.75
2nd position	718.25	2
3rd position	857.75	2.25
4th+ position	1126.11	1.78
Kruskal-Wallis test	H=2.52 (p=0.47)	H=5.75 (p=0.12)

Table 6.14 shows the differences in content between messages in cliques depending on whether they are in the first, second, third or fourth+ position within the clique. For each category, Table 6.14 shows the percentage of messages within the four groups that contain this category. The last column shows the Chi-square with the p-value indicating whether the differences are significant. As can be seen, none of the differences were found to be significant.

Table 6.14: Comparison of message content for messages at different positions in cliques

% of msg including	1st position	2nd position	3rd position	4th position	Pearson's Chi-sq
Self disclosure	75	75	88	89	Chi-sq=0.98 (p=0.81)
Deep support	38	38	25	33	Chi-sq=0.38 (p=0.95)
Light support	25	38	50	0	Chi-sq=5.90 (p=0.12)
Community building	13	38	38	56	Chi-sq=3.41 (p=0.33)
Factual information	13	0	13	0	Chi-sq=2.26 (p=0.52)
Off topic	0	0	0	0	-
Technical issues	13	13	13	0	Chi-sq=1.24 (p=0.74)

6.2.4   Discussion

In this study I investigated three different topologies formed by the relations between messages: lines, in which one message refers to only one previous message; triangles, in which three messages are fully connected; and cliques, in which four or more messages are fully connected. In the following, I discuss the association between characteristics of individual messages and the topologies that they belong to. Based on

the results, I discuss the nature of these topologies and their role in the communication process within the online support community.

6.2.4.1   Association of message characteristics and topology

Message size and variability of content: Firstly, the results show that there are significant differences in the size of messages depending on which topology the messages belong to (see Table 6.4 and Table 6.5). These results show that small messages are strongly associated with the formation of lines and large messages are associated with the more interactive topologies of triangles and cliques. Previous findings from Jones et al. (2001) showed that interactive messages (messages referring to several previous messages) tend to be smaller in size than non-interactive messages, as both high interactivity and a large message size increase the communication processing load and thus there is a trade-off between these two factors. In contrast, Jones et al. (2004) state that interactive messages are often longer because they refer to several messages and thus need to contain more information. The data in this study seems to support both arguments: the messages that belong to triangles, which are characterised by a medium level of interactivity, are larger than the non-interactive messages belonging to lines. But on the other hand, messages belonging to the very interactive topology of cliques are smaller than those belonging to triangles.

A trend similar to that of the size of messages was found concerning the variety of content within messages, as messages with a small number of different categories per message seem to be related to the formation of lines. In contrast, messages belonging to triangles were found to have the largest number of different categories per message, and cliques were found to have a larger number of different categories per message than lines but a smaller number than triangles (see Table 6.4 and Table 6.5). Again, an increase in interactivity seems to go with an increase in the variety of the content of messages, but only to a certain extent, as very interactive messages tend to have a lower variability of content. Again, this might be due to a trade-off between variability of content and the interactivity of messages.

Message content: Concerning the content of messages, there were significant differences between messages belonging to the three different topologies for all categories apart from *Technical issues* (see Table 6.6). The categories *Self disclosure*, *Deep support*, *Light support* and *Community building* were significantly less likely to

occur in lines compared to other topologies, whereas the category *Off topic* was found to be significantly more likely to occur in messages belonging to lines compared to other topologies (see Table 6.6). This indicates clearly that conversation that strays off the topic is associated with a responsive, non-interactive message structure (lines). Also, supportive interaction – expressed in the categories *Self disclosure*, *Deep support* and *Light support* – is less likely to occur in lines and thus less likely to occur in non-interactive message structures.

In addition, I found that messages containing text units coded as *Deep support*, *Light support* and *Factual information* are significantly more likely to be part of triangles (see Table 6.6) compared to the other topologies. It seems that the exchange of support, both emotional (*Deep support* and *Light support*) as well as informational (*Factual information*) is related to message-relations with a medium level of interactivity. As the findings suggest, online supportive interaction seems to be associated with the formation of triangles, as a lot of productive help and support is exchanged in this context.

Cliques were found to be significantly less likely to contain text units coded as *Factual information* and *Off topic* and significantly more likely to contain text units coded as *Self disclosure* than either of the other topologies (see Table 6.6). These findings show that the exchange of messages coded into the category *Self disclosure* is strongly related to the formation of an interactive message structure. It seems that people tend to exchange personal information about a particular topic in an interactive context.

In order to illustrate the likelihood of each category to occur in the three different topologies, I compared the frequencies of messages belonging to one of the three topologies within the entire data-set (all messages within our data-set) to the frequencies of messages belonging to one of the three topologies within subsets of the data-set (messages that contain a specific category). For example, 37.25% of the total 961 messages are part of lines. In comparison, among messages that contain the category *Self disclosure*, only 30.51% of them are part of lines. This means that the inclusion of the category *Self disclosure* diminishes the likelihood of the message to become part of a line. Figure 6.7 shows this comparison for all categories and topologies. A positive value indicates that the specific category correlates positively with the topology as messages containing this category are more likely to be part of the

specific topology. A negative value indicates that the category correlates negatively with the formation of the topology as messages containing this particular category are less likely to be part of the topology.
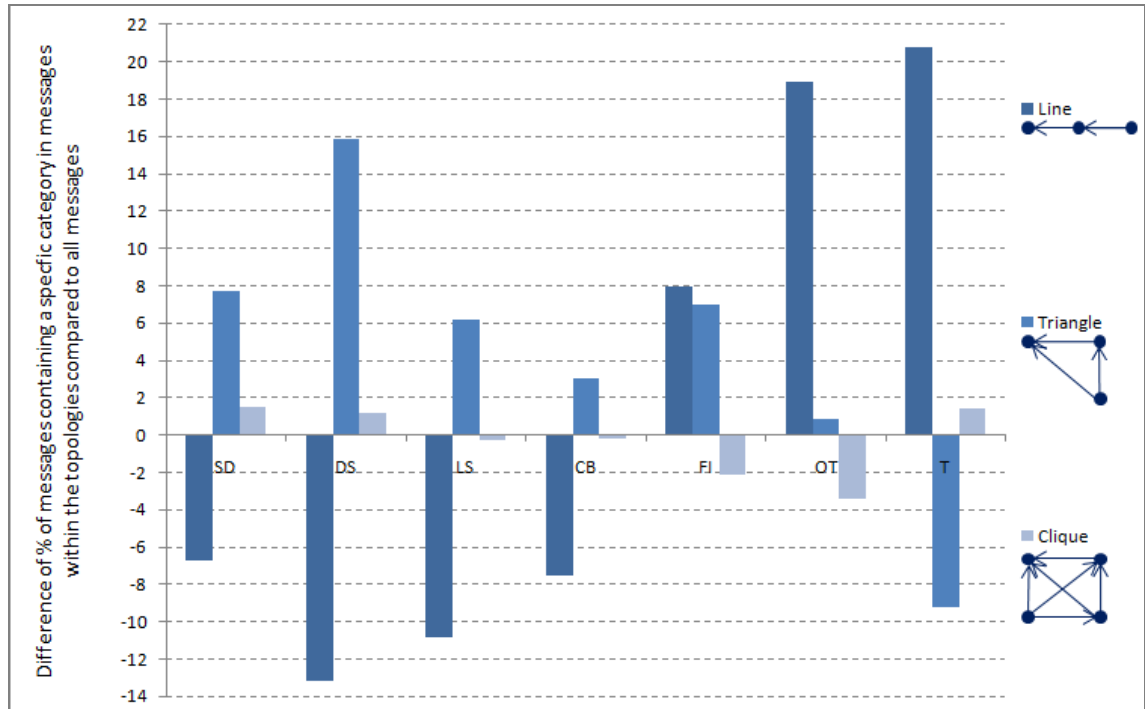
Figure 6.7: Association of message content and topology

As Figure 6.7 illustrates, messages including text units coded as *Self disclosure*, *Deep support*, *Light support*, and *Community building* seem to be positively associated with the formation of triangles and negatively related to the formation of lines. In contrast, messages containing the categories *Off topic* and *Technical issues* are related to lines and messages containing the category *Technical issues* correlate negatively with the formation of triangles. Thus, it seems that emotional and supportive content is associated with an interactive message structures, whereas off topic and factual information seem to be related to a non-interactive, responsive message-structure. Figure 6.7 shows that the category *Factual information* is related to the formation of lines as well as triangles. In addition to triangles, the category *Self disclosure* also seems to be associated with the formation of cliques, indicating that this message content is linked to a very interactive message structure. In addition, text units coded as *Deep support* and *Technical issues* also seem to be related to the formation of cliques.

Summarising, I conclude that small messages that are characterised by a low variety of content, which is often off-topic, are very likely to be related to a non-interactive, responsive message-structure (lines). In contrast, large messages containing

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a large variety of content, often of supportive nature (*Deep support, Light support, Factual Information*) or containing personal information (*Self disclosure*), are associated with a message-structure of medium interactivity (triangles). In addition, messages that are of medium size and variability of content and contain text units coded into the category *Self disclosure* are linked to the formation of cliques, characterised by a high level of interactivity.

6.2.4.2   *Role of topologies in the online support community*

As the previous sections show, messages belonging to the three topologies seem to have distinct characteristics (e.g. size and content). In the next section, I discuss the findings for messages belonging to each topology individually. This provides further insight into the nature and role of the topologies within the online support community.

The line topology: In order to investigate the role of lines within the online support community in more detail, I investigated the composition of such lines. I compared characteristics of messages depending on the position that they have within a line. As the results show, I found significant differences in the size of messages, depending on the position at which the message occurs within a line (see Table 6.7 and Table 6.8). As stated previously, I removed all quoting of previous messages in the analysis, so the size of the message reflects the amount of new content. I found that the first message within a line is the biggest, followed by messages in the second position within a line. Messages in the third and fourth position within a line are almost the same size and are smaller than messages in the first and second position within a line. This finding shows that the size of messages seems to decrease with the length of the line, indicating that the conversation content within lines gets less the longer the line goes on, until, eventually, it ends. This is also supported by the finding of significant differences in the number of different categories per message depending on which position within a line the message occurs (see Table 6.7 and Table 6.8). Table 6.7 shows that the later a message occurs within a line, the less variability it has in its content. Lines in general were already found to be characterised by a small size of messages and a low number of different categories per message. This tendency seems to be stronger, the later the message is placed within the line. This suggests that the volume and the variability of the content of messages in lines decreases until eventually authors don't bother to respond and the conversation ends. This might also be related to the fact that lines seem to be composed of only a few authors, meaning that sometimes only two people

exchange dyadic conversation. The fact that the conversation occurs only between these two might make it exclusive for other members and the conversation ends at the point where these two members don't have anything more to say to each other in the given context.

In addition to the size of messages and the variability of their content, I also found significant differences in the content of messages depending on which position within a line the message occurs. These differences were found to be statistically significant for all categories except for the category *Technical issues* (see Table 6.9). The results show that the later a message occurs within a line, the less likely it is to contain text units of the categories *Self disclosure*, *Light support*, *Community building* and *Factual Information* and the more likely it is to contain text units coded as *Off topic*. Text units coded as *Deep support* seem to occur quite frequently in the second message within a line (as a response to the first message), but are very unlikely to occur in subsequent messages within a line. It seems that although conversations in lines might start off being on the topic of the online support community by exchanging self-disclosure and support (factual and emotional), the conversation seems to drift away from this quite quickly and becomes more off-topic. This also fits into my general findings that lines do not seem to be associated with supportive communication, but rather related to off-topic conversations.

In summary, I conclude that lines take on the role of facilitating 'dyadic, lightweight off-topic conversations'. In addition to the exchange of personal experiences and support, there seem to be occasions when a few people drift away from the topic and engage in the exchange of short and monotone messages. These kinds of conversations form the topologies of non-interactive, responsive lines.

The triangle topology: In order to investigate the role of triangles within the online support community in more detail, I investigated their composition. I compared characteristics of messages depending on the position that they occupy within a triangle. I did not find any significant differences regarding the size of messages at different positions within triangles (see Table 6.10). Messages within triangles seem to be of similar size no matter what position they hold within the triangle. In contrast to lines, where message size decreased the later a message occurred within a line, triangles do not seem to experience a decline in message size.

I found significant differences in the number of different categories per message between messages that have different positions within a triangle (see Table 6.10 and Table 6.11). Messages in the first position have the least variability, followed by messages in the second position and lastly messages holding the third position. This tendency shows that messages tend to have more variability in their content the later they occur within triangles. An increase in the variability of content in later messages within triangles is the reverse tendency from lines, as messages within lines are more monotonous the later they occur within the line. In triangles, it seems that messages in the second and third position become more varied in content and the conversation within triangles ends abruptly with a lot of information rather than dying slowly off as was found to be the case with lines.

I also found differences in the content of messages depending on which position within a triangle a message occurs. These differences were found to be significant for the categories *Deep support* and *Light support* (see Table 6.12). The second message within triangles is more likely to contain text units coded as *Light support* and *Deep support* than the first message and the third message within triangles is more likely to contain text units coded as *Light support* and *Deep support* than the second and the first messages. It was generally found that triangles contain more supportive content compared to other topologies and it seems that the level of support increases towards the end of a triangle.

In summary, I conclude that triangles seem to be associated with the exchange of support. Although triangles were found to also contain a lot of self-disclosing content, the focus seems to be on the exchange of support as support is especially evident in the second and third messages of the triangle. I conclude that triangles with their medium level of interactivity take on the role of facilitating the exchange of support within the online support community. This includes emotional support as well as informational support.

The clique topology: In order to investigate the role of cliques within the online support community in more detail, I investigated the composition of such cliques. In order to do so, I compared characteristics of messages depending on the position that they have within a clique. I did not find any significant differences between messages that have different positions within cliques as regards the size of messages and the number of different categories per message (see Table 6.13). This suggests that the

messages within cliques are fairly similar in size and in variability of content no matter what position they hold within the clique. In general, cliques were found to consist of medium sized messages with medium variability in content.

Similarly, I did not find any significant differences in the content of messages holding different positions within cliques (see Table 6.14). This indicates that the messages within cliques seem to be fairly similar in their content irrespective of the position at which they occur. This finding supports the previous suggestion that in contrast to triangles, which seem to contain lots of problem-solving, progressive and supportive interaction, cliques are rather associated with the exchange of experiences (see Table 6.6), where people post their opinion about a specific topic and link this to the messages of others who also talked about the same topic. Whereas lines seem to be associated with dyadic conversation that eventually dies off, it occurs rarely that the same member posts twice within a clique. Rather, individuals who share their experiences and viewpoints about a certain issue seem to form the conversation structure of a clique.

Summarising, I found that cliques seem to be associated with 'experience exchange' in the communication process of the online support community. In particular, people mainly seem to exchange self-disclosing messages and messages about technical issues. Rather than being characterised by differences in size or content of messages, cliques seem to be related to the exchange of like messages, each person contributing messages that are similar in the size and in the type of content that they contain. Thus, I can conclude that the very interactive context of cliques seem to be suitable for exchanging experiences.

6.2.5   Conclusion of the topology analysis

The aim of this study was to investigate patterns of message relations within the discussion board about depression and their association with online supportive communication processes. In particular, I focused on different ways that messages are related to each other, characterised by different levels of interactivity. Specifically, I investigated related messages forming three topologies: lines (messages only responding to one previous message), triangles (three interconnected messages) and cliques (four or more interconnected messages).

The findings of this study show that these three topologies are associated with different kinds of communication processes. Short and general messages exchanged in a dialogue-style, containing mainly off-topic content are associated with a line-shaped communication structure. In contrast, the exchange of both emotional as well as informational support is linked to the formation of triangles, which are the backbone of supportive communication and play a major role in sustaining large conversations. Cliques, being the most interactive topology investigated, are associated with the exchange of experiences of online community members. Rather than being just a conversation between two or three people, cliques were found to be a conversation context that invites other members of the online support community to contribute their particular viewpoint about the issue under discussion.

This study provides an original contribution to the research area of computer-mediated communication as the identification of not only the content of supportive communication, but also its structural patterns help us understand what characterises and shapes the communication within online support communities. The results show the associations between the structure of related messages and message characteristics, such as content and size. As Rafaeli and Sudweeks (1997) point out, the connectedness of messages within online communities is what holds the members of online communities together. This study showed that there are different topologies of related messages and that these different topologies are associated with different kinds of communication processes. This study is currently under review as a full paper for language@internet (Pfeil et al., under review).

6.3 Conclusion

The two studies reported in this chapter addressed research question III (What is the conversation structure of supportive communication within the online support community like?).

Analysing the message-sequences that occur within the online support community and relating these to the level of activity helped me to identify the basic components of supportive conversation within the discussion board about depression. In addition, I also investigated message relations for groups larger than two messages and focused on different topologies of related messages in order to identify the association between the content of messages and their position in the network. This study went

beyond the sequences of two messages and looked at different formations and purposes of conversations within the online support communities. Combined, these two studies provide insight into the constructs and structure of conversation within the online community and thus answer research question III.

Whereas the two studies reported in this chapter focused on the relations and structural patterns of related messages, I will shift the focus back to the online community members in the next study. By analysing their communication behaviour and their connectedness to other members within the online support community, I identify different roles that people take on in the discussion board about depression. Results of this study address research question IV (What kind of roles do people take on in the online support community?)

7   Investigation of roles in the online support community

This chapter presents a study investigating the different roles that people take on within the online support community. Analysing the same data-set that was used for the studies reported in chapter 6, four roles are identified and described based on their functional as well as their structural characteristics. Findings of this study answer research question IV.

Up to now, I have investigated different aspects of online supportive communication within the discussion board about depression in SeniorNet. The main focus has been on the characteristics of messages and the structure that they form through their relations. Also, results of the study reported in chapter 5 showed how the content of the messages is associated with the relationships that people develop through their communication. In this chapter, I report a study investigating the social roles that people take on in the discussion board. This chapter addresses research question IV (What kind of roles do people take on in the online support community?). Based on the investigation of people's behaviour and their structural position in the communication network, a set of four roles is identified and described. Figure 7.1 visualises the mapping of research question IV onto MOSuC. As the roles are based on both users' behaviour and their structural position in the social network, research question IV is mapped onto the 'user-characteristic' and 'user-network' quadrant of MOSuC.
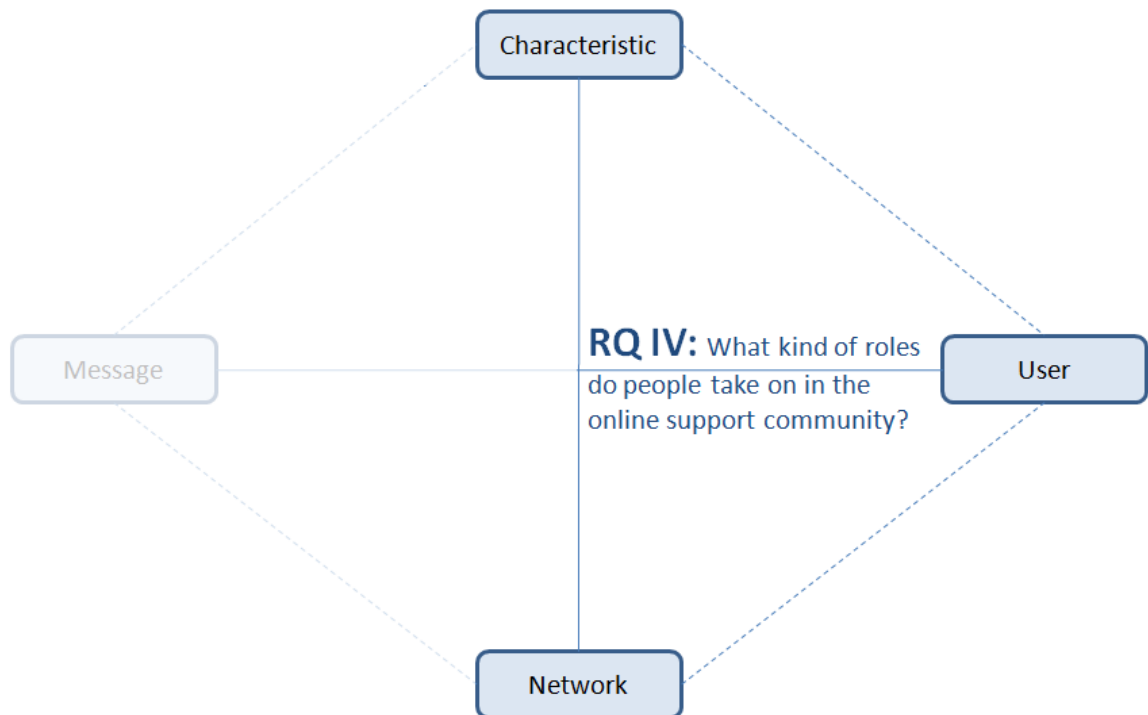
Figure 7.1: Research question IV in context of MOSuC

7.1 Aim of the study

The aim of this study was to identify and describe a set of roles within the online support community for older people and thus to address research question IV (What

kind of roles do people take on in the online support community?). This aim was broken down into the following objectives:

I.   To identify a set of roles based on the structural positions of the members within the communication network (people within one role have similar structural positions).

II.   To identify a set of roles based on the posting behaviour of members of the community (people whose behaviour is similar are grouped in the same role).

III.   To synthesise the findings of the two previous parts to identify a taxonomy of social roles that people take on within the discussion board about depression within SeniorNet.

In order to address the research objectives, I looked at roles from two different angles: a) the structural characteristics of a role, describing the role of an individual based on the individual's relationships and communication patterns with other members of the online community; and b) the functional characteristics of a role, focusing on the posting behaviour of individuals (e.g. the content, size and frequency of messages that individuals post).

The findings of this study help to understand the different roles that members take on when participating in the discussion board about depression, including the different responsibilities, purposes and motivations that drive them. Understanding roles in the discussion board about depression gives further insight into the dynamics of the exchange of support in this setting.

7.2 Related studies

Studies investigating patterns of participation in online communities have found that a few members of the communities post a large number of messages whereas most other members only participate sporadically (Butler, 2001; Jones et al., 2004; Schoberth, 2003). This inequality demonstrates the fact that online community members are not all the same, as some might be happy with infrequent participation, whereas others aim to become regular posters within the community. Depending on the

preferences and goals of individual users, their patterns of participation vary (Golder & Donath, 2004).

Researchers have applied various methods in order to understand social roles in online communities. In the following, emphasis is placed on two major approaches: (a) analysing roles based on the structural positions of members within the communication network of the online community; and (b) analysing roles based on the individuals' posting behaviour. For more detailed information concerning the definition of a role, role theories, and methods that can be applied to analyse them, please refer to section *2.4.4*.

7.2.1.1   *Analysis of structural position in the social network:*

When analysing social roles from a structural perspective, they are defined based on the patterns of communication relationships between online community members. Thus, social roles in this approach are characterised by 'relational' properties (Hanneman & Riddle, 2005). As section *2.4.4* suggests, social network analysis (SNA) is an appropriate method for analysing social roles from a structural perspective. Looking at existing literature, several researchers have applied SNA in different ways in order to study social roles in online settings. For example, Fisher (2005) studied communication patterns in emails and online communities using SNA. Similarly, Turner and Fisher (2006) developed a set of four different roles based on network attributes of online community members (e.g. the number of people a member sends messages to, and/or the number of people a member receives replies from).

Sack (2000) investigated the conversation patterns of Usenet newsgroup members based on their relationships to others. He focused on who talks to whom and who cites whom in the conversation. Based on these communication activities, he distinguished members based on their centrality within the social network (Sack, 2000). Similarly, Fisher et al. (2006) applied SNA in order to identify roles in Usenet newsgroups. They investigated the in-and out-degree of individual members, looking at the number of people that individuals are connected to. In addition to comparing individual members of the group, Fisher et al. (2006) also analysed the occurrence of social roles in different newsgroups. For example, they found that members in question and answer newsgroups (e.g. technical support groups) can be divided according to two social roles: members who ask questions (they usually start a conversation and send

only few messages) and members who provide answers (they usually respond to messages and send many messages). In social support newsgroups, they found that people emphasise greeting new people and that the percentage of people who appear only once is small in comparison to other groups (Fisher et al., 2006).

7.2.1.2   *Analysis of posting behaviour*

A series of qualitative studies investigating the posting behaviour of contributors to Usenet newsgroups have defined a range of social roles (Golder & Donath, 2004; Kim, 2000). For example, Golder and Donath (2004) used the concept of a social role to investigate members' behaviour in Usenet newsgroups. They looked at the messages that Usenet members wrote and constructed a taxomony of roles (Newbie, Celebrity, Elder, Lurker, Flamer, Troll, and Ranter). Then, they used this taxonomy to investigate social interactions and their impact on the community. Thereby, they associated social roles with different goals, motivations, and needs that members have. Linking individual behaviours to group behaviour, Golder and Donath (2004) suggested a role-based framework explaining social roles as well as the negotiation and establishment of social norms and hierarchies.

Kim (2000) took a slightly different approach as she looked at roles in the context of membership lifecycles, analysing people going through different roles depending on how long they have been participating in the community. She suggested that people go through the following stages: Visitors, Novices, Regulars, Leaders and Elders. Addressing community managers interested in building communities, she suggested a formula that describes the optimum mix of people taking on these roles in online as well as offline communities.

Investigating similarities and differences in posting behaviour among Usenet members, Viégas and Smith (2004) focused on the number of days that posters were active and the number of posts per thread of individual members. Based on these two dimensions, they constructed a set of four roles: the answer person (high number of days active, low posts per thread ratio), the debater (moderate to high number of days active, very high posts per thread ratio), the 'bursty' contributors (low number of days active, moderate to high posts per thread ratio), and the newcomers and question askers (very low number of days active, low posts per thread ratio) (Viégas & Smith, 2004). In addition to that, Viégas and Smith (2004) also considered whether members initiated a

thread or responded to an existing thread. Based on these, they changed their initial set of roles to include the following:

- the answer person (high number of days active, mainly responds to others, small number of messages per thread)

- the debater (high number of days active, mainly responds to others, high number of messages per thread)

- the spammer (moderate number of days active, initiates threads that trigger no replies)

- the 'balanced' conversationalist (initiates as many threads as (s)he replies to, same level of contribution to initiated and responded threads) (Viégas & Smith, 2004).

Similarly to these studies, Brush et al. (2005) aimed to identify a set of roles based on people's participation in Usenet newsgroups. In order to do so, they investigated Netscan\Tech which is a system that generates and publishes social metrics about approximately 15,000 technical newsgroups in Usenet on a daily basis. Members of Usenet newsgroups use Netscan\Tech in order to gain information across three dimensions: newsgroups, authors, and threads. Using surveys, usage log analysis and social accounting data from members' participation over a period of two years, Brush et al. (2005) analysed members' activities within Usenet newsgroups as well as their use of Netscan\Tech. Their results distinguished between frequent and infrequent Usenet users. Based on their findings, frequent Usenet users were more interested in information about individual other members in Netscan\Tech, and infrequent users were more interested in information related to different newsgroups. In addition, Brush et al. (2005) classified their survey participants into five roles of Usenet newsgroup users: the key contributors who considered themselves to be a main contributor of at least one newsgroup, the low volume repliers who provided answers to others but didn't think they were a key contributor, the questioners who asked questions in newsgroups but neither provided replies nor were key contributors, the readers who read messages but did not actively contribute themselves, and the disengaged observers who participated in newsgroups but didn't engage in a specific activity particularly often (Brush et al., 2005).

7.2.1.3   Combination of behavioural and structural analysis

Up to now, only a few studies have combined the analyses of the posting behaviour and the structural positions within the communication network of community members. For example, Turner et al. (2005) combined an investigation of individual members' posting behaviour as regards sending and retrieving messages with an analysis of their network relationships. This allowed them to identify roles based on member's attributes as well as their relationships to others. They developed a set of seven distinct roles: The questioner, the answer person, the troll/cynic, the spammer/binary poster, and the flame warrior/conversationalist.

In a separate study, Pfeil et al. (accepted) focused on an online support community within SeniorNet (not the discussion board about depression) and combined the analysis of members' posting behaviour with the analysis of their structural position in the community. Drawing on the communication patterns within this online support community, a set of six social roles was identified, defined and described in depth. The findings showed that the structural positions of online community members were associated with the kind of content these members tended to post. For example, they found that central members were very likely to give support whereas members who were not very well connected to other community members were more inclined to post self-disclosing messages. These roles were different from the roles identified in this thesis. A description of the similarities and differences is given in the discussion of this chapter.

Summarising, the studies reviewed above show that role analysis offers a way of thinking about members not as individuals but as groups of similar entities. Grouping similar members and defining the characteristics and attributes which make them similar, as well as eliciting the differences between different roles, helps us to identify principles of social behaviour and structures beyond the level of the individual.

7.3 Methodology

7.3.1   Data source and preparation

In order to analyse the social roles that people take on within the discussion board about depression within SeniorNet, the same data as in chapter *6* was used. Thus,

961 messages posted over a period of 6 years (August, 2000 until August, 2006) by 86 members were the basis of the analysis.

In order to prepare the data for analysis, two different procedures had to be undertaken: the coding of the communication relations between the online community members (in order to analyse the structural positions of individual members) and the coding of the content of messages (in order to analyse members' posting behaviour).

7.3.1.1   *Coding of relations between people*

The coding of the relations between people (e.g. who talks to whom) had already been done based on the first 400 messages (see section *5.3.1.2*). The same procedure was followed when coding the relations between people for the remaining 561 messages. This resulted in a social network of related community members based on their communication activity in all 961 messages posted over a period of 6 years.

7.3.1.2   *Coding of the content*

As the content of the data-set was previously coded using the code scheme reported in chapter *4*, this coding (see chapter *6*) was also used for the current study to analyse the social roles within the online community. For the distribution and frequencies of the codes in the data-set, please refer to Table 6.2.

Based on the coding of the message content as well as the relations between online support community members, I created an excel-file with several tables, listing the relations between people as well as the content of the messages that they sent to each other. This data was taken as the basis for further analysis.

7.3.2   Data analysis

As indicated in the research objectives, I aimed to identify a set of roles within the online support community based on the structural positions of members in the community as well as their posting behaviour. In the following, these two aspects are addressed separately.

7.3.2.1   *Analysis of the structural positions of online community members*

In order to study the structural positions of online community members, I analysed the equivalence of members within the constructed social network that

represented the communication activity among online community members (e.g. who talks to whom). Equivalence in this context refers to similarity in the members' relationships or communication patterns towards other members. Thereby, members who are similar are grouped into one role. Thus, social roles are identified by investigating similarities in the social relations that members have with each other (Hanneman & Riddle, 2005). One of the most common types of equivalence for identifying social roles is regular equivalence (Hanneman & Riddle, 2005). Hanneman and Riddle (2005) describe regular equivalence as follows: "Two nodes are said to be regularly equivalent if they have the same profile of ties with members of other sets of actors that are also regularly equivalent". A profile of ties is based on the nodes that are connected by these ties, as well as the ties' strengths and directions. Figure 7.2 visualises the concept of regular equivalence. Framed members belong to the same role based on their relationships with entities from other roles.
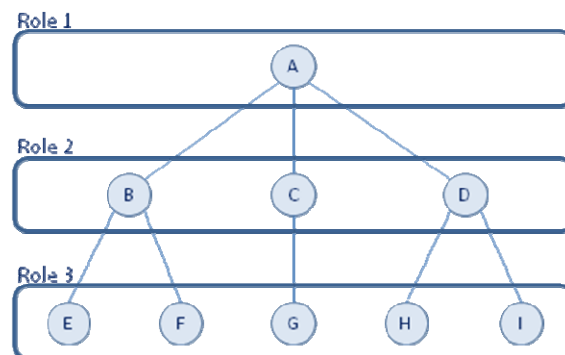
Figure 7.2: Conceptualisation of regular equivalence (Hanneman and Riddle 2005)

I used UCINET 6 (Borgatti et al., 2002) to analyse the regular equivalence of members in the data-set. UCINET offers various algorithms for the analysis of regular equivalence. I chose to apply the Continuous REGE (REGular Equivalence) algorithm which according to Hanneman and Riddle (2005) is appropriate for directed, valued networks. Continuous REGE uses the iterative REGE algorithm to look for regular equivalence in the profile of ties between two members (Borgatti et al., 2002; Hanneman & Riddle, 2005). In the first iteration, the algorithm distinguishes between members who send messages, send and receive messages and only receive messages. In the second iteration, the reach of the algorithm is increased by one (not only looking at immediate 'friends' but also 'friends of friends'). Two members are considered similar if they have ties to members who themselves were found to be similar in the first iteration. Thereby, also the strength of ties is considered. The reach is increased by one

in each further iteration. I experimented with the number of iterations and found that the outcome was stable from 15 iterations onwards. Thus, I did 15 iterations for my analysis.

The output of the algorithm is a symmetrical matrix with the list of members in the first row and column. The value in each cell represents the level of equivalence between two members. The matrix shows the regular equivalence between pairs of members on a scale from 0 to 100. 0 indicates that no ties to other groups are shared between two members, and 100 means that all ties to other groups are shared between them. The symmetrical matrix displays the regular equivalence between all pairs of members.

In addition to the regular equivalence matrix, the Continuous REGE calculation within UCINET also creates a dendogram. A dendogram is a table-like list in which members are ordered in a continuous line based on their structural equivalence. I reconstructed the matrix to display members in the order that they were listed in the dendogram. This means that members with high structural equivalence were displayed next to each other. Based on the reconstructed equivalence matrix, groups of members defined by a high structural equivalence were identified. Based on an analysis of the values for regular equivalence between pairs of members that were displayed next to each other, the rule that members within one group should have a value for regular equivalence of at least 31 to all other members within the group was established. Then, the average structural equivalence between all members within each of the identified groups was calculated. In cases in which the structural equivalence among group members was high (above 50), the group was considered to represent a social role. In cases in which the structural equivalence was low (below 50), the group was not considered to represent a role.

7.3.2.2   *Analysis of posting behaviour*

In order to analyse the posting behaviour of members of the community, I analysed two characteristics: (i) the level of activity of a member (measured in terms of the number of messages each member contributed and the sizes of these messages), and (ii) the content of the messages that each member posted (measured in terms of the percentage of messages containing each of the seven categories of the code scheme). In the following, I describe the analyses of these two characteristics in more detail:

Members' level of activity: When analysing the level of activity of individual members within the community, I focused on the number of messages that individual members sent as well as the average size of the messages per member. The results were plotted in diagrams (see Figure 7.5 and Figure 7.6). Based on these diagrams, the following groups were identified: members posting few (1-5) or many (6+) messages, as well as members posting short (<751 bytes) or long (751+ bytes) messages.

Members' content of messages: In order to analyse members based on the content of the messages that they wrote, I applied the categories of the code scheme. As the frequencies of the seven categories are very different and members have different levels of activity, a mere comparison of the number of text units coded into the seven categories was not considered to be an appropriate way for analysis. Instead, I focused on the percentile distribution of the seven categories for each member and compared that value to the average percentile distribution of this category for all members. To simplify comparisons between the different members, I renormalised the percentile values, so that the average percentile value for all authors in each category is labelled 100%. This resulted in a list in which each member had a value for each category indicating the percentile occurrence of messages containing the specific category in relation to the average percentile.

Based on this list, I then went on to calculate the similarities of these patterns among members. In order to do that, I calculated the root mean square of the differences between the percentile values for all categories for each pair of actors. This was done to calculate the numerical difference between the percentile values of the members. It resulted in a matrix of members, in which the values indicate the similarity between them. The value 0 in a cell of the matrix indicates that the two members have identical percentile values for each of the categories. The higher the value, the larger the difference between the two members. Based on these values, I restructured the matrix in a way that similar members were listed next to each other. The important factor when grouping members was to look for patterns. The members were grouped to maximise the overall consistency within each group, so that the internal differences were judged against the internal similarities.

Combination of the two characteristics: The groups based on members' level of activity and the groups based on members that post similar message content were largely overlapping, as members within the same content groups also showed similar

patterns in their level of activity. Thus, community members were grouped based on the content of their contribution and the level of activity provided further descriptions of the groups' characteristics.

7.4 Results

In this section, I discuss the results of each of the two analyses (analysis of members' structural positions and analysis of their posting behaviour) separately.

7.4.1 Results from the the analysis of members'structural positions

As described in section *7.3.2.1*, an equivalence matrix was established showing the regular equivalence of each pair of members ranging from 0 (totally dissimilar) to 100 (identical). In addition, the matrix was reconstructed in a way that members with high structural equivalence were put next to each other. This equivalence matrix is shown in Figure 7.3. The matrix was colour-coded based on the value of the regular equivalence (light shades of grey for values from 0-30, and light to dark shades of blue from 31-100). The node representing the whole online support community (for cases in which members address a message to the whole community) is listed at the very right end of the matrix and, as expected, is very dissimilar to any other 'member' of the online support community.
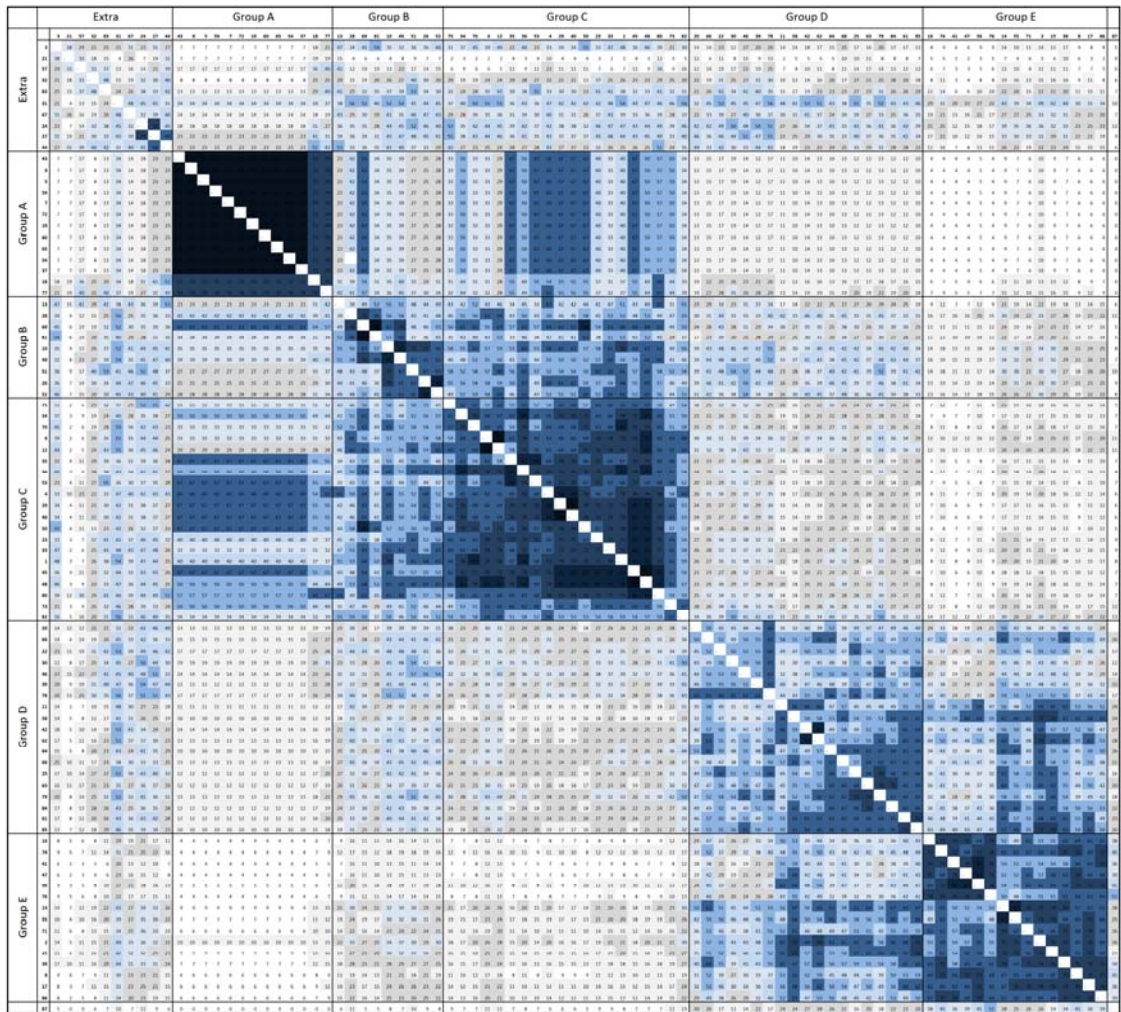
Figure 7.3: Restructured equivalence matrix indicating the level of similarity between individual members

Regular
equivalence value

0-9
10 to 19
20 to29
30 to39
40 to 49
50 to 59
60 to 69
70 to 79
80 to 89
90 to 100
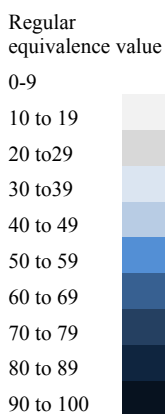
The groups shown in Figure 7.3 were defined based on the rule that members within one group should have a value for regular equivalence of at least 31 to all other members within the group. According to this rule, 76 members were sorted into five groups (group A-E). Ten members could not be sorted into any group. Based on this analysis, a member cannot belong to more than one group. Also, I calculated the

average regular equivalence of all members within one group. Results are shown in Table 7.1.

Table 7.1: Average regular equivalence of group members for each group

	(Group A)	(Group B)	(Group C)	(Group D)	(Group E)
Average equivalence value	92.21	57.83	69.39	54.4	66.26

Average equivalence values for groups A-E were above 50 (see Table 7.1); this was considered to substantiate the fact that these members form a group. The groups each have between 9 and 20 members. Ten members of the community are not part of any group. The groups with member IDs are presented in Table 7.2.

Table 7.2: Summary of members sorted into the groups

Group A	Group B	Group C	Group D	Group E	Extra
5	10	1	11	2	3
7	13	4	20	8	21
9	26	6	22	14	24
18	28	12	25	15	27
19	49	23	30	16	31
37	51	29	39	17	32
43	52	33	42	38	44
54	69	34	46	41	57
59	81	35	58	47	67
60		36	61	55	83
65		40	62	56	
72		45	63	71	
77		48	64	74	
		50	66	76	
		53	68	86	
		70	78		
		73	79		
		75	84		
		80	85		
		82			

7.4.1.1   *Analysis of group characteristics*

As described in section *7.3.2.1*, the calculation of the structural equivalence identified the degree to what two members are structurally equivalent (similar) to each other. However, this analysis did not give any indication about what defines these similarities. Although the analysis identified members belonging to the same group, it did not give any indication about the structural characteristics of these group members that is needed in order to describe the groups.

Thus, in order to analyse the structural characteristics of members belonging to a specific group, I analysed their centrality in the whole online community. To do so, I calculated two centrality measurements (degree and closeness) for each member. This was done in order to investigate whether members in different groups differ as regards the centrality in the online community. Please refer to Wasserman and Faust (1994) for the detailed formula on how to calculate these values. Table 7.3 shows the results of this analysis (for an interpretation of the results, please see section *7.4.1.2*).

Table 7.3: Average degree and closeness scores for the members of the five identified groups

	Average in-degree	Average out-degree	Average in-closeness	Average out-closeness
Group A	0	1.15	1.15	1.89
Group B	2.44	2.89	3.11	5.66
Group C	2.35	1.15	3.2	1.83
Group D	12.16	16.11	3.13	5.83
Group E	40.73	63.73	3.15	5.93

In addition to centrality, I was also interested in the communication flow between groups. This was done to investigate whether members of a group have a tendency to send or receive messages from members of another group. I calculated the number of messages per person that are exchanged within and between the five identified groups. The results are visualised in Figure 7.4. An arrow pointing from one group to another indicates that members of one group send messages to members of the other group. If there is an arrow within a group, it indicates that members of this group send messages to other members of the same group. The fact that there are some groups that are not connected by an arrow shows that members of these groups do not communicate with each other (e.g. members of group A do not send any messages to members of group B and vice versa).

0.1-0.9 msg/per author
1-4.9 msg/per author
5-9.9 msg/per author
10 and more msg/per author
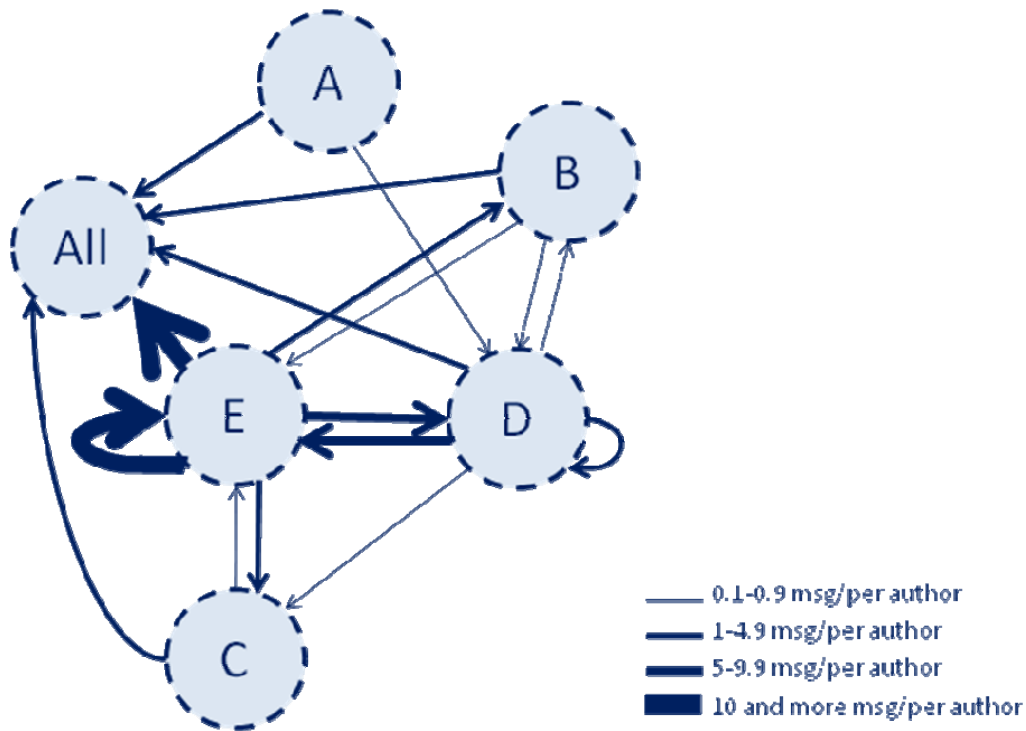
Figure 7.4: Visualisation of the communication flow among the five identified groups

7.4.1.2 Description of the groups

Based on the results reported in the previous section, the characteristics of the five identified groups are summarised below.

Group A: Members of group A have the lowest centrality (both concerning the degree and closeness) among the five groups. Thus, it seems that members of this group are not very well connected to others in the online support community (see Table 7.3). This is also reflected in the visualisation of the communication flow among groups, as group A members mostly tend to send their messages to the whole online community instead of addressing specific others. A very few messages are sent to group D members and none are sent to members of other groups. Also, Figure 7.4 shows that group A members do not receive any messages. This means that their initial messages to the online community are not answered.

Group B: Members of group B have a medium centrality. As regards in- and out-degree, the values for group B are quite low compared to those for other groups. However, concerning in- and out-closeness, the scores for group B are moderately high compared to the other groups (see Table 7.3). This means that although group B members do not tend to write and receive many messages, their position in the network

suggests that they are quite close to other members of the online community. Considering the visualisation of the communication flow among the groups, it becomes clear that group B members are mostly connected to group D and E members (the two groups having the most active members within the online community), as they send as well as receive messages from these groups. However, group B members do not have any connections to members of groups A and C (see Figure 7.4).

Group C: Considering the centrality of group C members, Table 7.3 shows that both, the degree- as well as the closeness values are quite low compared to the values for the other groups. However, group C has the highest in-closeness among all the five groups. This shows that group C members are quite close to other members within the online community, but only as regards the receiving of messages. This tendency is also reflected in the visualisation of the communication flow among the five groups (see Figure 7.4), as although members of group C mainly send messages to the whole online community (and very few messages to members of group E) they receive messages from members of both groups E and D.

Group D: Members of group D have a quite central position within the social network based on the communication activity in the community. This is especially the case in terms of the number of received and sent messages (in-degree and out-degree). But group D members also have a high in- and out-closeness. This indicates that group D members are central actors within the online community. Group D members have balanced communication relationships to group B and group E members, as they exchange messages with these two groups in both directions (sending and receiving). Also, group D members are the only ones who receive messages from group A. Concerning the relationship with group C, group D members send but do not receive messages from this group (see Figure 7.4).

Group E: Members of group E are the most central members in the online support community. Their average in- and out-degree is much higher than the values of all other groups. Similarly, group E has the highest out-closeness value and the second highest in-closeness value among all groups (see Table 7.3). Thus, group E members can be considered the core members of the online community. Group E members exchange messages in both directions with all other groups except group A which is totally disconnected to group E. In addition, group E members tend to send a lot of messages to members of their own group and they seem to be very inclusive in their

posting behaviour, as they have the highest rate of messages sent to the whole online community (see Figure 7.4).

7.4.2   Results from the analysis of members' posting behaviour

7.4.2.1   *Level of activity*

When analysing the level of activity of individual members within the community, I focused on the number of messages that individual members send as well as the average size of the messages per member. On average, members send 11.17 messages, but the median is only 2, indicating a very skewed distribution. Further analysis shows that a very large number of members (39 out of 86) only post one message, whereas a few members (3) post more than 50 messages. This distribution of the number of messages sent by individual members is visualised in Figure 7.5.
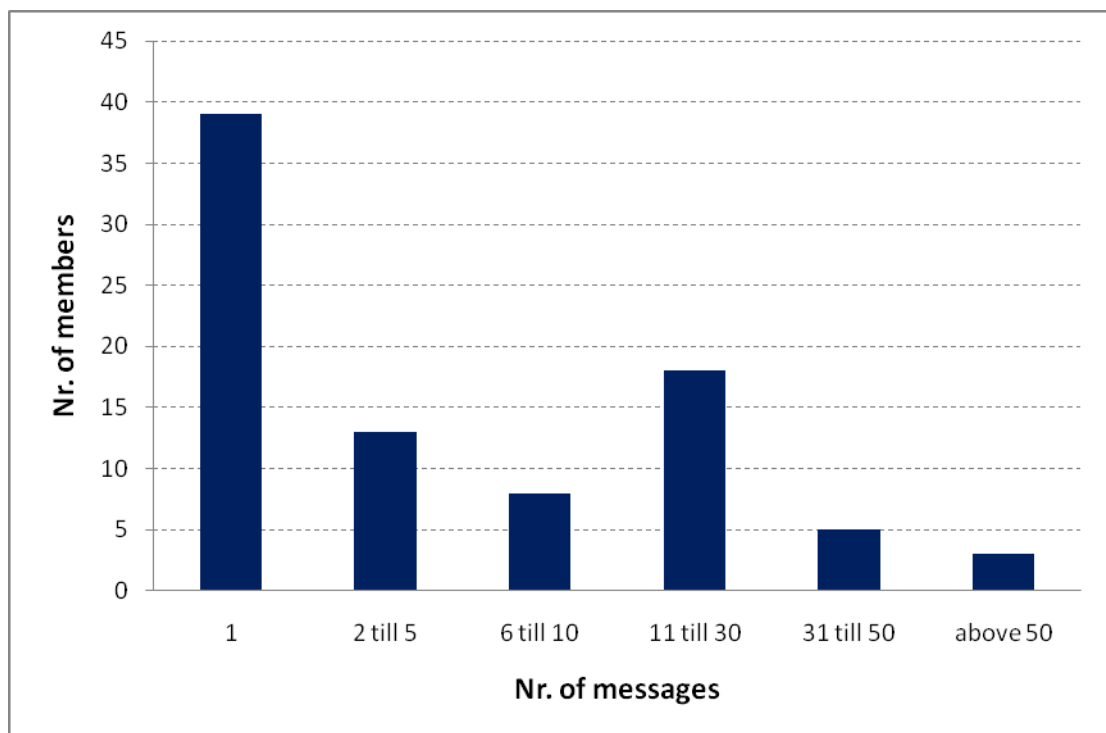
Figure 7.5: Distribution of the number of messages per person

The mean size of a message is 780.78 byte (median: 612:07), with the shortest message being 131 byte and the longest message being 4467 byte. Most messages lie between 200 and 1000 byte. The distribution of the size of messages is illustrated in Figure 7.6.
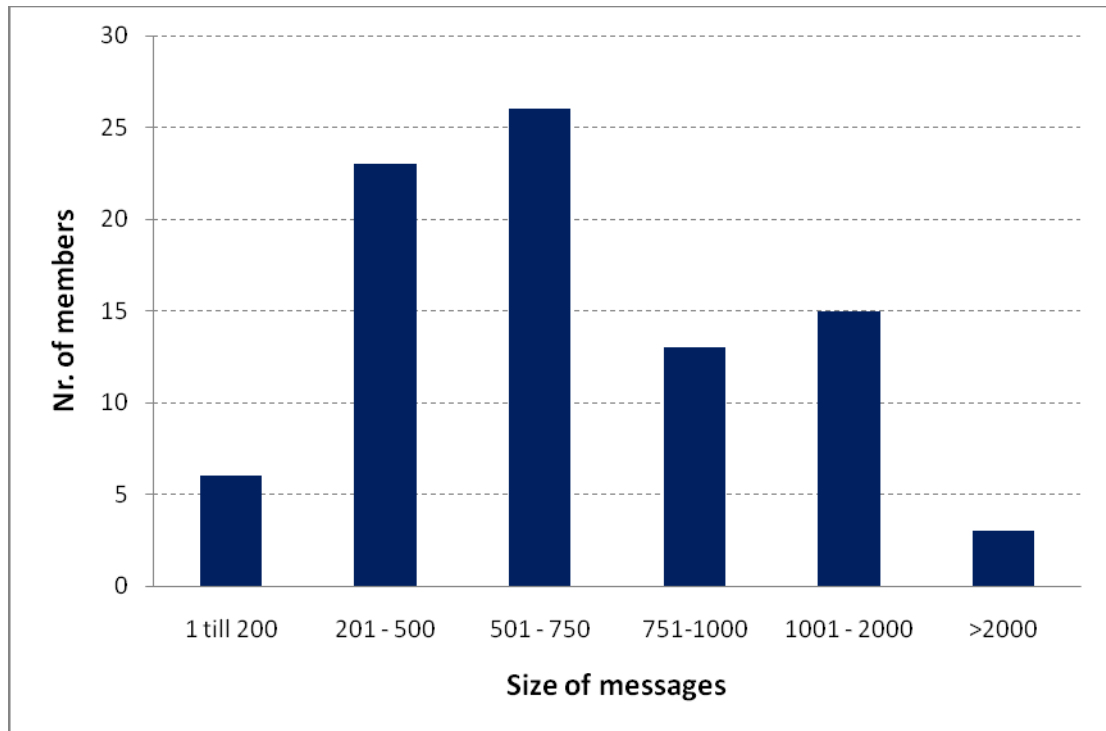
Figure 7.6: Distribution of the message size

In these two analyses, the distributions were separated at the local minima in the middle. Based on this, four groups were identified, depending on whether members post few (1-5) or many (6+) messages, and whether members post short (<751 bytes) or long (751+ bytes) messages:

- members who post many short messages (2, 11, 16, 20, 22, 24, 38, 39, 41, 46, 58, 61, 62, 63, 64, 66, 71, 74, 79, 84, 85)
- members who post many long messages (8, 14, 15, 17, 25, 42, 47, 55, 56, 68, 76, 78, 86)
- members who post few short messages (3, 5, 7, 9, 10, 12, 13, 19, 21, 23, 26, 27, 28, 31, 33, 34, 35, 37, 40, 44, 49, 50, 51, 52, 54, 57, 59, 67, 72, 73, 81, 82, 83)
- members who post few long messages (1, 4, 6, 18, 29, 30, 32, 36, 43, 45, 48, 53, 60, 65, 69, 70, 75, 77, 80)

7.4.2.2   Message content

Figure 7.7 shows the matrix of the community members, in which each value for a pair of members indicates the similarity of the content that they post. Please refer to section *7.2.1.2* for a detailed description of the calculation of this matrix and the identification of the groups. The matrix is colour-coded, with the value 0 (100%

identical) being coded in 'dark blue', values between 1 and 250 being coded in 'middle blue', between 251 and 350 in 'light blue' and between 351 and 400 in 'very light blue'.
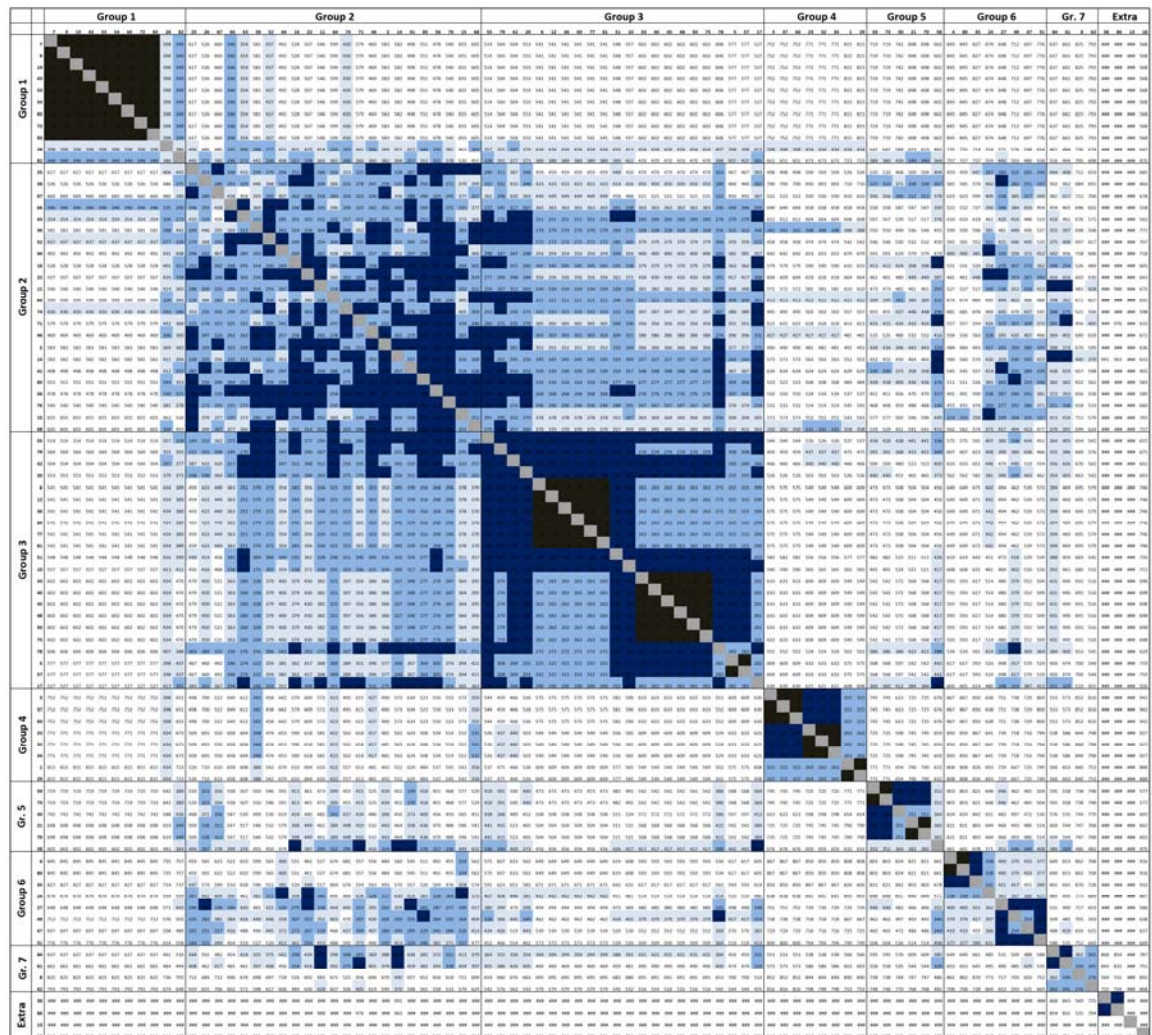
Figure 7.7: Matrix showing the similarities in message content posted by individual members

Similarity value

0 (identical)

1-250

251-350

351-450
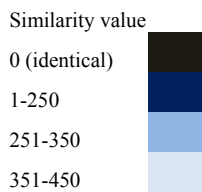
Based on this matrix, members of the online support community were grouped into seven groups (for a description of how this was done, see section 7.2.1.2). Again, each member can belong to one group. Four members did not fit into any of the seven groups and were left ungrouped (see Figure 7.7). Table 7.4 shows the members sorted into the seven groups and their posting behaviour (the percentile distribution for each category, the level of activity as well as the size of the messages that they post).

Concerning the percentile distribution of the categories, a value higher than 150% was considered to be substantially above the average percentile value (renormalised to 100%). A value between 50% and 150% was considered to be average, and a value below 50% was considered to be substantially below the average percentile value (see Table 7.4). In addition, members were distinguished according to their level of activity between sending few (1-5) or many (6+) messages, and posting short (<751 bytes) or long (751+ bytes) messages (see section 7.4.2.1).

Table 7.4: Members and their posting behaviour sorted into the identified groups
(values below and above the average percentile value are indicated with *)

	Author	SD	DS	LS	CB	FI	OT	TI	# msg	msg size
Group 1	7	0*	0*	0*	0*	0*	513.20*	0*	few	short
	9	0*	0*	0*	0*	0*	513.20*	0*	few	short
	19	0*	0*	0*	0*	0*	513.20*	0*	few	short
	43	0*	0*	0*	0*	0*	513.20*	0*	few	long
	53	0*	0*	0*	0*	0*	513.20*	0*	few	long
	54	0*	0*	0*	0*	0*	513.20*	0*	few	short
	65	0*	0*	0*	0*	0*	513.20*	0*	few	long
	72	0*	0*	0*	0*	0*	513.20*	0*	few	short
	83	0*	0*	0*	0*	0*	513.20*	0*	few	short
	28	0*	0*	0*	131.71	274.56*	256.60*	0*	few	short
	82	0*	0*	236.73*	0*	0*	256.60*	0*	few	short
	Mean	**0***	**0***	**21.52***	**11.97***	**24.96***	**466.55***	**0***		
	Author	SD	DS	LS	CB	FI	OT	TI	# msg	Msg size
Group 2	25	54.27	312.15*	174.44*	97.05	231.21*	81.03	0*	many	long
	26	114.57	197.70*	315.64*	87.81	0*	171.07*	0*	few	short
	67	0*	197.70*	315.64*	0	183.04*	0*	0*	few	short
	66	51.56	177.93*	47.35*	131.71	0*	256.60*	0*	many	short
	63	114.57	39.54*	31.56*	122.93	0*	205.28*	0*	many	short
	39	73.65	84.73	0*	75.26	235.34*	0*	0*	many	short
	52	42.97*	148.27	0*	0	137.28	128.30	0*	few	short
	44	42.97*	296.55*	0*	65.86	0*	128.30	0*	few	short
	16	50.78	179.73*	182.93*	85.81	66.56	89.42	138.10	many	short
	22	52.88	273.74*	145.68	20.26	42.24*	118.43	0*	many	short
	11	53.71	185.34*	118.37	65.86	68.64	64.15	189.88*	many	short
	64	64.45	0*	177.55*	131.71	205.92*	0*	0*	many	short
	74	66.96	38.51*	122.98	20.53	135.50	166.62*	157.82*	many	short
	71	74.72	141.83	195.56*	143.17	47.75*	55.78	198.14*	many	short
	46	109.37	161.75*	43.04*	23.95	199.68*	139.96	0*	many	short
	2	110.48	211.82*	169.10*	112.90	176.50*	54.99	0*	many	short
	14	118.52	122.71	146.94	154.42	94.68	53.09	209.52*	many	long
	41	124.99	148.27	236.73*	119.74	24.96*	139.96	0*	many	short

	Author	SD	DS	LS	CB	FI	OT	TI	# msg	Msg size
	85	130.94	141.21	157.82*	175.62	130.74	73.31	0*	many	short
	56	136.48	157.00*	97.48	123.97	80.75	120.75	0*	many	long
	76	142.68	223.81*	98.27	69.58	113.97	77.46	57.32	many	long
	15	152.03*	319.36*	36.42*	151.98*	126.72	0*	0*	many	long
	68	124.99	161.75*	86.08	95.79	299.52*	46.65*	0*	many	long
	Mean	**87.33**	**170.49***	**126.07**	**90.26**	**113.09**	**94.40**	**41.34***		
	Author	SD	DS	LS	CB	FI	OT	TI	# msg	Msg size
Group 3	55	143.22	49.42*	78.91	109.76	45.76*	42.77*	0*	many	long
	79	143.22	49.42*	118.37	65.86	137.28	0*	0*	many	short
	42	152.77*	0*	0*	87.81	122.03	57.02	0*	many	long
	20	152.77*	65.90	52.61	87.81	61.01	0*	0*	many	short
	6	171.86*	0*	0*	0*	0*	0*	0*	few	long
	12	171.86*	0*	0*	0*	0*	0*	0*	few	short
	36	171.86*	0*	0*	0*	0*	0*	0*	few	long
	69	171.86*	0*	0*	0*	0*	0*	0*	few	long
	77	171.86*	0*	0*	0*	0*	0*	0*	few	long
	81	171.86*	0*	0*	0*	0*	0*	0*	few	short
	51	171.86*	0*	0*	87.81	0*	0*	0*	few	short
	10	171.86*	0*	0*	131.71	0*	0*	0*	few	short
	33	171.86*	0*	0*	263.43*	0*	0*	0*	few	short
	40	171.86*	0*	0*	263.43*	0*	0*	0*	few	short
	45	171.86*	0*	0*	263.43*	0*	0*	0*	few	long
	48	171.86*	0*	0*	263.43*	0*	0*	0*	few	long
	50	171.86*	0*	0*	263.43*	0*	0*	0*	few	short
	75	171.86*	0*	0*	263.43*	0*	0*	0*	few	long
	78	171.86*	98.85	157.82*	175.62*	91.52	0*	0*	many	long
	5	0*	0*	0*	263.43*	0*	0*	0*	few	short
	57	0*	0*	0*	263.43*	0*	0*	0*	few	short
	17	118.98	45.62*	182.10*	162.11*	0*	78.95	116.85	many	long
	Mean	**149.49**	**14.06***	**26.81***	**137.09**	**20.80***	**8.12***	**5.31***		
	Author	SD	DS	LS	CB	FI	OT	TI	# msg	Msg size
Group 4	3	0*	0*	0*	0*	549.12*	0*	0*	few	short
	37	0*	0*	0*	0*	549.12*	0*	0*	few	short
	60	0*	0*	0*	0*	549.12*	0*	0*	few	long
	23	171.86*	0*	0*	0*	549.12*	0*	0*	few	short
	32	171.86*	0*	0*	0*	549.12*	0*	0*	few	long
	34	171.86*	0*	0*	0*	549.12*	0*	0*	few	short
	1	171.86*	0*	0*	263.43*	549.12*	0*	0*	few	long
	29	171.86*	0*	0*	263.43*	549.12*	0*	0*	few	long
	Mean	**107.41**	**0***	**0***	**65.86**	**549.12***	**0***	**0***		
	Author	SD	DS	LS	CB	FI	OT	TI	# msg	Msg size
Group 5	59	171.86*	0*	473.47*	0*	0*	0*	0*	few	short
	73	171.86*	0*	473.47*	0*	0*	0*	0*	few	short
	30	171.86*	0*	473.47*	0*	183.04*	0*	0*	few	long

	21	0*	0*	473.47*	0*	0*	0*	0*	few	short
	70	0*	0*	473.47*	0*	0*	0*	0*	few	long
	58	130.94	141.21	157.82*	175.62*	130.74	73.31	0*	many	short
	Mean	**107.75**	**23.54***	**420.86***	**29.27***	**52.30**	**12.22***	**0***		
	Author	**SD**	**DS**	**LS**	**CB**	**FI**	**OT**	**TI**	**# msg**	**Msg size**
Group 6	4	171.86*	593.09*	0*	263.43*	0*	0*	0*	few	long
	80	171.86*	593.09*	0*	263.43*	0*	0*	0*	few	long
	35	0*	593.09*	0*	263.43*	0*	0*	0*	few	short
	24	73.65	423.64*	0*	0*	78.45	0*	0*	many	short
	27	137.49	355.86*	284.08*	158.06*	0*	102.64	0*	few	short
	49	171.86*	296.55*	236.73*	263.43*	0*	0*	0*	few	short
	47	143.22	395.40*	315.64*	105.37	73.22	85.53	101.27	many	long
	31	114.57	395.40*	315.64*	263.43*	0*	0*	0*	few	short
	Mean	**123.06**	**455.76***	**144.01**	**197.57***	**18.96***	**23.52***	**12.66***		
	Author	**SD**	**DS**	**LS**	**CB**	**FI**	**OT**	**TI**	**# msg**	**Msg size**
Group 7	84	133.67	98.85	26.30*	73.17	152.53*	28.51*	337.57*	many	short
	61	40.44*	139.55	139.25	92.97	161.51*	30.19*	357.42*	many	short
	8	124.99	71.89	172.17*	143.69	66.56	77.76	644.45*	many	long
	62	171.86*	98.85	0*	263.43*	0*	0*	506.35*	Many	short
	Mean	**117.74**	**102.28**	**84.43**	**143.32**	**95.15**	**34.11***	**461.45***		
	Author	**SD**	**DS**	**LS**	**CB**	**FI**	**OT**	**TI**	**# msg**	**Msg size**
Extra	38	11.21*	103.15	72.05	103.08	47.75*	33.47*	1188.82*	Many	short
	86	138.81	136.87	145.68	131.71	42.24*	118.43	1168.50*	Many	long
	13	0*	0*	0*	0*	0*	0*	3038.10*	Few	short
	18	171.86*	0*	473.47*	263.43*	0*	513.20*	0*	Few	long
	Mean	**80.47**	**60.00**	**172.80***	**124.56**	**22.50***	**166.28**	**1348.86***		

7.4.2.3   *Description of the identified groups*

Based on the content that community members post, seven groups were identified (see Table 7.4). In the following, I describe the characteristics of these groups.

Group 1: As Table 7.4 shows, members of group 1 are characterised by sending a very high proportion of messages containing content coded as *Off topic*. Eight out of eleven members of this group only post messages that contain this category. Group 1 members do not send any messages containing the categories *Self disclosure*, *Deep support*, and *Technical issues*, and the proportion of messages containing the categories *Light support*, *Community building* and *Factual information* is very low. Concerning the number of messages, group 1 members post only a few messages, most of them

being short rather than long. Thus, members of group 1 are characterised by sending few and short messages that contain off topic content.

Group 2: Group 2 is the largest group and contains 23 members of the online support community (see Table 7.4). Messages that members of this group post are characterised by containing an average amount of all categories apart from the categories *Deep support* and *Technical issues*. The proportion of messages containing the category *Deep support* is very high compared to other groups, and the proportion of messages containing the category *Technical issues* is relatively low. A great majority of members in this group send many short messages. Thus, members of this group seem to be quite active and important. They contribute in all seven content categories, mostly at an average level. The high proportion of messages containing *Deep support* and the low proportion of messages containing *Technical issues* indicate that members of this group focus on the exchange of support in their activities.

Group 3: As Table 7.4 shows, group 3 members tend to send a very low number of messages containing content coded as *Deep support, Light support, Off topic, Factual information* as well as *Technical issues*. In contrast, a very high proportion of messages sent by group 3 members contain the category *Self disclosure*. Concerning the category *Community building*, group 3 members have contradictory patterns. Whereas six out of 22 members do not post any messages containing this category, ten members send messages of which a high proportion is coded into this category. Most group 3 members send only few messages; however, this tendency is not very strong (16 out of 22). Concerning the length of messages, group 3 members do not show a clear pattern. Thus, group 3 members can be characterised as sending few messages, containing a high proportion of self disclosing content.

Group 4: Group 4 consists of eight members (see Table 7.4). The main characteristic of members of this group is to send a high proportion of messages containing the category *Factual information*. In addition, most of the members (5 out of 8) also send a high proportion of messages containing *Self disclosure*. Group 4 members do not send any messages containing the supportive categories (*Deep support* and *Light support*) as well as the categories *Off topic* and *Technical issues*. Concerning the category *Community building*, there does not seem to be a pattern within the group. All members of group 4 send only few messages; however, they do not have a clear tendency regarding the messages size. Thus, group 4 members can be characterised by

focusing on the exchange of factual information. Although group 4 members do send self disclosing messages and messages that strengthen the feeling of togetherness within the community, they do not focus on the exchange of emotional support.

Group 5: As Table 7.4 shows, members of group 5 tend to send a very high proportion of messages containing the category *Light support*. However, they send a relatively low proportion of messages containing the category *Deep support*. Also, the proportion of messages containing *Community building*, *Off topic*, and *Technical issues* is very low. Group 5 members have a strong tendency to send only few messages, but there does not seem to be a tendency concerning the message size. Thus, group 5 members can be characterised by their focus on light and encouraging conversation, rather than the exchange of serious support. Also, they do not seem to be very active, as most of the members in group 5 send only a few messages.

Group 6: Group 6 only has four members (see Table 7.4). Like members of group 2, group 6 members tend to send a high proportion of messages containing the category *Deep support*. However, the difference is that messages sent by group 6 are not as varied in their content. In addition to the category *Deep support*, messages sent from group 6 members also contain a high proportion of text units coded as *Community building*. Group 6 members send an average level of self disclosing messages but only rarely send messages containing the categories *Factual information*, *Off topic* and *Technical issues*. Concerning the category *Light support*, group 6 members show contradictory tendencies, as some send a very high proportion of text units coded as *Light support*, whereas others send none. The majority of group 6 members send only a few messages, most of them being short. Thus, group 6 members can be described as not being very active, but nonetheless concentrated on the exchange of emotional and personal support.

Group 7: As shown in Table 7.4, group 7 only has four members. Members of group 7 show a clear tendency to write messages containing text units coded as *Technical issues*. In addition, the proportion of messages containing the category *Off topic* is lower than the average. The distribution of all other categories is around the average values meaning that, as regards this kind of content, group 7 members participate to an average extent. All group 7 members are quite active within the community, as they send many messages, most of them being short. Thus, group 7 members seem to be quite regular participants of the online community, spreading their

contributions across almost all categories. They seem to feel responsible for 'making the community work' as they tend to help others using the community by distributing technical advice.

7.5 Discussion

Based on the analysis of the communication structure as well as the posting behaviour of individual members within the online community, I developed two sets of groups in which members with similar patterns were identified. Firstly, members were grouped according to their regular equivalence based on their communication patterns. Secondly, they were grouped based on the content that individual members post to the community. In this section, I discuss how the findings from the social network analysis and the content analysis were used to develop a unified taxonomy of social roles based on the structural position and the behaviour of the members of the community.

There is no identical match between a group resulting from the structural approach (social network analysis) and the behavioural approach (content analysis). Thus, members' structural position in the community does not automatically reflect on the content that these members post. However, with a closer look, some relationships could be found. In this discussion, I present a synthesis of the results from the two approaches and describe the resulting social roles.

7.5.1 Role 1 – the manager

The role of the manager is a synthesis of structural group D and behavioural groups 2 and 7. Managers are fairly central members of the online support community, both sending and receiving a high number of messages, and also being structurally quite close to all other members of the community. When it comes to the content of messages from managers, we can see that they focus on distributing technical advice and on exchanging supportive messages. However, when it comes to support, the emphasis lies on light support rather than on deep support. In addition, the level of off-topic postings from managers is very low: they are trying to keep the topic of the conversation within the defined scope of the online support community. In summary, managers are fairly regular participants within the community, spreading their contributions across almost all categories. They seem to feel responsible for 'making the community work' as they tend to help others using the community by distributing technical advice. This role is

similar to the 'manager' role defined by Turner and Fisher (2006) and the 'moderating supporter' role identified by Pfeil et al. (accepted) since people in this role take responsibility for the well being of others and the maintenance of the community. Moreover, due to the large number of messages that members in this role post, it has similarities with the role described by Brush et al. (2005) as 'key contributor'.

7.5.2 Role 2 – the support seeker

The role of the support seeker is a synthesis of structural groups B and C and behavioural groups 3 and 4. Members in this role are characterised by a low in- and out-degree, indicating that they neither send nor receive many messages. However, they are still moderately central in the online community, as their closeness value is moderately high, especially as regards in-closeness. This indicates that their closeness is built through the receiving of messages from others in the community. Looking at Figure 7.4, we can see that support seekers (structural groups B and C) tend to send messages to the whole online community, and then receive answers from either managers (structural group D) or supporters (structural group E). Support seekers send messages containing mainly text units coded as *Self disclosure* and *Factual information*. Also, the proportion of supportive content within messages from support seekers is very low. This combination indicates that their main purpose in participating is to reveal their current situation and then ask questions in order to receive emotional support or information. When their need for support and/or information is met, these members tend to leave the online community, and only return again when they are in need of further help. The role of the support seeker is similar to Pfeil et al.'s (accepted) role of 'passive members' as support seekers also tend to disclose information about themselves in order to trigger support. Also, support seekers show similarities to Turner et al.'s (2005) 'questioner' role, which manifests as few and short messages sent, but more and longer messages received. Apart from these, due to the low volume of posted messages, support seekers also exhibit similarities to Brush et al.'s (2005) 'low volume contributors', who are defined as users who visit the online community less frequently, and often prefer reading rather than writing messages.

7.5.3 Role 3 – the supporter

The role of the supporter is a synthesis of structural group E and behavioural groups 2 and 6. Structurally, supporters are the most central members within the online

support community, having a high degree value as well as a high closeness value. They exchange messages with a great variety of community members, covering all structural groups except group A (see Figure 7.4). Supporters send a lot of messages to individual members as well as to the whole community. Looking at the content of messages from supporters, we can observe a strong focus on the distribution of text units coded as *Deep support*. Supporters also distribute an average amount of content in all other categories, with the exception of the category *Technical issues*. The strong focus on the distribution of text units coded as *Deep support* and the fact that supporters do not provide technical advice clearly distinguishes them from managers. Due to their central role in the online support community and their focus on the exchange of support, the supporters show similarities to the role of the 'central supporter' in Pfeil et al.'s (accepted) study. In addition, the supporters have some commonalities with Turner and Fisher's (2006) mentor role. A mentor is defined as an active participant who influences the community and helps other members (Turner & Fisher, 2006). According to Fiore et al. (2002) the attributes of the supporter also suggest that members in this role are valued and trusted by other members. In addition, because supporters reply to both connected and rather disconnected actors, they match the 'supporter' role defined by Fisher (2005).

7.5.4   Role 4 – the isolate

The role of the isolate is a synthesis of structural group A and behavioural group 1. Characterised by a very low centrality (both degree- as well as closeness value), isolates are not well connected to others within the online support community. They mostly send messages to the whole online community instead of individual members. In addition, they mostly post only once and do not receive an answer to their initial message. Looking at the content of messages from isolates, we can see a very high level of text units coded as *Off topic*, with some of the isolates exclusively posting messages coded into this category. In addition, isolates do not engage in the exchange of social support within the community as they neither send self disclosing content nor supportive messages. As mentioned above, isolates send only a few messages, and my analysis shows that most of them are short. The fact that isolates are not very active and post a lot of off-topic content makes them similar to Pfeil et al.'s (accepted) roles of a 'passive member' or a 'visitor'. Due to the low volume of posted messages, isolates also exhibit similarities to Brush et al.'s (2005) 'low volume contributors', which are defined as users who visit the online community less frequently.

7.6 Conclusion

The aim of this chapter was to investigate the social roles that people within the discussion board about depression take on in the communiy. Thus, the chapter aimed to address research question IV (What kind of roles do people take on in the online support community?). Based on a literature review on analysing social roles in online communities, I decided to tackle the research question from two perspectives: (i) an analysis of social roles within the online community based on the structural position that online community members have (using social network analysis), and (ii) an analysis of the social roles within the online community based on the posting behaviour of individual members (applying content analysis).

The study of online social roles through the use of both content analysis and social network analysis provides an interesting insight into the communication patterns of the online community. Traditional research focusing on the content overlooks important structural information about the community while studies focusing on the structure alone tend to neglect the context in which interaction takes place. Results of this study provide insight into the different social roles that members of the online support community take on from both perspectives. As a result of the structural and behavioural analysis of individual members, a unified taxonomy of four roles was identified: the manager, the supporter, the support seeker, and the isolate. Combining the findings of the two separate analyses gives further insight into how the structural position is associated with the posting behaviour of individual members. For example, the results show that frequent participation and a focus on supportive communication is associated with having a central position within the online community. Furthermore, as the role of the isolate shows, there seems to be an association between posting off topic content and being disconnected from other members of the online support community. The description of the groups identified on the basis of the content analysis and the social network analysis and the synthesis of these findings into a unified taxonomy of roles address research question IV.

8 Older people's perceptions and experiences of online social support

In this chapter, I investigate older people's needs and preferences concerning the exchange of social support. Based on the aspects of social support exchanged in the case study community (see chapter 4), interviews were conducted to investigate how older people perceive these aspects. The findings address research question V, as they shed light on the motivations of older people to participate in online support communities and the reasons for their reluctance to do so.

In the studies reported so far, I have investigated the content that people share in the case study community (see chapter *4*, (Pfeil & Zaphiris, 2007)), and I have looked at the social networks that members of this online support community form (see chapter *5*, (Pfeil & Zaphiris, 2009)). In addition, I have investigated the structure of the conversations within the community (see chapter *6*, (Pfeil et al., 2010; Pfeil et al., under review)) and the roles that people take on in the communication process (see chapter *7*). However, these studies have not investigated online supportive communication in relation to offline support. Also, the focus has been on people's behaviour, without taking into account their perceptions of their activities.

Thus, this chapter shifts the focus to investigate people's attitudes to online and offline support. This is a valuable additional analysis in order to understand how people perceive the exchange of social support in online communities in relation to offline support. As the case study community is an online support community targeted at older people, the study focuses on this age group. I report the results of interviews that I conducted to investigate older people's perception and expectations concerning the exchange of social support in offline and online settings. In combination with the previous findings, the results give insight into the relation between people's behaviour and their perception of their behaviour. Findings of this study address research question V (What are older people's needs concerning online support communities?). Figure 8.1 visualises research question V in the context of MOSuC. As the focus of this research question is on users' perceptions and opinions regarding participation in online support communities, it is mapped onto the 'user-characteristic' quadrant of MOSuC.
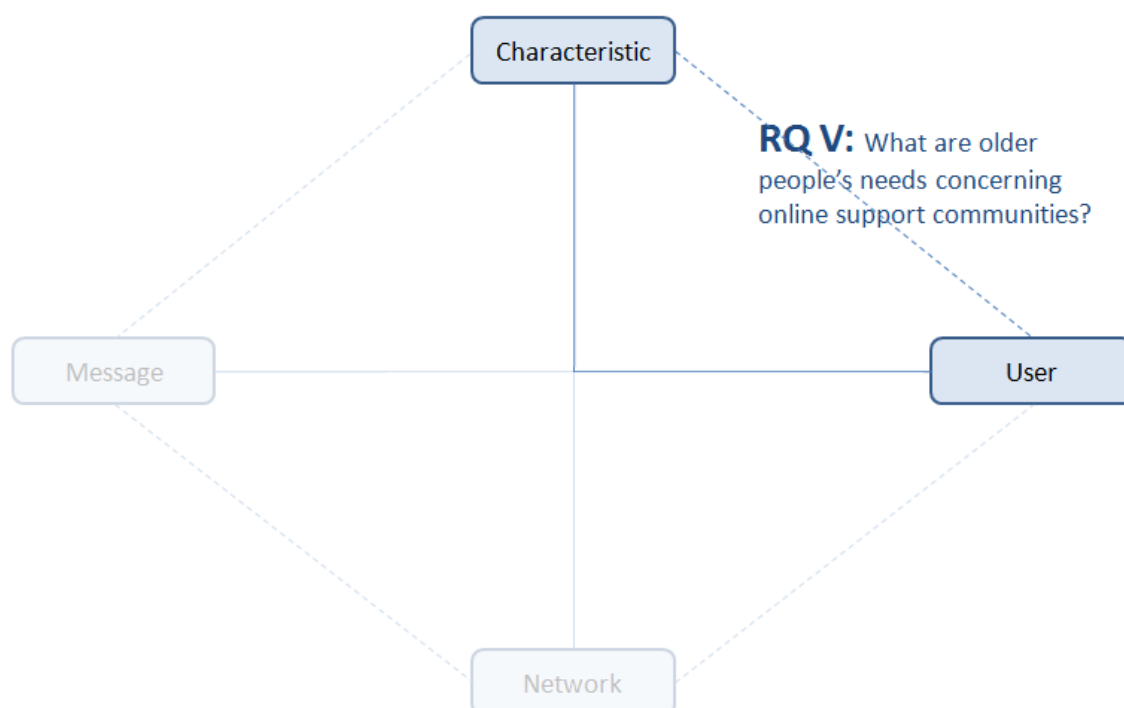
Figure 8.1: Research question V in the context of MOSuC

8.1 Aims and objectives

This study aimed to understand older people's perceptions and expectations concerning the exchange of social support in offline and online settings. In combination with the findings from the other studies, the results give insight into the relation between people's behaviour and their perceptions of their communication activities. Although interviewing participants of the case study community would have allowed me to closely map people's behaviour to their perceptions, it was difficult to reach out to the members of the despression discussion board. Also, the data set used previously consisted of messages from the depression discussion board that were exchanged between 2000 and 2006. However, the interviews were conducted much later, not only making it difficult to contact the members, but also making possible mappings between their behaviour and their perception less valid due to the large difference in time between the two data collections. Thus, I contacted other online communities within SeniorNet and other online support communities targeted at older people to recruit participants who were experienced participants in online support communities. In addition, I also recruited older people with other experiences of the exchange of social support in online settings (including older people who used email, and older people who did not use the internet at all). This provided additional benefits, as studies investigating older people's perceptions of online support communities have mainly focused on older

people who already participate in online social interactions, successfully eliciting the aspects of support they exchange and their perceptions of these aspects (Wright, 2000b; Xie, 2008). However, they have not captured the views and perceptions of the large proportion of older people who do not exchange support in online settings. As Andrews et al. (2001) state, it is often the reasons why people do not want to participate in online communities that can best inform online community design for a specific target population. Older people's support networks are often rooted in long-term offline relationships that might influence their expectations and preferences concerning support in online settings. Furthermore, older people often have special needs when it comes to internet use, which might also influence their attitude towards online support. I believe that the combination of participants with different experiences of the exchange of social support in online as well as offline settings provided a sound basis upon which to identify older people's needs concerning online support communities and thus answer research question V (What are older people's needs concerning online support communities?). In order to connect the interviews to the description of the case study community, I utilised the aspects of support that were previously found to be exchanged by older people in the case study community: *Self disclosure*, *Deep support*, *Light support*, *Community building*, *Factual information*, *Off topic*, and *Technical issues* (see Table 4.3). The study investigated the perception of these aspects of support by older people in offline as well as online settings. Hence, the overall aim was broken down into three research objectives that were investigated for each of the aspects of support:

I.   To analyse the perception of this aspect of support by older people

II.   To describe the situations in which older people exchange this aspect of support in online vs. offline settings

III.   To identify the perceived benefits and disadvantages of exchanging this aspect of support in online vs. offline settings.

In order to address these objectives, I conducted 31 detailed interviews with older people with various backgrounds in online communication (from non-internet users to frequent users of online support communities). I analysed each aspect of social support in turn and elicited information about participants' perception of this aspect of support as they encounter it in 3 settings: offline, email communication and online support communities.

The findings describe older people's perception of different aspects of support and identify their motivation for turning to online support and the reasons for reluctance to do so. Thus, this study gives insight into how online support communities could best be utilised to improve older people's experience with online support and addresses research question V.

8.2 Methodology

I chose interviews as the data collection method because this method allowed me to elicit qualitative data about older people's perception of offline and online support (for more detailed information please see section *2.4.5*). I decided that semi-structured interviews were most appropriate for addressing the research question, as the aspects of support could be used as the basis of the investigation and I still had enough flexibility to tailor the questions to individual needs of participants.

8.2.1   Interview sampling

Thirty-one (31) interviews were conducted with older people who had various experiences with internet communication: 10 non-internet users (group A); 10 internet users who use email (group B); and 11 internet users who use online communities (group C). All participants were 60+ years old (apart from one participant in group B who was 55). I initially aimed for an equal number of women and men in the sample. However this was not fully reached and I ended up interviewing seven women and three men for each group (four men in the case of group C). This bias towards female participants is not unusual when investigating older people's usage of online communication, as a lot of studies that analyse older people's internet usage report a sample that is characterised by a majority of female participants (Gatto & Tak, 2008; Kanayama, 2003; Kurniawan et al., 2006; Nahm et al., 2003; Selwyn et al., 2003; Wright, 2000a; Xie, 2008).

Groups A and B were recruited from local senior centres and interviewed face to face. Participants in group C were recruited from online support communities specifically designed for older people. A 'request for participants' was posted in several online support communities for older people and participants were interviewed either via email or via private messaging within the online community.

8.2.2   Interview structure

As mentioned above, the code scheme was used as a basis for the interviews (see Table 4.3). As the aspects of support in the code scheme had been found to be important components of the communication in online support communities for older people, I argue that they provided a good basis for further investigation into the behaviour and attitudes of older people concerning supportive online communication. Taking them as a basis for my interviews allowed me not only to investigate how these aspects of support are perceived by older people who participate in online support communities but also gave me the opportunity to investigate further how these aspects are related to offline and email support. This helped me to investigate the relation between people's experiences with support in offline settings and their attitudes and perception of support in online settings.

Each interview was divided into two parts. In part 1, I asked people to report on (describe in detail) a situation when they exchanged support in an offline setting. I asked this question to allow participants to report their own experiences of offline support without being restricted by the categories of the code scheme. After this initial question, I then asked clarification questions in order to get more detailed information. For example, if participants talked about a situation in which they exchanged personal and emotional support, I would ask how they felt in this situation, what they found to be important characteristics of this aspect of support, etc.

Some participants naturally covered all aspects of support without me probing in a specific direction, but most of them focused on some aspects only. I ensured that all seven aspects of support were covered in the interviews and when necessary asked further questions. For example, some participants reported a situation in which support was exchanged between two people and did not mention the role of communities (equivalent to the category *Community building*) at all. In these cases, I added a question at the end of the interview asking whether they had ever experienced support in a group setting and continued with further questions from there. This part of the interview was conducted in order to elicit the needs and experiences of the aspects of support as perceived by older people in daily life (see research objective I - investigate the perception of the aspects of support by older people). Part 1 of the interview was the same for all participants in this study.

In part 2, I focused either on support in online communities (for participants from group C) or on support via email (for participants from group B). Again, I took the aspects of support embodied in the code scheme as a basis and asked people questions to help me understand how the characteristics of the specific aspect of support are conveyed in online settings. For example, when participants mentioned that it is possible to exchange deep emotional support in online communities, I asked them to explain to me in more detail how this is done and how they perceive this aspect of support in online versus offline settings. In addition to eliciting experiences with the exchange of support, I also asked participants to compare the characteristics of support between the different settings they engage in (offline, email and/or online community support) (see research objective II – investigate the situations in which older people exchange the aspects of support in online vs. offline settings) and the reasons why they used/didn't use online communication in order to exchange this aspect of support (see research objective III – investigate the perceived benefits and disadvantages of exchanging the aspects of support in online vs. offline settings). As participants from group A did not use the internet, they were not asked to talk about their experiences with online support, instead I focused on the reasons why they didn't use online communication for the purpose of exchanging support (see research objective III).

As it was practically impossible to meet with all participants face-to-face, 9 out of the 31 interviews were conducted via email. In order to ensure similar conditions for the online and offline settings, I used the same questions for both face-to-face and online interviews. Answers to these questions were then followed up by clarifying and deepening questions. An online interview consisted of an initial set of questions that were emailed to the participants and the exchange of 5-10 clarifying emails afterwards. Face-to-face interviews lasted on average an hour each. In face-to-face as well as in online interviews, the follow-up questions were tailored to the kind of answers that participants had given to the initial set of questions. The fact that the online interviews consisted of a large number of message exchanges increased the interactivity in the online interviews and thus also similarity in structure to the offline interviews. In my view this diminished any influences on the findings of the study arising from the fact that some of the interviews were conducted offline and others were conducted online. The offline interviews were audio-taped and transcribed verbatim, and all exchanges in the online interviews were saved as one final document per interview.

8.2.3   Data analysis

For the analysis, I imported the interview data into the qualitative data analysis software MAXqda (2007). This software allowed me to store each interview separately and facilitated the assignment of categories to different parts of each interview. It also utilised several layers of coding which was very helpful as I could code different parts of the interviews according to two criteria: a) the kind of support that participants talked about (e.g. the seven categories) and b) the medium that they talked about (e.g. offline, email, online communities).

Before starting the coding, I read through the interviews in order to familiarise myself with the data-set. As the interview questions were based on the categories of the code scheme, I also used these categories as a guide during the analysis. After reading the interviews and getting a first impression about the data, I started the analysis by coding parts of the interviews into the categories. For example, all parts of the interview in which participants talked about characteristics of deep support were coded as *Deep support*. The coding was not exclusive and one part could be coded into several categories (e.g. when people were talking about the difference between light and deep support, this was coded into both categories). I went through the interview scripts several times until I considered the coding to be saturated. Additionally, I established a second level of coding and coded whether a participants talked about offline-, email-, or online community support. The two parallel codings allowed me to identify the aspect of support that was conveyed (categories), and the way this was done (offline, email, online community).

In order to address the aim of this study, I focused on each one of the categories in turn and identified re-occurring regularities and patterns within this category. In order to do so, I followed Tesch's (1990) advice to identify reoccurring themes in the parts of the interviews that were coded as a particular category. This process was highly iterative and notes were taken during the process in order to capture possible relationships between the themes. Following this approach, I ended up with several themes per category, each of the themes representing a key experience that older people have with this aspect of support (see research objective I - investigate the perception of the aspects of support by older people). For each category, I also investigated how it is influenced by the mediating technology (see research objective II – investigate the situations in which older people exchange the aspects of support in online vs. offline settings) and

perceived benefits or doubts concerning the use of online/offline settings to convey this aspect of support (see research objective III – investigate the perceived benefits and disadvantages of exchanging the aspect of support in online vs. offline settings).

8.3 Findings and discussion

The average age of all participants was 69.75 years. The average age of people in group A (non-internet users) was 77.6 (age range: 70-91), 63.2 (age range: 55-67) in group B (email exchange group) and 68.125 (age range: 65-77) in group C (online support group users).

Of the email-exchange group (group B), seven participants checked their email every two to three days, and three participants checked their email daily. Of the online communities group (group C), one person reported participating in the online community two to three times a week, while everybody else checked in the community at least once a day. Four participants reported participating in a health-related discussion board, four in a discussion board for caregivers (all specifically targeted at older people) and three participants said that they participate in discussion boards about geographical and political issues.

In the following, I report the qualitative findings from the interviews. I structure the discussion around the aspects of support (categories) used for the analysis of the interviews. For each category, I present key-themes that represent participants' main experiences and expectations concerning this aspect of support (see research objective I - investigate the perception of the aspects of support by older people). For each of these themes I also address participants' perceptions of this theme in online and offline settings (see research objective II – investigate the situations in which older people exchange the aspects of support in online vs. offline settings) and the perceived advantages and disadvantages concerning each theme (see research objective III – investigate the perceived benefits and disadvantages of exchanging the aspects of support in online vs. offline settings).

8.3.1   Self disclosure

8.3.1.1   Trust

Participants in all three groups mentioned that for self-disclosure to happen, it is necessary that the person in need of support has enough trust in the supporter to open up and talk about her situation, thoughts and feelings, while the supporter mainly listens. Participants reported that self disclosure offline rarely happens in a group setting, but mostly occurs on a one-to-one basis. Thus, older people's experiences with support in offline settings are mostly dyadic. I therefore expected that email would be an appropriate medium that suited people's needs as it is often also exchanged between two people. However, the findings showed that participants using email (group B) reported being very sceptical about writing self-disclosing emails, and would only reveal personal emotional information in emails to people they already knew well. They mentioned that they are very cautious when it comes to exchanging personal information and support with people that they do not know and trust. Some of them also mentioned that they think that the necessary level of trust can only be obtained by them in offline, face-to-face communication as they are not used to building relationships only via online communication. They stated that it is possible to get to the necessary level of trust via email-exchange, but unless they already know the person from offline meetings, this would take much longer and require more effort compared to face-to-face conversations. This finding is in line with the SIP theory that states that the development of friendships is possible in online settings but takes longer compared to offline communication (Walther, 1992).

While this finding is not unique to this age group, it may be especially the case for older people who are not very familiar with using the internet, as participants of group B argued that their reluctance and doubt about building trust in online settings is partly due to their unfamiliarity with the medium. This is also supported by the fact that the issue of building trust with people they don't know personally was not raised by people participating in online communities (group C). The fact that group B members mentioned to be reluctant to disclose personal information in emails, and group C members felt comfortable with doing so in online support communities might also indicate that older people find it easier to disclose personal information in online support communities compared to emails. Similarly, group C participants mentioned that they sometimes find it easier to talk to 'strangers' on the discussion board as

opposed to 'offline friends'. Especially when the topic was painful, shameful or very personal, group C participants reported finding it much easier to disclose it to people they do not know in real life.

Group C participant: *"[...] the people are not personally involved in your day to day life so you can tell as much as you feel safe doing and keep a certain amount of privacy."*

8.3.1.2   Courage

Participants in all three groups mentioned that it takes courage to disclose personal and emotional information to other people. In particular, participants in group A voiced having inhibitions and feeling shy when telling other people about their feelings and concerns. Although participants mentioned that they sometimes feel in need of support, they said that they often find it difficult to ask for support directly in offline settings. This was considered a limitation of offline support. However, I found that this limitation is diminished when it comes to online support, as participants from group B and group C mentioned that self-disclosure is easier via email and in online communities. Not being in the same room with the other person makes participants feel more open and gives them the feeling that it is safer to talk about personal issues. Participants mentioned that they feel more courageous online as compared to face-to-face conversation. This leads to them being more honest about their feelings, giving them courage to say what they think and making them less afraid of confrontations as compared to offline conversations. These statements explain the high level of self disclosure found in online community postings by older people (Kanayama, 2003; Pfeil & Zaphiris, 2007). However, this finding is not unique to this age group as these benefits of online communication have also been found by other studies investigating online communities not specifically targeted towards older people (Bowker & Tuffin, 2002). Particularly in online communities, the anonymity and the ease with which messages can be posted seem to encourage people to write about themselves. As one member of a health-related discussion board stated:

Group C participant: *"I believe some friends I have made on-line know more about me.-who I am and what I believe and feel - than my bridge buddies ever will."*

Some participants in group C also mentioned that they sometimes regret the openness with which they have disclosed private thoughts and feelings. They warned

that it is important to keep in mind that online communities are public and one has to be careful not to reveal too much information. They stated that disclosing too much private information puts them in a vulnerable position, as others could use this information against them.

In email-exchange, several participants in group B mentioned that they are concerned about the security and intrusion of others into their privacy, such as intercepting an email. Some of them added that they do not entirely understand how the exchange of email works and others had told them about possible threats, for example the possibility of 'stealing one's identity'. They stated that this concern inhibits them from writing emotional and personal content in an email. Although this concern is a general concern and not unique to older people, based on the importance that the participants gave to this issue, I believe that this age group may be especially vulnerable and concerned about possible harmful consequences that could result from disclosing personal information. This is in line with other studies that have found that compared to younger age groups, older people are more careful when it comes to disclosing personal information in social online settings (Pfeil & Arjan, 2009).

8.3.1.3   Degree of self-disclosure

Some participants in all three groups mentioned that they do not like to talk about their personal and emotional problems with offline friends because they are afraid that the other person might not be interested. They feel uncomfortable when they have to ask for support offline, be it practical or emotional support. As they may have gone through a lot of challenging situations in their life and mastered a number of crises they are proud of what they have achieved and independence is important for them. This finding suggests that older people tend to be reluctant to ask for support in offline settings. My findings also show that this tendency seems to be reduced when it comes to online support, as participants from groups B and C stated that they felt more comfortable talking about their problems and feelings in online settings and that they don't feel like they are a burden to anybody when disclosing information about themselves online. In contrast to the offline setting, participants in group C mentioned that online communities in general are a good place to offload feelings. The actual activity of writing one's worries down was described as relieving in itself and participants reported feeling much better afterwards. Similar thoughts were voiced by participants in group B concerning support via email, as participants mentioned that

writing about one's situation in an email is more self-reflection than actually getting immediate support, as you usually do not get back a supportive email straight away.

Group B participant: *"So, if you want to offload yourself, like for example when you are not feeling very well, you can disperse everything that is in your head, everything what is in there goes just out. Afterwards, you feel much better, lighter somehow. I think it is because you can let off everything."*

My findings show that especially for older people who have difficulties talking about their problems and emotions offline, online settings offer the possibility for them to disclose their thoughts and feelings.

8.3.2   Deep support

8.3.2.1   *Emotional support*

Participants in all three groups mentioned that physical presence and body language is crucial when supporting somebody emotionally in an offline setting. 'Being there' was considered to be supportive as it shows that the supporter cares about the person in need. Participants from group B and group C considered that the lack of physical presence, body language, eye-contact, and voice limited the quality of online communication compared to offline communication and made it less appropriate for emotional and personal communication purposes and support. This finding is also in line with the social presence theory (Short et al., 1976), stating that the lack of non-verbal cues limits the possibilities for interacting on a personal and emotional level in CMC.

Group C participant: *"[Offline], you can feel when to be brisk, when sympathetic, when they really want you to ignore or contradict what they are saying/feeling. I suppose I am talking about empathy, which I don't think really works with printed words alone."*

Some of the participants from group B and group C also stated that online communication is not a way of interacting with others that comes naturally to them. They stated that they did not grow up using online communication but had to learn it just recently. They also mentioned that their experiences with support in offline settings places a huge emphasis on physical presence and the idea of supporting each other via text in online setting is something that they have just encountered recently. I conclude

that this might make it more difficult for older people to engage in emotional support in online settings compared to younger people.

However, participants from group C also reported that they experienced deep emotional support, empathy, sympathy, caring and love in an online community. Some even said that the online community was their main support group at times that were especially challenging in their lives. This substantiates recent findings from studies investigating online communities for older people that have found a high level of support within these communities (Kanayama, 2003; Wright, 2000b) including my findings in chapter *4* (Pfeil & Zaphiris, 2007). Similarly, some participants from group C stated that they especially valued emotional support in online communities as their current living situation as a carer restricts their ability to meet people offline. Participants from groups B and C said that emotional online support is much more considerate than offline support and they find it easier to give honest and frank support online (via email or in online support communities). The fact that people take time to think thoroughly about what kind of support to write in a message and that they have the opportunity to read through it again before they send it, helps to fine-tune the support and avoid possibilities for misunderstandings.

However, a lot of participants in group B and group C also mentioned that support via email or in online communities is not appropriate for urgent emotional support (due to the time delay). The fact that they do not know when the other person is going to read and answer their email/message makes them feel insecure, especially in times of emotional distress. They stated that their experience with offline support is different from online support, as they usually meet up with friends in order to exchange support, and thus they get immediate feedback and reactions to what they say which helps them to evaluate and reassess their own situation. This experience makes it difficult for them to get used to a longer time period between an initial message and the answer(s) in online settings. They mentioned that in times of huge distress, they are more likely to use the telephone or face-to-face communication instead of email and online communities. Although some participants from group C mentioned that they also use the chat facility within the online community, they did not report using it for emotional support.

8.3.2.2   Misunderstandings and misbehaviour

Participants from all three groups mentioned that the exchange of deep support is often very difficult, as the person in need is often distressed and is vulnerable to critique or harsh comments from the supporter. Often, the person in need can be easily upset by inappropriate comments. Participants mentioned that it requires skill and patience on the part of the supporter to give support that is helpful.

When talking about the exchange of support in offline settings, participants mentioned that misunderstandings arise rarely and, if they do, they are solved quickly. In contrast, participants in group B and group C mentioned that misunderstandings happen easily in online support. Due to the lack of body language, sarcastic or funny messages are sometimes misunderstood and can hurt people. In particular, group B participants mentioned that the lack of non-verbal cues in combination with the time delay of emails can be problematic, as the sender of the message can neither see the reaction that his/her message caused and nor can (s)he immediately correct a misunderstanding. Compared to their experience with offline support, participants reported that they have to be much more careful to avoid misunderstandings and to be clear about what they want to say in online settings. This was considered to be a disadvantage of online support compared to the exchange of support in offline settings. Participants voiced concern that they might touch a sensitive point with their email and not even recognise the effect it has on the receiver. Again, this has to do with the lack of non-verbal cues in email communication and supports the social presence theory which states that misunderstandings occur more easily in online communications due to the restricted ways of communicating only via text (Short et al., 1976).

Group B participant: *"[I]f I was speaking to someone and I realise that I have touched their sore point, I can correct it. And say: no, but I didn't mean that. But if you are typing, and it goes out [...]. You hadn't seen the sore point, all you have seen is the letter that you have sent. Yeah? So, when the person receives it, they will get it and then pick up immediately on the sore point and think: oh, bad news."*

In cases where misunderstandings happened, participants in group B stated that the fact that the communication was online complicated the situation. The time delay with online support, and the fact that people can read annoying or hurtful messages again and again, made the situation worse in many cases. Participants mentioned that

this was different from offline support, as they felt that misunderstandings that they considered problematic in the online setting could be resolved easily and quickly in offline communication.

Participants in group C stated that people in online communities are sometimes rude and intentionally post provocative messages to create trouble in the community and upset other people. They mentioned that there are people who think it is permissible to misbehave and release anger and frustration in online communities because it does not affect their offline life. Particularly in online communities that deal with personal and emotional topics, misbehaviour can have serious consequences, because people can get hurt and drop out of the community. This finding is in line with other studies that have found that misbehaviour in online settings can have harmful consequences, especially in online support communities that deal with sensitive and emotional topics (Bowker & Tuffin, 2002; Feldman, 2000; Feldman et al., 1998).

8.3.2.3   Advice

Concerning offline support, participants in all three groups mentioned that they are very cautious when giving advice to another person. Often, they feel that they do not know enough about the situation in order to give valuable advice and what they consider good advice might not be good advice for the person in need. They also stated that offline they would only advise people that they know, as different people need different sorts of advice. Participants in group B mentioned that the same is true for support via email. Knowing what kind of support is appropriate and how the other person will react to that supportive email is vital. Knowing background and contextual information about the other person can help in giving appropriate and helpful support in the absence of non-verbal cues.

Group B participant: *"I think in an email, I think you learn to read between the lines. And if you know that person, it is different if you don't know that person. Well, if I don't know the person, I could give general advice, but not deep emotional advice, because not knowing, you don't know the way people think and the way that they react to things. Because one person will accept what you say and another one would be insulted."*

Knowing the person well and knowing also the context of the person's situation was considered to be an important factor in giving valuable advice. Participants in

group C reported that this is difficult in online communities as they cannot see the other person and they often do not know the context of the situation. They stated that this makes it difficult for them to give advice to other people that is tailored and personalised towards their unique situation and equivalent to the kind of support that they would give in offline settings. They stated that when giving advice in online communities, they do not like to give direct and explicit advice to others but rather talk about how they would (or did) face a similar problem. This is in line with Wright's (2000b) finding that older people tend to disguise advice as self-disclosure by explaining how they dealt with a similar problem rather than giving direct advice. Still, most of the participants in group C reported that they try to give support that is as personalised as possible. Although general, uplifting comments are perceived as encouraging, individual support that is tailored to the specific situation is much more valued.

8.3.2.4   Similarity

Participants from all three groups mentioned that similarity between the supporter and the person in need plays an important role in the exchange of offline support. In order to give valuable and helpful advice, it is crucial that the supporter can understand and identify with the thoughts and feelings of the person in need, which is easier if one has encountered a similar situation. They valued advice and support from people in similar situations because it is based on experience and therefore believed to be more valuable and helpful than theoretical advice. In relation to that, age was believed to play a big role as well. Participants stated that people of a similar age to themselves are more likely to understand their thoughts and feelings.

Group B participant: *"I think when I was younger I didn't understand lots of things, but now I have got older and I have experienced different ways of life. I think you get more feelings for other people, you understand more."*

Likewise, similarities in general were described as being an important factor by group C participants in establishing friendships and exchanging support in online communities. Especially where the ways of conveying thoughts and feelings were limited due to the lack of non-verbal cues and voice, similarities between the communicators provided a common ground and basis for understanding and support. In offline settings, participants reported that although the supporter and the person in need

had a lot in common, they usually didn't state it explicitly. Whereas participants didn't have to externalise their similarities when exchanging support in offline settings, in online support communities it was considered to be helpful for the exchange of support if similarities were clearly mentioned (e.g. by clearly stating the topic of the discussion). Participants in group C mentioned that just knowing that there were other people within the online community who were in the same situation supported them and made them feel better. They mentioned that people who are in a similar situation can empathise with each other, are more attuned to each other's problems, understand each other better, and can offer more helpful, experience-based advice. This fits with findings from current studies (Bakardjieva & Smith, 2001; Maloney-Krichmar & Preece, 2005; Pfeil & Zaphiris, 2007) that similarity between online community members is necessary in order to exchange support.

Group C participant: *"The Bosom Buddies [health related online community] were sympathetic and supportive because they had all had breast cancer, and knew what I would be going through - physically, mentally, and socially."*

8.3.3 Light support

8.3.3.1   *Casual talk*

In talking about offline support, some participants from all three groups mentioned that support is talking about positive, light and uplifting things instead of serious, emotional and sad situations. They deliberately avoid deep emotional topics, because it brings back painful memories to them. On the contrary, gossiping, chatting, having fun and making jokes was considered to be uplifting and vitalising. Whereas deep support was exchanged only in times of crisis, light support was reported to be exchanged more frequently in everyday life. Participants from groups B and C reported that this kind of casual and light support was also easily conveyed in online settings. Some of them felt that the online setting was equally suitable as the offline setting for casual and light communication.

Concerning email exchange, participants in group B stated that most of their email communication is light and causal, with friends or family members whom they do not see very often. This finding shows that older people seem to use email for similar purposes and in similar ways to younger people: to keep friends and family members up to date on what is happening in their lives. Rather than very personal or emotional

content, participants mentioned that most emails contain a narration of what has happened recently in their lives, together with some casual and funny comments.

Group B participant: *"Casual emails, you know, we are talking about, you know, what things have happened, and they are saying how they are and what things are happening with them. Yeah, it is quite good."*

8.3.3.2   Keeping in contact

Participants from all three groups said that they would keep in touch with their friends by regular meet-ups or regular conversations on the phone. Also, sending birthday cards and thinking about the other one on special days (e.g. Christmas) is considered to be important and helps to maintain friendships. Although these encounters are light and casual, there is often a deep underlying friendship. Rather than the content of the communication, it is the regular contact that maintains social support networks. Casual phone calls are often exchanged between good friends who want to check how the other person is doing. This keeps them informed about the other person's wellbeing. Should the other person need more support, the supporter would know about it quickly via the regular contact, and would then engage in further supportive activities, e.g. visit the person in need. Participants in groups B and C mentioned that they frequently used email to exchange light talk and chat with friends and relatives and that they felt that online communication is a very good complement to offline communication for this purpose. Although the content is not deeply personal, short casual emails show that the other person is thinking of them and that they are a part of their lives, which brings a feeling of closeness and connection.

Group B participant: *"As I said with my cousin before, I mean we are so much closer now, because of email communication. That would never have happened."*

In online communities, group C participants mentioned that they keep in contact with others by posting regular questions about other members' well-being. This shows that people think about each other and are concerned about each other's wellbeing. This is in line with the findings from Pfeil and Zaphiris' (2007) who showed that older people frequently ask how the others are doing and post uplifting, encouraging and motivational messages in online support communities. However, this finding is not unique to older people, as other studies investigating online support communities have

also found that people of other age groups stay in regular contact with each other and frequently ask about each other's wellbeing (Preece, 2000a).

8.3.3.3   Humour and encouragement

Concerning offline support, humour was often mentioned by participants of all three groups to be included in encouraging and uplifting casual get-togethers. People exchange jokes and humour to encourage each other and to cheer each other up. Humour and encouragement were also mentioned to be part of emotional, personal support used to lighten a serious situation with a laugh. Especially concerning offline support, humour was deliberately used to distract the person in need from her current feelings.

Group B participant: *"I throw in through a flippant comment, sometimes, because […] it sort of frees them up so that they are not so full of angst. And they may have a sort of joke in the middle of it all. […]Even in the darkest you can make somebody else laugh."*

However, participants in all three groups mentioned that this is only possible if you know the person in need well enough to be sure that she will not be hurt by this.

In contrast to offline support, humour was considered to be more problematic in online settings. Participants in groups B and C mentioned that one has to be careful in online support about how to include humour, as it can easily be misunderstood. Although participants in these two groups mentioned that humour is exchanged in emails and online communities, they also stated that this is done rarely and with caution. This finding shows that as far as humour is concerned, the habits and characteristics of offline support cannot be fully transferred into the online setting. In order to make up for the missing humour in online settings, participants in group B noted that they include encouragement and uplifting comments in emails instead. Although emails are restricted in the ways that emotions can be communicated, participants in group B thought that it is possible to get enough of a feel about the other person via email to convey general, uplifting support. Similarly, participants in group C reported that the majority of support in online communities is such uplifting encouragement.

When asked whether they show affection online, some group B and C participants referred to virtual kisses and hugs. These are sometimes used to encourage and uplift the other person and indicate that she is supported. However, opinions about virtual hugs and emoticons in online communities and emails were split among the participants. While some of them feel less alone when they receive a virtual hug, others do not feel touched by them at all, as one member of a health related online community put it:

Group C participant: *"I must admit I am left cold by virtual hugs. eg {{{{{{{{{{{{{{HUGS}}}}}}}}}}}}}}. That is the first time I`ve produced one, and it doesn`t look right, somehow."*

This is similar to Kanayama's (2003) finding that older people enjoy various ways of conveying emotions. Some of our participants mentioned that they would use emoticons, often as a way of greeting the other person at the end of an email or in a message posted to the online community. In contrast, others said that they felt emoticons are not a way for them to convey emotions. They argued that only younger people would use emoticons as they are a way of communicating emotions for people who have grown up with online communication amongst which they did not count themselves.

When it comes to encouragement via email, participants in group B mentioned that pictures are often sent to brighten up the other person. Either pictures of oneself, or pictures of places and events that one has been to are attached to an email to make it more personal and encouraging. Knowing what the other person looks like creates more intimacy and closeness between the communicators and is described as a sign of close friendship.

Group B participant: *"Photographs are really good, you get to know the person. […] [P]ictures can tell so much and you feel so much closer."*

8.3.4   Community building

8.3.4.1   Group feeling

When asked about the role of communities when it comes to offline support, participants in all three groups mentioned that they were part of various leisure communities, e.g. choirs, knitting group. They described their groups as places where

people engage in activities together and generally engage in light and casual talk. The sense of belonging to a community was described as being generally supportive. The fact that all members have something in common leads to a bond between the members and regular group meetings were described as supportive in the sense that they help to distract people from their everyday lives and worries. This sense of community is not only important for offline groups, but was also explicitly mentioned as an important characteristic of online communities. Similarly to the offline setting, participants in group C listed the feeling of togetherness as a very important strength of support in online communities. According to them, community-feeling is especially strong when people within the online community have something in common.

Group C participant: *"I think after a while forums do become small communities where everyone becomes personally concerned about the others."*

Many participants in group C said they made such strong connections within the online community that they started to have email-, phone- and often also face-to-face contact with those members. Some online communities had official face-to-face meetings. Participants mentioned that they established real and deep friendships with some of the members of their online community. One participant even mentioned that another member of her health-related online community came to be with her in a time of crisis. This is not particularly unique to older people as other studies have found that some people who get to know each other in online settings transfer their friendship or relationship to offline settings (Rheingold, 2000). Xie (2005) investigated online communities for older people in particular and her findings show that friendships in online communities often overlap with offline communities.

8.3.4.2   *Prejudice about online communities*

When asked whether they knew about online communities, most members of group A said that they were not familiar with the internet and thus didn't know that such communities existed. Furthermore, they did not show interest in how such online communities worked as they did not see how they could possibly benefit from participation. They were content with their offline support experiences and did not feel a need to search for further ways to exchange support.

All participants in group B knew about the existence of online communities but were suspicious about using them. They mentioned that they did not want to reveal

personal or emotional information in an online community, because they did not want to tell too many people about their situation. They stated that revealing personal information to a group of strangers would make them feel vulnerable to attack and humiliation. When participants in group B whose only online communication was email were asked why they did not participate in online communities, online communities were highly stigmatised and described as 'comfort zones' where people can fake their identities, lose all inhibitions, and play out secret roles that they dare not take on in 'real' lives. These suspicions did not seem to be rooted in experiences that participants had had in offline settings or while exchanging emails, but seemed to be based on stories that other people had told them. These participants also associated online communities with identity deception used by paedophiles and men getting to know women to cheat on their wives. Some participants also said that online communities were not real and therefore were mainly used by people who could not handle emotions and people who should not be trusted.

Group B participant: *"I think that they are very sad people that have to meet that way. Something is wrong somewhere, surely, to have to go to that."*

It seems that participants from group B who did not participate in online communities had a stigmatised and negative attitude towards online communities. In contrast, participants in group C who participated in online communities did not share this view and reported how they benefited from the participation in online communities. They especially mentioned the group feeling within an online community as one of its strongest, most positive characteristics.

8.3.4.3   Access to a high number of people

In offline settings, participants of all three groups reported that communities are especially helpful because they offer access to a large number of people. This is beneficial if one is searching for specific information or a service. The same benefit was also mentioned by participants in group C concerning online communities. The fact that online communities offer the possibility of gaining access to a lot of people strengthens the community-feeling as support is not just possible on a one-to-one basis but also on a one-to-many basis. Participants in group C stated that compared to offline settings, online communities sometimes even provide greater access to a lot of like-minded

people who are knowledgeable about the topic and that sharing knowledge within the community strengthens the bond between the members.

Group C participant: *"On-line communication can provide strength in numbers - if lots of people are sharing your own problem, there is more chance of solving it."*

This has also been found to be true for online support communities not specifically targeted at older people as it is in line with Maloney-Krichmar and Preece's (2005) finding that participants in an online support community valued "access to a wide variety of members, information, and experiences" (p. 8). Also, participants in group C viewed online communities positively because they are accessible at all times and information and support can be distributed to several people at once. People do not need to meet at a specific time, but can read and write messages at a time that is convenient for them. This is especially helpful for very busy people (e.g. caregivers) who might not have time to attend an offline support group. As some participants mentioned, they would like to be part of an offline support group, but their life situation does not allow them to have time off on a regular basis. Compared to offline support groups, they valued the opportunity to participate in online support communities at their own time and pace.

8.3.5   Factual information

8.3.5.1   Distribution of information

Participants from all three groups mentioned that they support each other in offline settings by passing on information. For example, one group A participant mentioned that he is very knowledgeable about pension benefits, because he had to go through the application process himself, and is now determined to help others in this situation to get the best out of it. He considers his knowledge as beneficial and wants to distribute it to as many people as possible. Participants stated that they feel empowered and motivated when they can pass on information and support to others.

Participants in group B mentioned that the exchange of email enhances the possibilities for them to pass on information. They described email as a very factual and straight-forward way of communication, and therefore considered email to be very valuable for exchanging information and giving practical advice to each other. Compared to distributing information in offline settings, they described passing on

information in email as easy, as they do not need to meet at the same time and all the information that has been exchanged can be saved. Also, people could read an email before sending it and make sure that the information they want to convey is complete and accurate before they send it.

Group B participant: *"[I]t is even better online, because you can think about what to write and write everything down, you don't forget anything and […] it is in front of their eyes. Details will be there, you can send it quickly. And even if they forget they can have a look at the email again."*

Similarly, the opportunity to distribute knowledge widely and quickly was seen as one of the most beneficial qualities of online communities by participants in group C. Participants said that they usually get quick replies to a question, as one of the many members will always know the answer. This is in line with findings from other studies, as the opportunity to distribute information and the fact that people get feedback are considered to be benefits of online communities in general (Maloney-Krichmar & Preece, 2005).

8.3.5.2   *Validation of information*

In contrast to offline support, participants in groups B and C mentioned that, in online support, one has to judge the accuracy of the received information. In offline settings, participants mentioned that they often know the person that they get the information from, and that they have a feel for how knowledgeable this person is. They are not concerned about the validity of the information in offline settings, as they find it easy to judge the quality of information when they talk to people face-to-face.

Participants in group C mentioned that people have to be careful not to assume that information from an online community is always accurate. They stated that the way people judge the validity of information in offline settings cannot be applied to online settings. Everybody can post in an online community and claim to be an expert even if they are not. Participants in group C also stated that one needs to be careful in online communities, because people might be insincere, attention seeking, and untruthful, which is difficult to detect. Compared to offline support, this was considered to be an issue that required more care in online settings. Similar concerns were raised by participants in group B concerning email-exchange, as they mentioned that it is very important to distinguish carefully between valuable and incorrect information in emails.

Being cautious about information in online settings is not a unique characteristic to older people and has also been found to be true for people of other ages (Bowker & Tuffin, 2003). However, the high frequency as well as the strong insistence with which my participants warned from incorrect information and misbehaviour showed that they seemed to place a lot of emphasis on this issue and that they considered it to be very important to always keep in mind that the information given might be wrong. They also stated that many other people make the mistake and are easily deceived by inaccurate information given in online settings as the fact that it is typed makes information sometimes look more official and correct than it is.

Group B participant: *"And...it is information, and […] a lot of people would take that as gospel, a lot of information that you do get over the net is very dodgy. And it is having a sort of sixth sense almost, to weed out what is relevant and what isn't. And what is accurate."*

Participants in group C mentioned that, in online communities, whether they would trust the information or not depends on the reputation of the poster. They will trust and believe members with a good reputation for giving helpful advice, but they are careful with information from new members as their reputation has to be established first. Often, participants take the information from an online community as a first step into further research.

8.3.5.3   Information based on experience

Participants from all three groups mentioned that they pass on information and show each other how to do things, but also encourage each other to learn new things and give each other confidence in approaching new and difficult tasks. Many mentioned that it is beneficial if the person teaching is about the same age as them and has gone through similar experiences. Often one person would know how to solve a problem, especially if she had been in the same or similar situation before. One participant in group A for example mentioned that she gets together with others to share experiences and help each other with filling out forms for the council, as this is something that they all have to do and the exchange of experiences helps all of them.

Similarly to the way experiences are exchanged in offline settings, participants in group C also reported that they often exchange information in online communities by describing their experience. For example they would exchange information about taking

vitamins to support a healing process by reporting on what vitamins they take and how often they take them. Learning from each other's practices was considered to be very valuable. Again, this is in line with Wright's (2000b) findings that older people disguise advice in online support communities by reporting on their own experiences. The fact that they all share a similar experience was often identified as the key reason for a feeling of togetherness within an online community.

Group C participant: *"Our initial connection had nothing to do with [...] politics, education, geography, or anything other than the fact that we have or have survived breast cancer. We may or may not agree or have anything in common on anything else, but we hang together on this issue."*

Being in a similar situation was found to be a vital component of online support communities in other studies (Maloney-Krichmar & Preece, 2005), not just in online support communities for older people. However, as mentioned before, in this study being of similar age (see section *8.3.2.4*) was also considered to be valuable in order to understand each other's thoughts and emotions. I conclude that not only being in a similar life situation but also being of similar age is beneficial for the exchange of support in online settings.

8.3.6   Off topic

Although intermittently talking about something completely different can be a relief for the person in need, participants from all three groups considered it to be important to stay on topic in offline support. Staying on the topic was not only found to be important in offline settings, but seemed to be even more important when it comes to support in online communication. Participants in group C said that it is important for online communities to have a theme or a purpose and that this should be clearly stated. They also mentioned that it is important that the discussion stays within the topic and that off-topic posts are inappropriate. Some of the participants in group C mentioned that they would meet the same people in different discussion boards. However, they would only ever talk to them within the topic of the discussion board and not refer to their conversations in other boards. As it is the purpose/topic that connects people in the online community, it is important to stick to that in a conversation.

Group C participant: *"None of us seem to talk about BC on other discussions - and we do meet each other elsewhere. Having BC does not define who we are."*

Participants in group C who are active in health-related online communities also mentioned that the conversations sometimes stray away from the topic, especially if there are no new members or nothing new happens. However, if somebody posts a new message requesting help in finding some information (e.g. a report), the communication quickly switches back on topic.

8.3.7   Technical issues

Some participants, especially in group A, mentioned that they believe their reluctance to use email to support each other in daily life is due to their age. They often referred to email being the communication of the younger generation, and that online communication required being able to speak a 'specific language' which is hard for them to learn, because they have not grown up with it. Furthermore, participants in group B mentioned that they use other forms of communication in combination with email, e.g. sending each other text messages to make sure that the other person reads the email, or phoning each other up to remind them to check their emails. This can be seen as a reason for the reluctance for using email as a means for social support because people are not sure whether others actually will read what they have written to them. When it comes to email-support, participants in group B mentioned that often their friends would not be computer-literate and not have access to email. Even if they wanted to exchange support via email, this was often not possible, because the people they know do not use email. Most participants in group B reported still feeling unfamiliar and alien towards the technology and would rather pick up the phone or meet up face-to-face when the reason for communication is more serious. Especially in times of stress and pressure, participants mentioned that accessing the internet and email would be a burden to them.

Group B participant: *"If I don't feel well, it is an effort, you have to switch on the computer and then you have to type. […]Also, when I am stressed, you see […] my typing goes out of control anyway, only god knows what language it would come out."*

8.4 Conclusion

8.4.1   Summary

This study addressed research question V and investigated older people's needs and preferences concerning online social support. In order to do this, I focused my

analysis on the seven different aspects of support determined previously: *Self disclosure, Deep support, Light support, Community building, Factual information, Off topic*, and *Technical issues* (see Table 4.3). In order to answer the research question, I divided it into three more detailed research objectives. For each of the seven categories I was interested in how older people perceive this aspect of support (research objective I - investigate the perception of the aspects of support by older people), what they think are the similarities and differences of the exchange of this aspect of support in online settings vs. offline settings (research objective II – investigate the situations in which older people exchange the aspects of support in online vs. offline settings) and what they perceive are the advantages and disadvantages of communicating this aspect of support online (research objective III – investigate the perceived benefits and disadvantages of exchanging the aspects of support in online vs. offline settings). In the following, I summarise how the findings address the research objectives for each aspect of support.

Self disclosure: Concerning the aspect of disclosing one's feelings to other people, participants clearly mentioned that it is important to establish a level of trust with the other person(s). This was described as being more difficult and time-consuming in online settings compared to offline settings. Also, participants mentioned inhibitions in disclosing personal information in online settings, especially in online support communities, as they felt uncomfortable with the fact that a lot of other people can read it. Participants also mentioned reluctance to talk about their problems with other people in offline settings. As a reason, they mentioned the fear of being a burden to the other person. The concern of being a burden did not exist when disclosing information about oneself in online settings. Participants even reported being more courageous and thus also more honest when talking about themselves in online settings due to the anonymity and the fact that they do not have to face the other person directly when writing a message.

Deep support: Participants mentioned that physical co-presence of the supporter and the person in need is often essential for the exchange of deep support. Although participants mentioned that it is possible to exchange emotional support in online settings, they also stated that the vulnerability to misunderstandings and misbehaviour in online settings is very high. Offline as well as online, participants reported being very cautious when giving explicit advice to one another, as they realise that they might not know what is best for the other person. For deep support in general, it was seen as an

important advantage when the supporter had experienced a similar or the same situation as the person in need. This was also mentioned as one of the advantages of online support communities, as they are usually focused around a topic, that each of the members is connected to. This was believed to strengthen the understanding and support within online support communities.

Light support: The exchange of light support was seen as an important aspect of support in everyday life. Casual talk and keeping informed about each other's wellbeing was essential for a strong relationship. Participants mentioned that email especially was a good way of keeping in contact with each other and exchanging news and light encouragement. Humour was considered an essential part of offline support, as it lightens people up, even in an otherwise serious situation. However, this was associated with difficulties in online support, as the receiver might misunderstand the humour. Instead of humour, participants mentioned exchanging uplifting encouragements in online support, sometimes including emoticons to show affection and the inclusion of pictures to encourage the receiver.

Community building: Being part of an offline community was considered to be supportive for participants. Having a group of people with whom they share similar interests and whom they meet on a regular basis provided them with a feeling of belonging. Also, being part of an offline community meant having access to a large number of people that would be beneficial should they need support. Participants who did not currently use online communities voiced a very sceptical and negative opinion about them. Prejudices about their members being sad and incapable of participating in 'real communities' were mentioned and they distanced themselves clearly from such people. In contrast, participants who were currently members of online communities stated positive feelings towards them, mentioning the same advantages as for the offline communities: a feeling of belonging and the access to many people.

Factual information: Concerning the exchange of factual information, participants mentioned the need to be very careful with trusting the accuracy of information received via email or read in online support communities. This concern was not mentioned when participants talked about the exchange of factual information in offline settings. An advantage of exchanging factual information in online settings was that, once written down, the information was always available for the receiver. Also,

information could be distributed to several people at once, which was rarely possible to the same extent in offline settings.

Off topic: Regarding all kinds of support, participants mentioned that it is important not to diverge from the topic. This was found to be true in online as well as offline settings. Especially concerning online support groups, participants stressed the importance of sticking to the topic of the community.

Technical issues: Throughout the interviews, I found that older people still reported having difficulties and inhibitions in using the internet. Especially concerning the exchange of support, participants stated that they do feel uneasy using the internet for that purpose. Support was associated with being in a distressed or tense situation, in which using the internet would only add to their distress. Thus, face-to-face or phone contact was preferred in these situations.

8.4.2   Contribution

Previous research has shown what older people do in online support communities (Kanayama, 2003; Pfeil & Zaphiris, 2007; White & Dorman, 2000; Wright, 2000b; Xie, 2005; Zaphiris & Sarwar, 2006) and how they perceive their participation in such online settings (McMellon & Schiffman, 2002; Wright, 2000a; Wright, 1999). This study was based on previous findings and went beyond existing research to investigate the experiences of support of older people and the role online support can or cannot play in these experiences. By putting the experiences of online support in relation to offline support experiences, I did not look at support in online settings in isolation but in relation to offline support. Thus, I elicited valuable information about where expectations, needs and preferences of older people concerning online support are rooted.

Also, I did not only elicit information from older people already using online support communities, but also integrated the views from older people who have the knowledge and ability to use online support communities but do not want to use them at the moments (group B who used email) and older people who are not using the internet at all (group A). Including also the view of older people who do not use the internet and do not participate in online support communities, I identified the reasons for their reluctance to do so. These findings help me understand older people's behaviour in

online support community settings and also in some cases the reasons for their non-participation.

In summary, this study investigated in detail older people's needs and preferences concerning the exchange of online social support. By covering older people with various experiences of using the internet and online support communities, I have provided a broad range of views on this topic, giving an extensive overview over people's views and expectations. For each aspect of support, I showed how people perceive this aspect of support, how this aspect of support differs for them between offline and online settings and what they believe to be the advantages and disadvantages of this aspect of support in offline and online settings. Thus, the findings of this study answer research question V (What are older people's needs concerning online support communities?). This study was published as a long paper in Interacting with Computers (Pfeil et al., 2009).

9 Discussion

This chapter discusses the findings of this PhD work in context of MOSuC. On the basis of MOSuC, the findings of the individual studies are combined and a holistic description of the online support community is provided.

Throughout this thesis, I have presented a series of individual studies conducted to investigate an online support community for older people. Although the studies all utilised the same set of categories, they analysed different aspects of the community and the findings were reported separately. Based on MOSuC (Model of Online SUpport Communities) (see chapter *3*), the individual findings are now combined in this chapter in order to provide a holistic description of the case study community. In order to do this, the findings of the individual studies are revisited in the context of MOSuC and the associations between them are discussed. The combination of the individual studies offers a detailed description of the online support community.

9.1 Mapping of the studies onto MOSuC

This section explains how MOSuC can be used to combine the results of the individual studies to allow for a bigger picture and understanding of the online community. In Figure 9.1 the individual studies are mapped onto MOSuC in order to visualise how they can be combined into a holistic description of the setting.
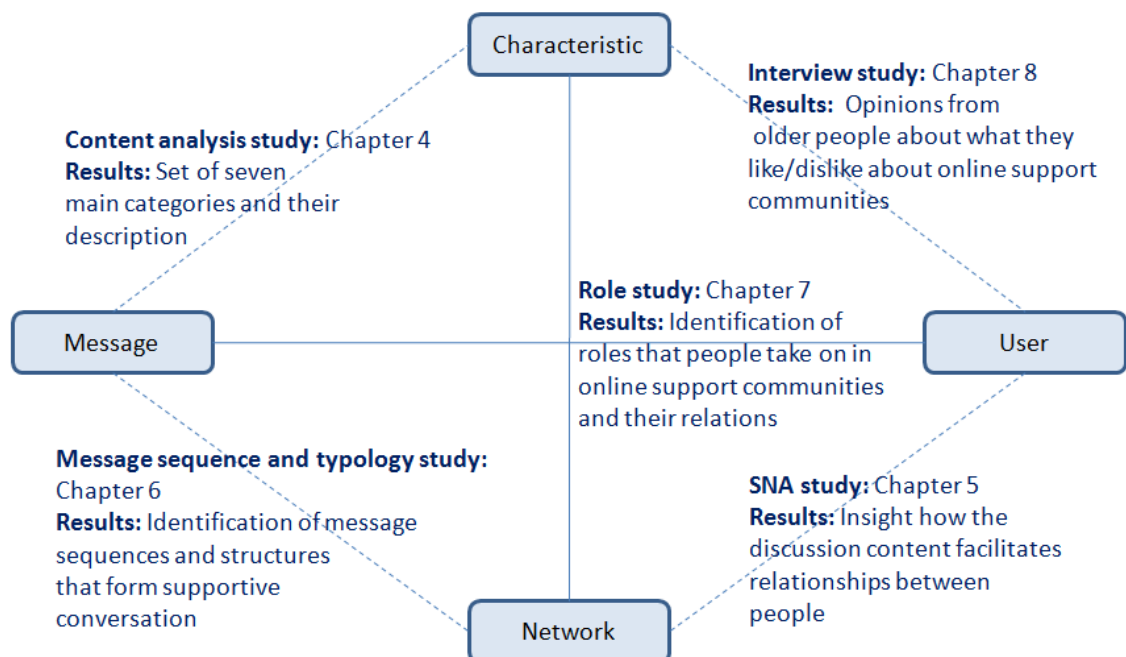
Figure 9.1: Mapping of the studies onto MOSuC

Up to now, each of the studies has been discussed individually. In chapter *4,* I investigated the characteristics of the messages that are exchanged in the discussion board about depression. In doing so, special emphasis was placed on the content of the messages. As a result, a set of seven categories that describe the communication content

was developed. In chapter *5,* I analysed the association between the content that members posted and the structure of the social network of related members in the community. Chapter *6* presented a study in which I utilised the set of seven categories in order to study the structure of online supportive conversation within the community. In chapter *7,* I analysed the roles that the members take on within the online support community based on their structural as well as behavioural attributes. Finally, chapter *8* reported the findings of interviews with older people about their opinions and perceptions of the online setting as a means to exchange social support. The set of seven categories was taken as guidance for conducting these interviews. Findings of the studies have been discussed in the respective chapters. However, as Mayring (2001) and Maloney-Krichmar and Preece (2005) state, additional insight into a setting can be obtained through the combination of several methodological approaches and the discussion of the similarities and differences of the findings of the individual analyses. In this thesis, MOSuC, a model describing the basic components of online support communities (see chapter *3*) is taken as a basis to combine the findings of the individual studies into a holistic description of the setting. In the following, the findings of the different studies within this thesis are combined and discussed in the context of MOSuC.

9.2 Holistic description of the case study community

In this section, the findings of the individual studies are combined in the context of MOSuC. In order to do so, the results are compiled for each of the seven categories that were developed in chapter *4* (see Table 4.3). The categories offer an appropriate basis for the compilation of the individual findings, as they have been applied and analysed in all the studies within this thesis. In the following, I go through every category individually and combine the findings of the individual studies based on MOSuC. This sheds light on the interaction and dependencies between the investigated aspects of the online support community. In detail, I integrate the following aspects for each category:

- *Message-characteristic quadrant:* I present the frequency of the catgegory in the 1.5 year data-set as well as in the 6 year data-set. In addition, I provide a brief description of the characteristics of the category (based on the findings reported in chapter *4*).

- *Message-network quadrant:* I present the message-sequences that the category is included in as well as the topology of related messages that is associated with this category (based on the findings reported in chapter *6*).

- *User-network quadrant:* I report the characteristics of the network structure of related community members (density, inclusiveness, closeness, reciprocity, cliques) that is associated with the category (based on the findings reported in chapter *5*)

- *User-characteristic quadrant:* I give a brief overview over older people's perceptions and opinions regarding the exchange of the content coded as the category (based on the findings reported in chapter *8*).

- *Combination of the user-network and the user-characteristic quadrants:* The role that is associated with the category is presented and described (based on the findings reported in chapter *7*). In cases in which a role is characterised by the exchange of several categories, this role is presented in the discussion of each of the categories.

After the discussion of the individual categories based on MOSuC, the additional insight that results from the combination of the findings is presented.

9.2.1   Self disclosure

The most frequent category within the data-set is the category *Self disclosure*. Figure 9.2 shows the category in the context of MOSuC. As Figure 9.2 shows, text units coded as *Self disclosure* occur in more than half of the messages that are exchanged in the discussion board about depression (in 71% of messages in the 1.5-year data set and in 56.61% of messages in the 6-year data set). In text units coded as *Self disclosure*, the poster provides information about her/himself. This includes narrative descriptions of the poster's day or activities and information about medical and emotional issues. Furthermore, text units coded as *Self disclosure* are very important components of online supportive conversations, as *Self disclosure* is one of the few categories that occurs at times of high as well as very low levels of activity in the community. Thus, it is often a self-disclosing message that starts a conversation in a period of a very low (or no) level of activity. The analysis of message-sequences further revealed that messages containing the category *Self disclosure* serve two purposes: (i) they encourage other members to write self-disclosing messages as well and (ii) they trigger others to provide deep (often emotional) support. Both aspects are very important and fundamental parts of the communication in the community.

Self disclosure

Frequency: 71% / 56.61%
Description: Text units in which people post information about themselves. This can be done in different ways (e.g. emotional, narrative, medical)

Benefits: No concerns about being a burden online; more courageous and honest online.
Challenges: Need to establish a certain level of trust; the fact that many read personal information promotes uncomfortable feeling.

Characteristic

Message

User

Prominent role: The support seeker
Attribute of role: Neither sends nor receives many messages; sends messages mainly to the whole community.

Associated message sequence:
Self disclosure–Self disclosure
Self disclosure–Deep support–Self disclosure
→ Occur at low as well as high level of activity
Associated message typology:
Inhibits lines
Promotes triangles (occurs especially in 1st and 3rd position) and cliques (occurs especially in 3rd and 4th position)

Network

Related network structure:
- High density
- High inclusiveness
- High closeness
- Low reciprocity
- High number of cliques

Figure 9.2: The category *Self disclosure* in the context of MOSuC

In addition, it was also found that the category *Self disclosure* is associated with a very interactive message structure, as it tends to occur in messages that are well embedded in a larger bulk of related messages. Thus, the category *Self disclosure* occurs throughout the whole conversation, and plays an important role in starting and maintaining an interactive conversation.

Figure 9.2 also shows that the category *Self disclosure* is associated with a highly connected network structure among online community members, as the exchange of text units coded into this category is associated with a high density, inclusiveness, closeness and a high number of interrelated cliques in the social network. Only the level of reciprocity is low between members exchanging text units coded as *Self disclosure*. This indicates that a person sending self-disclosing text units rarely receives answers that are coded as *Self disclosure*. This observation is further strengthened by the social role that is associated with sending self-disclosing messages: The support seeker. This role is characterised by sending self-disclosing messages for the purpose of triggering supportive replies.

Overall, the category *Self disclosure* seems to be a central component of the communication within the online support community. Asking older people about their

perceptions of and opinions about exchanging self-disclosing messages reveals that they see great potential in doing so, as online self-disclosure is described as more courageous and honest compared to its offline counterpart. However, they also mention inhibitions towards providing personal information to many other members and a high level of trust is considered to be essential for exchanging self-disclosing messages in online settings.

9.2.2 Community building

Figure 9.3 shows the category *Community building* in the context of MOSuC and visualises the interplay of the different aspects of the online community on the basis of this category.

Community building

Frequency: 61.5% / 38.81%
Description: The text unit includes people's opinion about the online community and meta-information about communication activities on the discussion board.

Characteristic

Benefits: Being member of online community provides access to many people; feeling of togetherness.
Challenges: Negative stereotypes about members of online communities.

Prominent role: No prominent role – the exchange of community building seems to be part of all roles except of the isolate.

Message

User

Associated message sequence:
Community building–Community building
Deep support–Community building
→ Occur at low as well as high level of activity
Associated message typology:
Inhibits lines
Promotes triangles (occurs especially in 3rd position)

Network

Related network structure:
- Very high density
- High inclusiveness
- Very high closeness
- Very high reciprocity
- High number of cliques

Figure 9.3: The category *Community building* in the context of MOSuC

As shown in Figure 9.3, the category *Community building* occurs quite often within the messages that are exchanged in the online support community (in 61.5% of messages in the 1.5-year data-set and in 38.81% of messages in the 6-year data-set). Text units coded as *Community building* mostly contain meta-information about the communication activities within the online community. This includes comments about the posting activities of the posters themselves and other online community members. In addition, text units coded as *Community building* strengthen the feeling of togetherness

between online community members as they praise the helpfulness and great support that is exchanged in the setting. Looking at the relation between the category *Community building* and the conversation structure, we can see that text units coded into the category *Community building* are often posted as a reaction to the reception of support (see the message-sequence *Deep support – Community building*). This means that text units coded as *Community building* occur after a supportive conversation and comment on the communication activities that have just taken place. Furthermore, the occurrence of text units coded as *Community building* is found to be associated with a triangular conversation structure of three inter-related messages with these text units mostly occurring in the third and last message that refers to two previous messages. This further explains the importance of the category *Community building* as a way of reflecting on the communication that has just taken place in the online support community.

As Figure 9.3 further shows, the exchange of messages containing text units coded as *Community building* is associated with a very high density, closeness and reciprocity among online community members as well as a high inclusiveness and a high number of cliques in the social network. These findings suggest that the exchange of text units coded as *Community building* is crucial for the development and maintenance of a feeling of togetherness within the online support community. This argument is further strengthened by the fact that content in the category *Community building* is not associated with a specific role in the community, but seems to be posted equally by all kinds of (active) members.

Older people who participate in online support communities generally find great value in the feeling of togetherness among online community members. Also, having access to many people who are in a similar situation is found to be beneficial. However, others (specifically older people who are not members of online support communities) have strong negative stereotypes about online community members. This indicates that one has to experience the togetherness and community feeling within an online support community in order to be able to value it.

9.2.3   Deep support

The category *Deep support* is one of two categories in the code scheme that is concerned with the exchange of support. Figure 9.4 shows the category *Deep support* in

the context of MOSuC. *Deep support* occurs in around a third of the messages that are exchanged in the discussion group about depression (in 38.25% of messages in the 1.5-year data-set and in 24.66% of messages in the 6-year data-set). Text units coded into this category are characterised by their very supportive content, including emotional support as well as advice based on personal experiences. In addition, text units coded as *Deep support* are often specifically tailored to the situation of the recipient of the message.

Figure 9.4: The category *Deep support* in the context of MOSuC

Looking at the position of the category *Deep support* in the conversation structure, we can see that text units coded as *Deep support* serve both as an answer to and a trigger for messages containing text units coded as *Self disclosure*. In addition, messages containing text units coded as *Deep support* are also often responded to by messages containing text units coded as *Community building*. Thus, the category *Deep support* seems to play a central role in the communication within the online support community. This suggestion is further supported by the fact that the category *Deep support* is associated with an interactive conversation structure as it is associated with conversation structures of three (triangles) or more (cliques) related messages.

Figure 9.4 shows that the exchange of messages containing text units coded as *Deep support* is associated with a very high density, closeness and a high inclusiveness in the social network of online community members. Furthermore, the exchange of *Deep support* is very strongly related to the formation of cliques indicating that *Deep support* is best exchanged in small subgroups of online community members. Similar to the category *Self disclosure*, the category *Deep support* is associated with a very low reciprocity in the social network. This indicates that a person who sends a message that contains text units coded as *Deep support* does not necessarily receive messages containing text units coded into the same category. Rather, sending and receiving messages containing *Deep support* occurs in combination with the exchange of other kinds of text units, often those coded as *Self disclosure* or *Community building*. This is also reflected in the prominent role associated with the category *Deep support*: The supporter. The supporter is described as a central person within the online community who is structurally close to all other members of the community. The supporter specialises in the distribution of messages coded as *Deep support*, and although (s)he also receives many replies, they do not necessarily include the category *Deep support* themselves.

The exchange of *Deep support* in online support communities is considered to be very valuable by older people. They state that the fact that online community members usually experience a similar situation improves the quality of the exchanged support. However, older people who are members of online (support) communities also state that the lack of physical contact decreases the quality of the support. Also, people tend to be cautious with explicit advice and would rather disguise advice in form of self-disclosing messages. In addition, the lack of non-verbal cues nurtures misunderstandings and misbehaviour in online support communities which can have a profoundly negative impact on the quality and credibility of the exchanged support.

9.2.4   Light support

Figure 9.5 shows the category *Light support* in the context of MOSuC. In addition to *Deep support*, *Light support* is the second category concerned with the exchange of support. Text units that are coded as *Light support* contain encouraging and uplifting support, often targeted towards the whole online community and not tailored to fit the needs of another specific member. In comparison to the category *Deep support*, the category *Light support* is described as being less emotional and more general. Also,

it occurs slightly more often than *Deep support* (in 42.75% of messages in the 1.5-year data-set and in 29.55% of messages in the 6-year data-set). Thus, although the category *Light support* does seem to be the 'light' version of support, its frequency shows that it is an important component of the communication within the online support community.
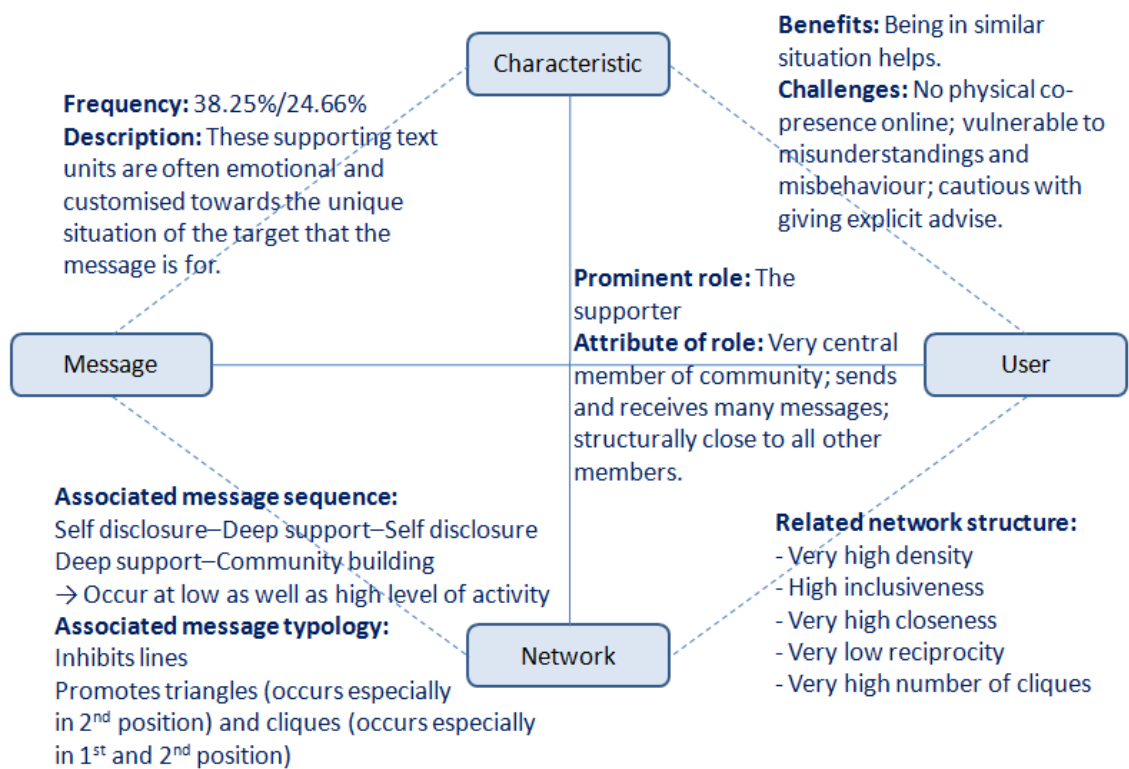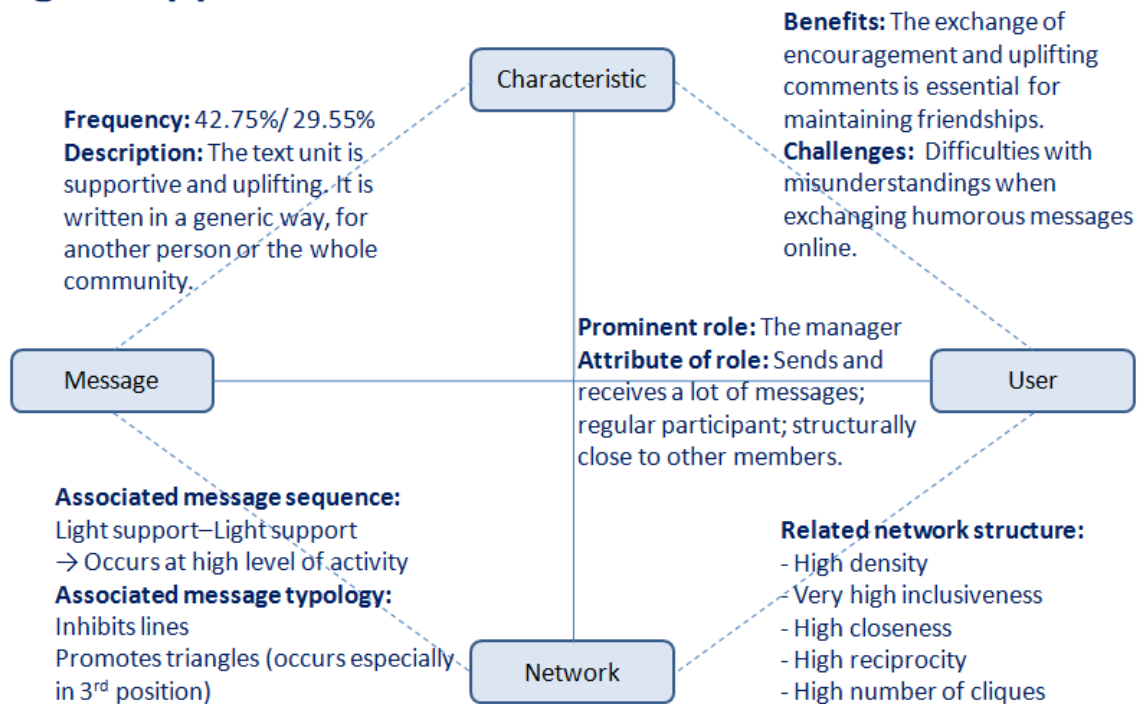

Figure 9.5: The category *Light support* in the context of MOSuC

Investigating the role of the category *Light support* in the conversation structure, we can see that the sending of text units coded as *Light support* encourages other members to post messages containing *Light support* as well. Thus, the exchange of *Light support* can be seen as a way of mutually keeping up the supportive atmosphere within the online support community. Similar to the category *Community building*, the category *Light support* is also related to a semi-interactive conversation structure, as the exchange of *Light support* is associated with triangle-shaped relations between messages.

Also, as Figure 9.5 shows, the exchange of text units coded as *Light support* is associated with a high density, a high closeness, a high reciprocity and a very high number of cliques in the social network of related online community members. Most importantly, the exchange of *Light support* is also related to a high inclusiveness among members, reinforcing the purpose of *Light support* as keeping community members attached to the communication activities. This finding is further strengthened when we

look at the prominent role that is associated with the exchange of text units coded as *Light support*: The manager. Tasks of the manager include being close to other online community members and nurturing and maintaining conversation within the community.

Older people who participate in online communication (email or online communities) consider the exchange of text units coded as *Light support* to be essential for keeping online friendships alive. However, text units coded as *Light support* are rarely exchanged when a person is in serious trouble. Rather, content coded into this category serves as a way of constantly reassuring each other that support and help is there in case it is needed.

9.2.5   Factual information

Figure 9.6 shows the category *Factual information* in the context of MOSuC. Text units coded into this category include factual questions and factual answers/ information about the topic under discussion. Around 15% of the messages exchanged in the online support community contain text units coded as *Factual information* (in 14.5% of messages in the 1.5-year data-set and in 16.34% of messages in the 6-year data-set). Thus, it seems that the exchange of messages containing this category does not play a prominent part in the communication within the online support community. This is further strengthened by the role of the category *Factual information* in message-sequences: Sending messages that contain text units coded as *Factual information* triggers messages that contain the same category again, indicating that there are message-sequences of factual questions and answers. These sequences are independent of the level of activity within the online support community. In addition, as Figure 9.6 shows, the exchange of text units coded as *Factual information* is associated with line-shaped and triangle-shaped formations of related messages, indicating that content coded into this category is related to a rather non-interactive conversation structure.

Factual information

Frequency: 14.5%/16.34%
Description: These text units include questions and answers about factual information within the topic (e.g. medication).

Characteristic

Benefits: Archived information is always accessible and information can be distributed to several people at once.
Challenges: Caution is necessary concerning the accuracy of information.

Message

Prominent role: The support seeker
Attribute of role: Neither sends nor receives many messages; send messages mainly to the whole community.

User

Associated message sequence:
Factual information–Factual information
→ Occurs independently from the level of activity
Associated message typology:
Promotes lines (occurs especially in 1st and 2nd position) and triangles (occurs especially in 1st position)
Inhibits cliques

Network

Related network structure:
- Low density
- Low inclusiveness
- Low closeness
- Very low reciprocity
- Low number of cliques

Figure 9.6: The category *Factual information* in the context of MOSuC

Figure 9.6 shows that the exchange of text units coded as *Factual information* is associated with a low density, low inclusiveness, low closeness, very low reciprocity and a low number of cliques in the social network of related online community members. This shows that the exchange of message content coded as *Factual information* is not linked to a high connectivity among online community members. Furthermore, the category *Factual information* is associated with the role of the support seeker who participates in the online support community in order to receive emotional and informational support and often asks factual questions in order to do so. Overall, the analysis of the communication activities suggests that the exchange of text units coded as *Factual information* plays only a minor part in the online support community. In contrast, older people who participate in online (support) communities perceive the exchange of *Factual information* as one of the most valued aspects of the communities, as online settings offer an easy and quick way to send, search and store information. The only caution that older people associate with sending and receiving factual information is that it is necessary to critically judge the credibility and accuracy of the exchanged information.

9.2.6   Off topic

The category *Off topic* describes message content that is not related to the topic of the online support community. Figure 9.7 shows the category *Off topic* in the context of MOSuC.
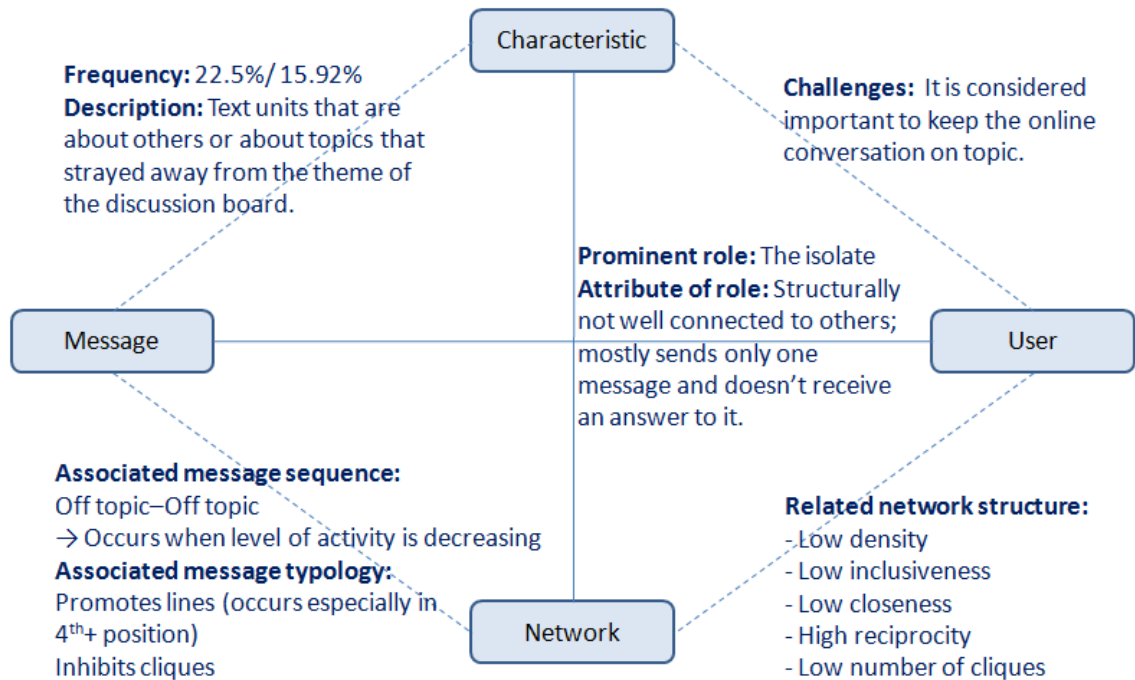
Figure 9.7: The category *Off topic* in the context of MOSuC

As can be seen, text units coded into this category occur in in 22.5% of messages in the 1.5-year data-set and in 15.92% of messages in the 6-year data-set. The content of these text units varies from the weather to general political issues, music and pets and other people and issues that are not related to the topic of the online support community. This difference between the category *Off topic* and other categories can also be observed when we look at the role of the category *Off topic* in the conversation structure: Once a person starts an off-topic conversation, others often join in and reply to this message with more messages containing text units coded into this category. This often results in a line-shaped, non-interactive conversation structure, in which one message is only ever related to one previous message. The longer the conversation goes on, the higher the proportion of messages containing text units coded into the category *Off topic*. Message-sequences consisting of two related messages that contain text units coded as *Off topic* are the only sequences that are associated with a decrease in the level

of communication activity within the community. This further supports the opposing nature of this category in comparison to all other categories.

In addition, the exchange of off-topic content is associated with a low density, low inclusiveness, low closeness and a low number of cliques in the social network of related online community members. However, the social network based on the exchange of messages containing text units coded into this category is characterised by a high reciprocity. This further supports the finding that most of the messages containing text units coded as *Off topic* are mutually exchanged between only a few members of the online support community.

The distinct nature of the category *Off topic* is further indicated by the fact that the category is associated with the role of the isolate, who is characterised by his/her lack of connections to other online community members. This shows that messages containing text units that are coded as *Off topic* are not appreciated within the online support community. This is also in line with older people's perception of off-topic content within online (support) communities, as no mention was made of the merit of exchanging messages that do not fit into the topic of the discussion. In contrast, the importance of staying within the scope and stated topic of the online support community was considered to be important for the online community to be beneficial for its members.

9.2.7 Technical issues

The least frequent category within the data-set is the category *Technical issues*. Figure 9.8 shows the category *Technical issues* in the context of MOSuC. Text units coded into this category are characterised by questions and/or information about the usage of the discussion board. Messages containing text units coded as *Technical issues* are often posted after participants experience technical problems when they try to log on or post/read messages. They then ask about solutions for this issue and others try to help and give suggestions on how to solve the problem. This category occurs very rarely (in 4.5% of messages in the 1.5-year data-set and in 6.45% of messages in the 6-year data-set). As Figure 9.8 shows, this category often occurs in a message-sequence of two consecutive messages. Often, these sequences consist of technical questions answered by technical information. Furthermore, these sequences occur independently from the level of activity within the discussion board suggesting that the exchange of messages

containing text units coded as *Technical issues* is somewhat detached from the remaining communication activities within the online support community. Furthermore, text units coded into the category *Techncial issues* tend to be exchanged in either line-shaped conversation (often a longer sequence of technical questions and answers between two members) or clique-shaped conversation (often a discussion of a technical issue on which more than two members comment).
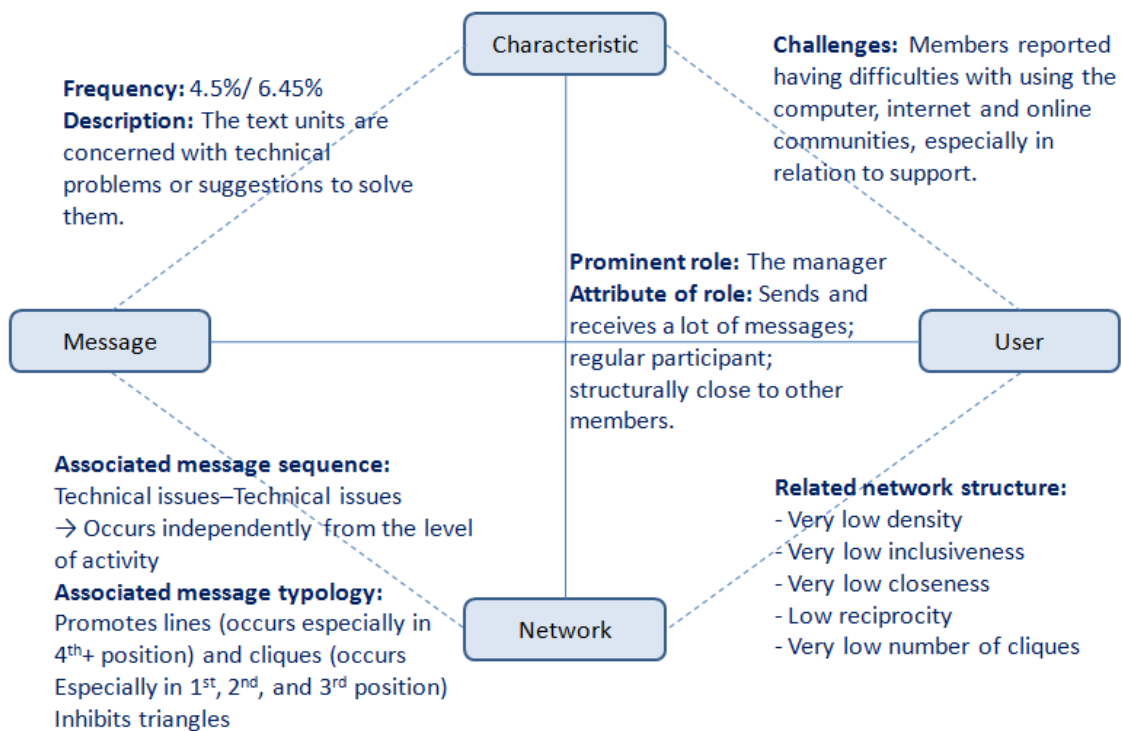
Figure 9.8: The category *Technical issues* in the context of MOSuC

The rare occurrence of the category *Technical issues* is also reflected in its role in the development and maintenance of relations between online support community members. The exchange of messages containing text units coded as *Technical issues* is associated with a very low density, very low inclusiveness, very low closeness, a low reciprocity and a very low number of cliques in the social network of related members. Although these findings suggest that the exchange of content coded as *Technical issues* is a marginal part of conversations within the discussion board, the category is associated with the social role of the manager. Thus, it is the responsibility of very prominent and central members to distribute content that is coded into this category. It is the manager who makes technical announcements that have to do with using the

online community and who solves any technical problems that other community members experience.

Older people consider computer literacy and knowledge about the internet and online communities an essential requirement for successful and satisfying participation in an online support community. Many older people still have difficulties in using the computer and the internet which hinders their participation. Especially considering participation in online support communities at times when people are experiencing emotional distress, any further strain caused by technology can have negative consequences for the participants.

9.3 Integration of the findings

The previous sections discussed in detail the findings of the studies within this thesis in the context of MOSuC. In doing so, special emphasis was placed on the categories developed in the code scheme. Each category was addressed individually and MOSuC was used to combine the findings for each category. This resulted in a holistic description of the discussion board about depression. In order to deepen this description and further conceptualise the findings, the focus is now shifted away from the categories towards the quadrants of MOSuC and their interplay. For each quadrant, the findings are distilled into two opposite qualities that describe this quadrant. Taking the categories as a basis, the dependencies and relationships between the qualities of the four different quadrants are then analysed. This results in an abstract description of the quadrants of MOSuC based on the findings of the case study community.

Table 9.1 summarises the main findings of the studies for each of the quadrants of MOSuC. Please note that this is done at a very abstract level: For each of the quadrants, the findings are reduced to two opposing qualities. The qualities are chosen based on the main results of the respective studies. Firstly, message content in the 'message characteristic' quadrant is divided based on the question of whether it is related to social support or not, the two qualities being 'associated with the exchange of social support' or 'not associated with the exchange of social support'. Similarly, the findings for the 'message network' and 'user network' quadrants are also split into two groups each: Message content that forms basic or peripheral components of conversation ('message network' quadrant) and message content that is associated with highly interconnected or loosely interconnected online community members ('user

network' quadrant). Concerning the perceptions and opinions of online community users ('user characteristics' quadrant), the message content is divided according to how difficult older people find it to exchange this aspect of the communication in online support communities (e.g. message content that users find easy to exchange and message content that users find difficult to exchange in the community). As the goal of this integration was to emphasise the dependencies and interrelationships between the four quadrants of MOSuC, the description of these quadrants is reduced to only two opposing qualities per quadrant in order to focus on the relationships between these qualities rather than the detailed description of the findings as discussed in section *9.3*. Thus, these abstractions reflect only a part of the findings of the individual studies.

Table 9.1: Summary of the main findings in context of the four quadrants of the model

Message characteristic	Message network	User characteristic	User network
Message content associated with the exange of social support: SD, DS, LS, FI (associated with support)	Basic components of conversation: SD, CB, DS (basic component)	Message content that users find easy to exchange in online support communities: FI, LS, CB, TI, (OT) (easy to exchange)	Message content associated with a highly interconnected social network of community members: SD, DS, LS, CB (highly interconnected)
Message content not associated with the exchange of social support: CB, OT, TI (not associated with support)	Peripheral content exchanged on top of the basic components: LS, FI, OT, TI (peripheral component)	Message content that users find difficult to exchange in online support communities: SD, DS (difficult to exchange)	Message content associated with a loosely interconnected social network: OT, TI, FI (loosely interconnected)

Based on the summary of the findings in Table 9.1, the associations between the qualities of the four quadrants are identified. For example, Table 9.1 shows that most of the categories that are associated with the exchange of social support (*SD, DS, LS,* FI) within the discussion board about depression are also associated with a highly interconnected social network of related online support community members (*SD, DS, LS*, CB). In contrast, categories that are not associated with the exchange of social support (*OT, TI*, CB) are in general related to a rather loosely interconnected network of online support community members (*OT, TI*, FI). Also, most categories that form the basic components of conversation within the discussion board are also associated with the exchange of social support, in contrast to the categories that are peripheral components of conversation. Furthermore, although the communication content associated with the exchange of social support seems to form the basic components of the conversation as well as being related to a highly interconnected network structure, the exchange of this kind of content was often perceived as much more difficult than the exchange of more informational and factual content. Please note that these associations

do not always fit perfectly, as they are considered valid when the majority of the categories in the respective quadrants match.

Figure 9.9 visualises the qualities of the four quadrants of MOSuC and their interplay based on the findings summarised in Table 9.1. Each quadrant is described by its two qualities and based on the findings reported in Table 9.1, the qualities of the individual quadrants are put in relation to each other. In addition, Figure 9.9 also visualises how the qualities of the quadrants and their interplay are related to the roles that were investigated as part of the research. Rather than providing a detailed description of the case study community, Figure 9.9 focuses on the relationships between the four quadrants of MOSuC and provides an integrated overview of the synthesis of the findings on an abstract level.
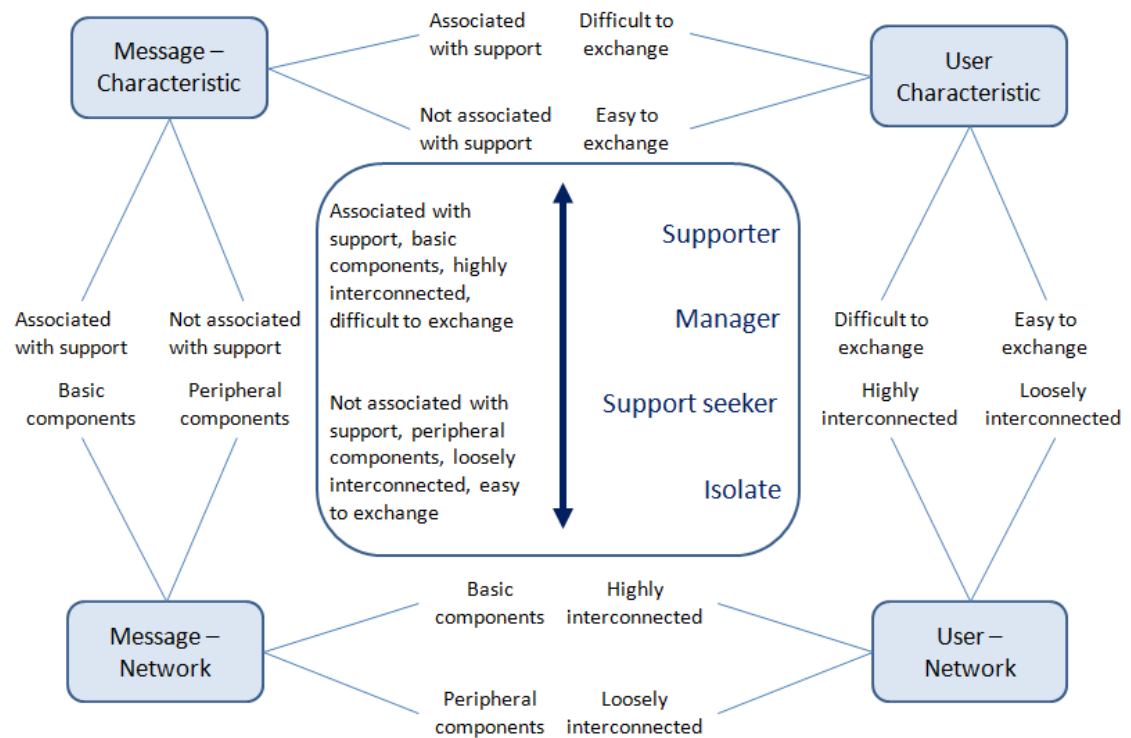
Figure 9.9: Relations between the four quadrants of MOSuC based on the findings of the studies within the thesis (inset: association of roles with the integrated findings)

In summary, Figure 9.9 shows that the online support community is characterised by two extremes: (i) message content associated with the exchange of social support that forms the basic component of the conversation, is related to a highly interconnected network structure among members, and is considered to be difficult to exchange in the online setting, and (ii) message content not associated with the exchange of social support that is a peripheral component of the conversation, is related

to a loosely interconnected network among members, and is considered to be relatively easy to exchange. The communication activity within the online support community takes place between these two extremes.

The distinction into the two extremes also fits the description of the four roles as these roles can be put alongside the two extremes, with the isolate posting message content that is not associated with the exchange of social support, a peripheral component of the conversation, related to a loosely interconnected network of community members and easy to exchange. In contrast, the supporter posts content that is associated with the exchange of social support, a basic component of the conversation, related to a highly interconnected network of community members and difficult to exchange. The two additional roles (manager and support seeker) also show tendencies to post messages that fit the description of one of these two extremes but not to the same extent as the isolate and the supporter (see Figure 9.9, inset).

Summarising, I conclude that MOSuC provides a framework, not only for a holistic description of the case study community (as discussed in section *9.2*), but also for an integration of the findings on an abstract level in order to show how the four quadrants of MOSuC are related. This integration offers insight into the case study community beyond the discussion of individual characteristics as it shows how different aspects of the case study community depend on each other.

9.4 Summary

In this chapter, I have drawn together the individual parts of the thesis in order to provide a comprehensive description of the case study community. Firstly, as a reminder, I put the research studies in context of MOSuC in order to link the theoretical part of the thesis (MOSuC developed in chapter *3*) to the practical studies (chapters *4-8*). This showed how the individual studies that had been treated separately could be combined based on the theoretical concepts of MOSuC.

Secondly, I discussed the seven categories that served as a basis for all studies in the context of MOSuC. For each category, I combined the findings from the individual studies and discussed their interplay on the basis of MOSuC. This provided a combination of the findings into a detailed description of the case study community. Each category was discussed in detail and its influence on the different aspects of the online support community was presented.

Thirdly, I discussed the qualities of the four quadrants of MOSuC and their interplay at an abstract level. Based on the previous discussion of the categories, I distilled the main qualities of each of the four quadrants and analysed their relations across different quadrants. This resulted in a comprehensive description of the different qualities of each of the aspects of the case study community and their interrelations.

In summary, the discussion of the findings of the individual studies in context of MOSuC allowed me to not only focus on the individual findings in isolation but also to analyse how the findings compliment and contradict each other. It showed how the different studies, each focusing on a different aspect of the online support community and utilising different methods (quantitative and qualitative), could be combined in order to provide a comprehensive and holistic description of the community.

10 Conclusion

In this chapter, the research questions are revisited and the contributions of this thesis are summarised. In addition, implications of the presented work for practitioners and scholars in related research areas are discussed. Finally, I elaborate how the work done in this thesis fits into current research activities and point out recommendations for future research.

The research reported in this thesis provides an in-depth analysis of an online support community for older people. In order to investigate the community from different perspectives, a set of research questions covering multiple aspects of the community was addressed. To answer these questions, a theoretical model (MOSuC) that describes the key aspects of online support communities was developed (see chapter *3*). In addition, five studies each addressing different aspects of the case study community were conducted. The findings of these individual studies were then combined in context of MOSuC to provide a holistic description of the community.

In this chapter, I revisit the research questions and discuss how they were addressed and answered in this thesis. In addition, the contribution of the thesis and its implications for researchers and practitioners in the area of HCI/CMC are stated. Finally, I discuss how this thesis informs current research activities and make recommendations for future research.

10.1   The research questions revisited

The key research question of this thesis was:

"How is social support exchanged in an online support community?"

In order to answer this research question, I focused on one specific case study community: the discussion board about depression within SeniorNet. Different aspects of this community were analysed. In order to do this, the key question was divided into seven sub-questions. In the following, I summarise for each sub-question how it was addressed and answered.

I. What are the characteristics of social support in the online support community?

This sub-question was addressed in chapter *4*. A code scheme describing the communication content of the discussion board about depression that had been developed in a previous research study (Pfeil & Zaphiris, 2007) was applied to two additional online support communities for older people within SeniorNet. In addition, a focus group was conducted in order to investigate the suitablility of the code scheme to accurately describe the characteristics of social support. Through these activities, the

code scheme was further refined and its applicability to other online support communities for older people was analysed.

As a result, a code scheme that consists of seven categories was developed (*Self disclosure, Community building, Deep support, Light support, Factual information, Technical isues,* and *Off topic,* see Table 4.3). Results of the analysis of the generalisation of the code scheme show that the final code scheme is applicable to other online support communities for older people beyond the topic of 'depression' (see section *4.2.2*). The final code scheme shows similarities to other existing code schemes addressing the exchange of social support. For example *Factual information* is similar to Cutrona and Suhr's (1992) *Informational support* category, Preece's (1998) *Factual information* category and Moursund's (1997) *Information* category. Also, *Self disclosure* shows similarities to Preece's (1998) category *Writing about own experiences*. Although the categories *Deep support* and *Light support* can be linked to the categories *Emotional support, Esteem support* (Cutrona & Suhr, 1992), *Positive feedback, Motivational support* (Moursund, 1997), as well as *Empathic messages* (Preece, 1998), these two 'kinds' of support differ in their focus and level of detail from similar categories in existing code schemes. The category *Community building* also shows similarities to Cutrona and Suhr's (1992) code scheme (*Social network support*), as well as Moursund's (1997) code scheme (*Belongingness, Companionship*). Finally, the categories *Off topic* and *Technical issues* do not show any similarities to the categories of other code schemes. In summary, this shows that the code scheme has some similarities to other code schemes for analysing social support in other online support communities (Cutrona & Suhr, 1992; Moursund, 1997; Preece, 1998). However, some unique features were also found, suggesting that this code scheme is particularly tailored to the case study community. The application of the code scheme to the case study community describes the communication activities within the community and thus characterises the exchange of social support in the setting. Throughout the following research activities, the categories of the code scheme served as a basis for analysis (see chapter *4*).

II. How does the exchange of social support influence the relations between people participating in the online support community?

This sub-question was addressed in a study that investigated the association of the communication content with the characteristics of the social network of related

members in the case study community. Utilising content analysis (with the categories developed in chapter *4*) in combination with social network analysis, findings of the study explain the relation between the communication content and the social network structure of related online community members. This study is reported in chapter *5*.

Findings show that emotional communication content (represented in the categories *Self disclosure*, *Community building*, *Deep support*, and *Light support*) is related to a very dense and connected network structure. In contrast, factual communication content (represented in the categories *Factual information*, *Technical issues*, and *Off topic*) is related to a very loose network structure. This is similar to a study from Maloney-Krichmar and Preece (2005) who found that empathic and supportive messages promote strong and close relationships between online support community members. Also, Xie (2008) found that different technical forms of online communication (e.g. chat, forum) promote different kinds of relationships (e.g. companionship, support) and Rheingold (2000) states that it is the strong feeling of togetherness in online communities that promotes relationships between online community members. In addition, findings in chapter *5* show that messages written in order to seek support (*Self disclosure)* are sent to the whole online support community, whereas messages including text units that provide support (*Light support* and *Deep support*) are often targeted towards individual members of the online support community. The importance of the messages containing the category *Self disclosure* is also supported by Arguello (2006) who found that sending messages containing autobiographical testimonials to the whole community nurtures conversation among community members. Also, when focusing on the impact of different kinds of support on the social network structure, findings in chapter *5* showed that text units coded as *Deep support* tend to be exchanged in small subgroups (cliques), whereas text units coded as *Light support* result in a high inclusiveness of the network, indicating that these messages tend to be distributed to almost all members of the community. This finding fits the theory of optimal matching (Cutrona & Russell, 1990) which explains that in order to exchange meaningful (deep) support, the support needs to fit the situation of the support seeker. Thus, meaningful support can only be exchanged between people who know each other very well, as might be the case between members of small cliques in an online community.

III. What is the conversation structure of supportive communication within the online support community like?

Two studies were conducted in order to address this sub-question. They are reported in chapter *6*. In the first study, emphasis was placed on message-sequences of two related messages. Applying message-sequence analysis, prominent message-sequences within the online support community were identified. These message-sequences were then related to the level of activity within the community. Findings show that message-sequences including text units coded as *Self disclosure*, *Deep support* and *Community building* compose the backbone of sustainable communication within the online support community. Notably, the sequence *Self disclosure – Deep support* fits Preece's (Preece, 1998) explanation that talking about one's own feelings and thoughts triggers supportive messages. Furthermore, the exchange of text units coded as *Off topic* was found to be related to a decrease in the level of activity within the community and is thus regarded as an hindrance for sustainable communication.

The second study focused on conversation patterns of three or more related messages. Based on the network of all related messages, I focused on three topologies: (i) lines, in which each message refers to only one previous message; (ii) triangles, a formation of three interrelated messages; and (iii) cliques, a formation of four or more interrelated messages. The content and composition of messages within these three topologies was analysed in detail. Findings show that these three topologies are associated with different kinds of communication processes. Short messages that are exchanged in a dialogue-style and contain mainly off-topic content are associated with a line-shaped communication structure. In contrast, the exchange of both emotional and informational support is related to the formation of triangles. In addition, cliques, being the most interactive topology, are associated with the exchange of experiences between community members. Rather than conversations between two or three people, cliques are linked to conversations among more members. They form a conversation context that invites members of the online support community to contribute their viewpoint about the issue under discussion. Overall, the importance of interactive message structure for the exchange of experiences and support fits with the findings of Rafaeli and Sudweeks (1997) who state that responsive and interactive messages are an important characteristic of online communities as they are believed to be more engaging and beneficial for their members (Rafaeli & Sudweeks, 1997).

IV. What kind of roles do people take on in the online support community?

This sub-question was addressed in a study analysing the social roles that members of the case study community take on. The study is reported in chapter *7*. Based on the behavioural characteristics of individual members (the quantity, size and content of messages that they post to the community), as well as their structural position within the social network (identified through the analysis of the structural equivalence between the members), a set of four roles was identified:

- *The manager*: This role describes fairly central members in the social network of the online community whose focus is on the distribution of technical advice (*Technical issues*) and general, uplifting support (*Light support*). This role is similar to the 'manager' role defined by Turner and Fisher (2006) and the 'moderating supporter' role identified by Pfeil et al. (accepted) since people in this role take responsibility for the well being of others and the maintenance of the community.

- *The supporter*: This role describes the most central members within the social network whose focus is on the distribution of personal and emotional support (*Deep support*). The supporters show similarities to the role of the 'central supporter' in Pfeil et al.'s (accepted) study. In addition, because supporters reply to both connected and rather disconnected actors, they match the 'supporter' role defined by Fisher (2005).

- *The support seeker*: This role describes members who have a moderately central position within the social network and whose main purpose in participating is to report their current situation (*Self disclosure*) and to ask questions (*Factual information*) in order to receive emotional support or information. Support seekers show similarities to Turner et al.'s (2005) 'questioner' role, which manifests as few and short messages sent, but more and longer messages received. Due to the low volume of messages they post, support seekers also exhibit similarities to Brush et al.'s (2005) 'low volume contributors'.

- *The isolate*: This role describes members who are characterised by a very low centrality and who often send only one message to the community. As these messages mostly contain content that is not related to the topic of the community (*Off topic*) they rarely receive an answer to it. The fact that isolates are not very active and post a lot of off-topic content makes them similar to Pfeil et al.'s (accepted) roles of 'passive member' or 'visitor'.

V. What are older people's needs concerning online support communities?

This sub-question was addressed in chapter *8*. Based on interviews with 31 older people, their needs and preferences concerning online social support were investigated. For each of the seven categories in the code scheme, I analysed how older people perceive this aspect of support, what they think are the similarities and differences between the exchange of this aspect of support in online versus offline settings, and what they perceive are the advantages and disadvantages of communicating this aspect of support online.

Findings show how older people with different levels of expertise concerning the use of the internet, email, and online support communities perceive the exchange of social support in the respective settings. The study describes in detail the perceptions and expectations of older people when it comes to the participation in online support communities. Challenges as well as benefits are summarised concerning each of the seven aspects of communication in order to describe the needs of older people as regards their participation in online support communities.

VI. What methods are appropriate for studying online support communities?

This sub-question was addressed directly in a literature review of appropriate research methods for analysing aspects of the online support community (see section *2.4*). Indirectly, the application of existing, modified and novel methods in chapters *4-8* also addressed this sub-question.

I chose to apply a combination of different qualitative (qualitative content analysis, interviews) and quantitative (social network analysis, message-sequence analysis) research methods. Existing methods and tools were modified in order to suit the research questions. For example, the application of social network analysis in order to analyse the conversation structure (see section *6.2*) presented a novel way of investigating conversation based on an existing research method. Also, Jeong's (2005a) 'Discussion Analysis Tool' was modified and applied in order to investigate the content of frequent message-sequences within the community. Furthermore, a code scheme describing the communication content within the online support community was utilised in order to link the individual studies. For example, the categories served as guidance for the semi-structured interviews (see chapter *8*).

In addition, existing methods were integrated in new ways. For example, content analysis and social network analysis were combined in order to investigate the

association of the communication content and the social network structure of related members of the online support community (see chapter *5*). Also, message-sequence analysis was combined with the analysis of the level of activity in the online community (see section *6.1*) in order to analyse the association of the message-sequence with the level of activity in the community. Furthermore, the identification of the roles that older people take on in the online community was based on an integration of the analysis of the content of the messages (content analysis) and members' structural positions in the network (social network analysis) (see chapter *7*).

I chose to integrate multiple methods in the investigation of the case study community because it allowed for detailed analyses of different aspects of the community as well as the combination of the findings into one holistic description of the community.

VII. How can a model provide a holistic description of the online support community?

In order to address this research question, MOSuC (Model of Online Support Communities), a model that describes the components of online support communities, was developed (see chapter *3*). MOSuC was later utilised in order to combine the findings of the individual studies within this thesis into a holistic description of the case study community (see chapter *9*).

The development of MOSuC was separated into two steps: Firstly, the components of MOSuC were defined based on a literature review of CMC theories as well as theoretical perspectives on social support. Two perspectives were identified on the basis of which online support communities can be described:

- the 'user – message' perspective, describing the users of the online community and the messages they post as the main units of online support communities, and
- the 'characteristic – network' perspective, describing two main approaches to the analysis of an online support community: (i) placing the focus of the analysis on the characteristics of the investigated units or (ii) placing the focus of the analysis on the relations between these units (e.g. how they form a network).

Summarising, the 'user – message' perspective is based on CMC theories, making this perspective applicable to *online* communities in general. In addition, the

'characteristic – network' perspective is based on theoretical perspectives on social support and is thus applicable to *support* communities. The combination of these two perspectives resulted in the identification of the four quadrants of MOSuC which describe the main components of *online support* communities: 'message – characteristic', 'message – network', 'user – characteristic', and 'user – network'. Existing research studies that analyse online (support) communities were mapped onto MOSuC in order to: (i) analyse whether MOSuC provides an adequate representation of existing research studies (Can all studies be mapped onto MOSuC?), and (ii) to investigate whether existing research studies cover all perspectives identified by MOSuC (For each study, which quadrant(s) of MOSuc does it address?). Results showed that all reviewed studies could be mapped onto MOSuC which indicated that MOSuC provides a sound basis for describing different components of online support communities. This shows that MOSuC is applicable to all kinds of online support communities. Some studies were mapped onto only one quadrant of MOSuC, whereas others were mapped onto two or three quadrants of MOSuC. This indicated that all studies missed one or more perspectives in their analysis, and had difficulties in providing a holistic description of the community. The development of the model is described in detail in chapter *3*.

After reporting the separate analyses of the different aspects of the online support community in chapters *4-8*, MOSuC was then utilised to combine the individual findings into a holistic description of the community (see chapter *9*). Based on this description, the qualities of the four quadrants of MOSuC and their relations were discussed at an abstract level. This resulted in a comprehensive description of the different qualities of each of the aspects of the case study community and their interrelations.

10.2   Thesis contributions

This thesis presents a holistic investigation of an online support community for older people. This was achieved by focusing on the integration of different aspects of the case study community, applying different methodological procedures as well as integrating different theoretical backgrounds.

Multiple individual studies were conducted in order to analyse specific aspects of the community and these were then integrated in order to show not only the

characteristics of these individual aspects but also how they relate to each other. In addition, existing methods were adapted and modified in novel ways. The integration of these methods offered insight into the case study community beyond the level of the individual analyses. Also, MOSuC was developed based on an integration of different theoretical backgrounds (CMC theories and theoretical perspectives on social support). Based on this model that describes the components of online support communities, the findings of the individual studies were combined in order to provide a holistic description of the community. In the following, the three main contributions of this thesis are highlighted: The findings of the studies, the contribution of MOSuC, and the methodological contributions. Implications of each of the contributions for related research and design in the area of CMC/HCI are also discussed.

10.2.1 The findings of the studies

The results of the individual studies within this thesis are of significant value for scholars and practitioners within the area of CMC/HCI as they contribute to the heavily discussed topic of the success and suitability of online communities for exchanging social support:

- The analysis of the characteristics of social support (see chapter *4*) gives detailed insight into the aspects of support exchanged in the case study community. The categories of the code scheme identify the different kinds of communication content, and the extent to which they are supportive. In comparison to existing code schemes (e.g. Cutrona and Suhr (1992), Moursund (1997), Preece (1998)), the code scheme developed in this thesis offers a synthesis of existing categories as it places emphasis on the different levels of support (e.g. *Light support*, *Deep support, Information*), as well as including categories that nurture the exchange of support without being supportive themselves (*Self disclosure* and *Community building*) and categories that are not connected to the exchange of support but nonetheless important components of the communication content in the case study community (*Technical issues* and *Off topic*). The analysis of the frequency of the categories provides an indication of the importance of the different kinds of communication content in the online support community. For example, results show that the exchange of support (*Light support* and *Deep support*) occurs much more frequently than the exchange of factual information (*Factual information*).

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- The analysis of the social network of related members in the case study community (see chapter *5*) clearly shows the associations between exchanging different kinds of communication content and the amount and strength of relationships among members of the community. The fact that the distribution of self-disclosing, supportive and community-building messages is related to a higher centrality and connectivity among members in the community underlines the importance of such messages for the development and maintenance of relationships in the community. The importance of supportive messages is similar to findings from Maloney-Krichmar and Preece (2005) who state that empathic and supportive messages promote strong and close relationships between online support community members. In addition, the importance of self-disclosing messages for strong relationships among online support community members was also investigated by Preece (1998) and Arguello (2006), who conclude that the disclosure of personal testimonials is a crucial component for successful communication and strong relationships among members in online support communities. Thus, although the findings of this study are specific to the case study community, similarities to other online support communities were identified.

- The analysis of the conversation structure and its relation to the level of activity within the online community as discussed in chapter *6* identifies the components of supportive conversation that are associated with a sustainable conversation within the community. In particular, the interplay of self-disclosing and supportive messages is found to be an important message construct for both starting as well as maintaining conversation. This finding is similar to Preece's (1998) discussion about self disclosing messages triggering supportive responses. In addition, the interactivity of the conversation was found to be positively related to the success of the case study community. This is in line with Rafaeli and Sudweeks (1997) who state that responsive and interactive messages are crucial for an engaging and beneficial communication in online communities (Rafaeli & Sudweeks, 1997). Summarising, the two studies reported in chapter *6* show how the composition of different communication content is related to the success of the online support community.

- In addition, a critical aspect of successful support communities is the extent to which members provide each other with support. The analyses of the roles that

people take on within the community (see chapter *7*) showed that people providing support (the supporters) and people managing the communication activity (the managers) are amongst the most active members of the community. Thus, similar to previous work analysing roles in online (support) communities, the importance of members providing support (e.g. 'central supporter' in Pfeil et al. (accepted), 'supporter' role defined by Fisher (2005)) as well as members managing the communication activity within the community (e.g. 'manager' role defined by Turner and Fisher (2006), 'moderating supporter' role identified by Pfeil et al. (accepted)), was highlighted. This suggests that the number of frequent posters in an online support community could be an indicator of the community's effectiveness in terms of providing support.

- The analysis of older people's perceptions of the support exchanged in online settings puts the previously observed phenomena into perspective and provides an additional angle on analysing the case study community. Discrepancies between the observed behaviour and older people's perceptions are identified. For example, although very prominent in the case study community and most valued by older people, the exchange of personal and emotional support in online support communities was also considered to be difficult and prone to misunderstandings and misbehaviour due to the lack of non-verbal cues and physical contact.

In summary, the numerous investigations in this thesis provide a multi-faceted analysis of the case study community and help reveal how different components contribute to a successful online support community. Although the findings of the individual studies are specific to the case study community, the similarities to previous studies discussed above show that some of the findings are likely to be generalisable to other kinds of online (support) communities.

10.2.1.1   *Implications for the design of online support communities*

A detailed understanding of the characteristics of social support in online support communities can help designers in developing technologies that nurture the exchange of social support. Although the description of a full set of design implications is out of the scope of this thesis, two illustrative examples of how the findings of the individual studies can be utilised as design implications are given below:

- The taxonomy of roles based on individuals' network structures and behaviour provides an in-depth understanding for developers as to how various types of users interact with each other, and the patterns of their posting behaviour. Thus, online communities that nurture supportive communication can be designed more successfully. For example, supporters were found to be the most central members within the online support community. They exchange messages with a great variety of community members. Also, supporters send a lot of messages to individual members as well as to the whole community. Looking at the content of messages from supporters, I observed a strong focus on the distribution of text units coded as *Deep support* (see chapter *7*). Thus, findings of the role analysis show that active participation in the online support community leads to a person occupying a central role within the social network of the community as well as an increase in the amount of supportive messages. As a community designer whose aim is to design for a high level of supportive message content, this finding entails the implication to provide incentives for community members to be more involved in the discussions, potentially motivating them to take on a supporting role. Such incentives could, for example, give an official status to frequent and important supporters in the community. This could confirm the role they have taken, and make their importance to the community evident both to themselves and others.

- Several of the studies in this thesis have stressed the importance of messages containing personal information. For example, in the analysis of the communication content (see chapter *4*), the category *Self disclosure* was found to be very frequent, as it occurs in 207 out of 869 text units in the first 400 messages (see Figure *4.4*) and in 56.61% of all messages (see Table *6.2*). In addition, the analysis in chapter *5* revealed that communication content coded as *Self disclosure* is associated with keeping the members of the community connected as it is most often sent to all community members instead of specific others (see Figure *5.2*). Furthermore, communication content coded as *Self disclosure* was found to be a basic component of the conversation structure, as it often starts a conversation, even at times of low level of activity. Thus, self disclosing messages serve as the initial component of a conversation that trigger the exchange of social support (see chapter *6.1*). Based on the importance of messages containing personal information about the poster identified in several studies in this thesis (see especially chapter *4*, *5* and *6*), another implication could be to make users feel comfortable posting about their personal

thoughts and feelings. Design guidelines that improve trust (Shneiderman, 2000) for instance could be beneficial since a higher number of people posting about themselves contributes significantly to a sustainable conversation as well as a dense connectivity among online support community members.

These two cases provide examples of how the findings of the individual studies can be utilised as design implications. Depending on the topic and target population of the online support community and the intention of the designer, further implications can be drawn based on the findings of the individual studies within this thesis.

10.2.1.2   *Implications for community moderators*

Furthermore, the findings of the individual studies within this thesis can help moderators who maintain online support communities. When moderating such communities, it is essential to know about the nature of online support and its impact on the conversation as well as on the development of relationships among community members. Often, moderators struggle to apply their knowledge from offline communication styles to online communication. The findings of the studies give insight into the influences of technology and the nature of online communication on social support which could guide moderators in their task. As examples, some of the findings and their implications for moderators of online support communities are given:

- The findings of the interviews show that older people perceive the exchange of factual information in online settings to be much easier than the exchange of personal and emotional information. Concerning the exchange of information, participants valued the fact that, once written down, the information was always available for the receiver. Also, information can be distributed to several people at once, which is rarely possible to the same extent in offline settings. In contrast to this, participants stated that the vulnerability to misunderstandings and misbehaviour in online settings is very high. This led to the fact that participants reported being very cautious when providing personal information and exchanging social support in online settings (see chapter *8*). However, results from further studies in this thesis also show that providing information about oneself and distributing emotional support are very important for the success of online support communities. For example, the exchange of communication content coded as *Self disclosure* and *Deep support* was found to be related to a high density (see Table

5.1), inclusiveness (see Table *5.5*) and closeness (see Table *5.7*) in the network of related community members. In addition, these two categories play a very important role in the supportive conversation in the case study community, as posting self disclosing messages triggers supportive replies as well as supportive messages encouraging members to provide more personal information in response (see Figure *6.4*). Thus, community moderators should help provide a nurturing and supportive atmosphere in order to make people feel safe and make it easier for them to talk about their personal feelings and provide emotional support by providing a good example themselves and being vigilant to prevent misbehaviour.

- In multiple studies throughout this thesis, it was found that the feeling of togetherness is very important for the success of an online support community. For example, communication content coded as *Community building* was found to be very frequent in the case study community (see chapter *4*), as 208 out of 869 text units in the first 400 messages were coded in this category (see Figure *4.4*), and 38.81% of all messages contain *Community building* (see Table *6.2*). In addition, the study reported in chapter *5* revealed that the exchange of messages containing *Community building* is associated with a high level of density (see Table *5.1*), inclusiveness (see Table *5.5*), closeness (see Table *5.7*), and reciprocity (see Table Table *5.11*) in the network of community members and is thus related to the formation of strong relationships among them. Finally, the category *Community building* was also found to be important in conversation structure as it serves as a way to reflect on the conversation and acknowledge its value for the community as well as individual members (chapter 6) . In contrast to the offline setting, explicit reflections upon activities within the community, as well as messages that report on the value of the community, are necessary to provide this community feeling. Moderators should therefore not only promote the exchange of informational and emotional support but should also give room to reflections upon the activities in the community, as well as encourage people to provide an explicit description of the atmosphere and supportiveness of the community in their messages.

- Findings of the interviews (see chapter *8*) reveal that many older people still experience barriers and technical difficulties when using the computer and the internet. Especially concerning the exchange of support, participants stated that they feel uneasy using the internet for that purpose. Support was associated with being in

a distressed or tense situation, in which using the internet would only add to their distress. Thus, face-to-face or phone contact was preferred in these situations. These problems hamper their participation in online support communities. Moderators should watch out for people experiencing difficulties using the online support community and should be prepared to give simple and straightforward guidance in order to help. In addition, a simple and easy-to-use interface to the community, as well as on-site guidance for technical problems, might help to address this issue.

These three bullet-points provide only examples of how the findings of the individual studies can help moderators with their task. Overall, all findings in this thesis contribute to a better understanding of the exchange of social support in the case study community and can thus provide help and guidance for moderators of online support communities.

10.2.2 Contributions of MOSuC

The second main contribution of this thesis is the development and utilisation of MOSuC. MOSuC was developed based on CMC theories as well as theoretical perspectives on social support. It describes the components of online support communities (see chapter *3*). Later, it was utilised in order to combine the individual studies in the thesis to provide a holistic understanding of the case study community (see chapter *9*). These two contributions of MOSuC are discussed in more detail in the following.

Description of the components of online support communities: MOSuC offers a way for practitioners and researchers to approach online support communities based on an integrated perspective of social support and CMC research. As discussed in chapter *2*, neither CMC theories nor theoretical perspectives on social support are on their own sufficient to fully describe online support communities. On the one hand, the literature about CMC theories explains how the mediated communication differs from offline communication. This resulted in the 'user – message' perspective of MOSuC which describes the main components of *online* communities. On the other hand, the theoretical perspectives on social support provide an explanation of the characteristics and dynamics of social support. This resulted in the 'characteristic – network' perspective of MOSuC which describes the main components of *support* communities.

These two perspectives were combined and resulted in MOSuC, a model which integrates these two perspectives (*online* and *support*) and provides an all-encompassing description of the components of *online support* communities. Thus, MOSuC is suitable for the description and analysis of online support communities. The mapping of existing research studies onto MOSuC showed that MOSuC sufficiently describes the components of online support communities, as all studies could be mapped onto one or several quadrants of the model. In addition, it also showed that most existing studies only investigate a few components of online communities as most studies did not cover all four quadrants of MOSuC.

As researchers up to now have mainly studied online support communities from either the CMC perspective or from the perspective of social support research, MOSuC provides an opportunity to approach online support communities based on a combination of these two perspectives. The description of MOSuC shows how the different foci of these two perspectives can be integrated, as the objects of online support communities (user – message) are identified based on CMC theories and the lens through which these objects can be analysed (characteristic – network) is based on theoretical perspectives on social support. Thus, the model provides guidance for researchers as regards the planning and conduction of analyses rather than describing detailed steps on how to procede when analysing online support communities.

Combination of the findings using MOSuC: MOSuC was utilised in order to integrate the findings of the individual studies into a holistic description of the case study community (see chapter *9*). In detail, MOSuC integrated the different analyses of the following aspects of the case study community:

- the characteristics of social support,
- the structure of supportive conversation,
- the social network among online community members,
- the roles that people take on in the community, and
- older people's perceptions of online social support.

MOSuC was utilised in order to combine the findings of the individual studies and provide an all-encompassing understanding of the case study community. Rather than prescribing the detailed steps that should be conducted in a holistic analysis of an online support community, MOSuC provides a framework that guides the researcher in

design of his or her research questions and methods.The application of MOSuC in this thesis shows one of many possible examples of how the model can be utilised. Thus, MOSuC contributes a sound basis upon which multiple analyses of different aspects of the community can be combined.

In addition to the holistic description of the case study community, the combination of the findings was discussed on an abstract level. To this end, MOSuC facilitated an abstract description of the relations and dependencies between the investigated aspects of the case study community (see section *9.3*). Thus, MOSuC not only provides a structure upon which different aspects of the online support community can be described, but it can also be utilised in order to investigate and describe the dependencies and interplay between these different aspects. MOSuC contributes to an analysis of online support communities that goes beyond the investigation of individual aspects.

10.2.2.1   *Implications for CMC research*

MOSuC has multiple implications for research in the area of CMC/HCI. It shows how different research perspectives can be integrated in order to provide a combined basis for analysis, it provides a novel way of structuring and combining existing analyses of online support communities, and it encourages and supports the combination of multiple methods and analyses into a holistic description of further case study communities. These main implications are explained in detail in the following:

- The way in which MOSuC was developed (based on theoretical perspectives from two different research areas) shows the advantages of an approach that combines perspectives from different research areas. This has important implications for an interdisciplinary research field such as CMC/HCI. Depending on the focus of the analysis and the associated areas of research, the development of MOSuC can be taken as an example of how to combine and integrate different perspectives in order to provide a sound basis for analysis. Rather than investigating the same setting from different perspectives, the integration of the approaches can provide additional insight. Thus, the development and utilisation of MOSuC in this thesis encourages and guides the development of similar, integrational models in the area of CMC/HCI.

- The development of MOSuC impacts significantly on the organisation and integration of current research into online support communities. The quadrants of MOSuC can be used in order to identify the focus of existing studies, as well as their relations and dependencies to other studies in this field. Thus, MOSuC helps to put individual studies addressing different components of online support communities in perspective relative to each other and can be utilised in order to integrate these findings in order to provide insight into the nature of online support communities as a whole.

- In addition, MOSuC can also be utilised by individual researchers in order to combine analyses of individual aspects of a case study community, thus providing a comprehensive description of the community. Similarly to the utilisation of MOSuC in this thesis, the model can be applied in order to analyse a specific online support community in detail. Doing so, it encourages and guides researchers to a more holistic approach to studying online support communities.

In summary, MOSuC has implications for research in the area of CMC/HCI on several theoretical as well as practical levels.

10.2.3 Methodological contributions

In this thesis, multiple methods were applied in order to address the research questions. The methodological contributions arise especially from the novel adaptation and application of the content analysis, message-sequence analysis and social network analysis methods, as well as the integration of these and additional methods into a holistic analysis. These contributions are described in more detail in the following:

- *Content analysis:* In this thesis, content analysis was utilised in different ways in order to investigate the communication content of the case study community. The application of inductive, qualitative content analysis showed how a set of categories that describe the communication content can be identified based on the messages in the online support community (see chapter *4*). In addition, deductive quantitative content analysis was conducted in order to establish a basis for further analysis, for example the identification of roles based on the communication content (see chapter *7*), or the analysis of the content of messages sequences (see section *6.1*). Whereas content analysis is a method often applied in CMC research, this thesis showed how

it can be adapted to suit different needs. Whereas the aim of the inductive qualitative analysis was to describe the communication content with a set of categories, the deductive quantitative content analysis was conducted in order to utilise the categories for further analysis. Thus, the studies in this thesis showed that a mixture of qualitative and quantitative as well as inductive and deductive content analysis can provide comprehensive insight into the communication content of an online community.

- *Message-sequence analysis:* In the application of message-sequence analysis, I built on Jeong's (2005a) 'Discussion Analysis Tool' (DAT). I customised DAT for the purposes of my analysis by taking the set of categories as well as the previously coded messages as a basis. In addition, the analysis of message-sequences was combined with the analysis of the level of activity within the case study community. In the analysis of the level of activity, a running average was calculated which provides the opportunity to analyse changes in time independently from predefined time periods. The combination of these two analyses provides a novel way of combining and utilising message-sequence analysis and time-related analysis of the level of actvitiy within online communities. It showed how the content and structure of the conversation are related to the level of activity in the case study community.

- *Social network analysis:* Similar to the application of content analysis, social network analysis in this thesis was applied in different ways in order to investigate different aspects of the case study community. In chapter *5*, quantitative SNA was utilised in order to analyse differences in the network properties of seven different social networks (one for each of the categories). In order to do this, a network of related online community *members* was taken as a basis. In contrast, qualitative SNA was applied in order to identify prominent conversation structures. In this analysis, the network based on related *messages* was taken as a basis (see section *6.2*). In these two analyses, the networks were analysed as a whole. In contrast, an egocentric approach to SNA was taken in the analysis of the roles that members of the online support community take on (see chapter *7*). In this analysis, SNA was applied in order to identify individuals who have similar positions in the social network (structural equivalence). Instead of properties of the whole network, structural properties of individual network members were taken as a basis. Thus, this thesis combined the application of quantitative and qualitative social network

analysis as well as the egocentric and whole network approach to SNA. Similar to the application of content analysis, a mixture of different applications of this method contributed to the multi-faceted and rich analysis of the online support community.

- *Integration of methods:* In addition to the methods mentioned above, other methods were also applied in this thesis (e.g. interviews), however in a non-modified way. The methodological contribution of this thesis lies not only in the novel ways of utilising existing research methods, but also the combination of multiple methods into one analysis, as the findings of the individual studies were integrated in order to provide a rich description of the case study community. Thereby, the developed set of categories as well as MOSuC served as a basis upon which the individual studies were combined.

10.2.3.1   *Implications for CMC research*

The methodological approaches taken in the individual studies within the thesis contribute significantly to the analysis and evaluation of online communities. Each of the individual studies within this thesis provides guidance for the analysis and evaluation of a specific aspect of online support communities. The approaches, the modifications and application of the various methods can be taken as a basis for further analysis and evaluation of different components of online communities. Also, one important component of the findings of the thesis is the categories of the code scheme that describe the communication content within the case study community (see chapter *4*). The set of categories, developed in earlier work, was further refined and applied in all of the studies within the thesis. Researchers investigating the exchange of support in different online support communities can utilise the set of categories in order to study the communication content of the community. Moreover, the set of categories can be applied and adapted to suit the analysis of all kinds of online communication (e.g. online forums, chats, etc.). The description of the individual categories, as well as their association with other aspects of the online support community (e.g. the exchange of messages containing text units coded as *Deep support* is associated with the occurrence of sub-cliques in the social network of the community), provide a hands-on tool to be used in further analysis.

10.3 Future research directions

Many parts of this thesis can be extended, validated and built on in future research in order to further explore online support communities, enrich the description and utilisation of MOSuC and build on the methodological developments. In the following, I conclude with directions for future research.

10.3.1 Generalise findings across different online support communities

One important tool for the analysis of online support communities that was developed in this thesis was the set of categories used to describe the communication content of the online support community. The aim of this thesis was to provide a rich description of the case study community. Thus, the generalisation of the set of categories across different online support communities was only touched on briefly (see section *4.2.2*). Findings of this analysis show that the code scheme is applicable to other online support communities for older people beyond the topic of depression. However, further work is needed in order to analyse its applicability to online support communities targeted at different user populations and online support communities running on a different technologies (e.g. chat). Still, I believe that the code scheme can also provide a useful research tool for the investigation of online social support in general. I encourage others to apply the categories of the code scheme in order to investigate social support in various online support communities. The reuse of the categories for the analysis of multiple different online support communities would help to validate and/or adapt the categories. Also, further work using the categories of the code scheme would investigate the generalisation of the categories across different kinds of online support communities. Up to now, many researchers utilise Cutrona and Suhr's (1992) code scheme in the analysis of online support communities. However, the categories of this code scheme were originally developed in an investigation of offline support and might thus not cover relevant aspects of online support. A generalised and validated version of the categories presented in this thesis might be a good substitute.

In addition to the utilisation of the categories of the code scheme, I also believe that further research should extend and deepen the analysis of the interplay and dependencies of different aspects of online support communities. This thesis provides an investigation of an online support community as a case study and sheds light on how different aspects of online support communities interrelate. Though insightful, this

thesis does not investigate the generalisability of the findings across different online support communities, as the work in this thesis provides one example of a multi-faceted analysis of an online support community, showing how the different aspects of such a community can be linked. Further work on the basis of MOSuC can help to describe different aspects of online support communities and their interrelations in more detail. Thus, similar analyses with different online support communities could shed light on the general characteristics of online support communities and the interplay of their individual aspects, as well as differences and similarities in these issues across different online support communities.

10.3.2 Further applications and extensions of MOSuC

In this thesis, MOSuC was developed and utilised in order to integrate multiple aspects of an analysis of an online support community into a holistic description. Up to now, the four quadrants of MOSuC are described in a very general way. Further work could also address specific quadrants of MOSuC in order to refine and describe the components of online support communities in more detail. In addition to the description of the components of online support communities, MOSuC also provides an abstract description of the interplay and dependencies of the different aspects of online support communities. Future research could focus on these dependencies and analyse them in more detail. The results of these studies could then refer back to MOSuC and further improve and refine the model.

In summary, I argue that the development and first utilisation of MOSuC reported in this thesis provide a starting point for an integrated analysis of online support communities that can be further deepened by multiple applications and refinements of the model in future studies.

10.4   Conclusion

In this thesis, I provide a comprehensive understanding of an online support community for older people. MOSuC, a model that describes the components of online support communities, was developed based on an integration of CMC theories as well as theoretical perspectives on social support. Based on the model, different aspects of the case study community were investigated in multiple individual studies. Later, the individual findings of the studies were combined using MOSuC in order to provide an all-encompassing description of the community.

As a result, this thesis provides detailed insight into the characteristics of an online support community as well as the interplay and dependencies between different aspects of the community. Based on the integration of multiple studies, the thesis sheds light on two main issues: the characteristics of the individual aspects of the community and how these aspects are related to and affect each other. In addition to the findings of the studies, the thesis also contributes MOSuC, which serves both as a theoretical description of the components of online support communities, as well as a practical tool for integrating the individual studies. Both the individual findings and MOSuC have significant implications for CMC research into online support communities. In addition, the application, modification and integration of multiple methods in this thesis provide a novel methodological way for an integrative analysis of online support communities.

With the increase of social interactions in online settings especially for personal and supportive reasons, this thesis contributes to the methodological approaches that can be taken to investigate these interactions, the aspects that need to be investigated and to the theoretical modelling that is necessary in order to integrate the findings and provide a comprehensive understanding of online settings that facilitate the exchange of social support.

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Appendices

Appendix A: Mapping of existing research studies onto MOSuC

	Citation	Message characteristic	Message network	User characteristic	User network
1	Andrews et al. (2001)			X	
2	Arguello et al. (2006)		X		
3	Aviv et al. (2003)				X
4	Baym (2000)	X		X	
5	Berthold et al. (1997)		X		
6	Bowker and Tuffin (2002)			X	
7	Bowker and Tuffin (2003)			X	
8	Bowker (2001)	X		X	
9	Bradley and Poppen (2003)			X	
10	Braithwaite et al. (1999)	X			
11	Brush et al. (2005)			X	
12	Buchanan and Coulson (2007)			X	
13	Butler (2001)	X		X	
14	Caplan (2003)			X	
15	Coulson (2005)	X			
16	Coulson et al. (2007)	X			
17	Cummings et al. (2002)			X	
18	Eastin and LaRose (2005)			X	X
19	Eichhorn (2008)	X			
20	Fay (2007)	X		X	
21	Fiore et al. (2002)			X	
22	Fisher (2005)				X
23	Fisher et al. (2006)				X
24	Golder and Donath (2004)			X	
25	Greenfield and Subrahmanyam (2003)		X		
26	Greschke (2007)	X		X	
27	Han and Belcher (2001)			X	
28	Haythornthwaite (2000)			X	X

29	Henderson (2004)			X	
30	Herring (2002)			X	
31	Himelboim (2008)				X
32	Ito et al. (2001)	X		X	
33	Jones et al. (2001)	X	X	X	
34	Jones et al. (2004)	X	X	X	
35	Joyce and Kraut (2006)	X	X	X	
36	Kalman et al. (2006)		X		
37	Kanayama (2003)	X		X	
38	Kleinman (2002)	X		X	
39	Klemm and Wheeler (2005)	X			
40	Laghos and Zaphiris (2006)				X
41	Maloney-Krichmar and Preece (2005)	X		X	
42	McKenna et al. (2002)			X	
43	Mickelson (1997)			X	
44	Moursund (1997)			X	
45	Nahm et al. (2003)				X
46	Nimrod (2010)	X			
47	Paccagnella (1998)	X		X	X
48	Peter (2005)			X	
49	Pfeil and Zaphiris (2007)	X			
50	Pfeil and Zaphiris (2009)				X
51	Pfeil et al. (accepted)			X	X
52	Pfeil et al. (2009)			X	
53	Pfeil et al. (accepted)		X		
54	Pfeil et al. (under review)		X		
55	Preece and Ghozati (2001)	X			
56	Preece (1998)	X			
57	Preece (1999)	X			
58	Preece (2000)	X			
59	Rafaeli and Sudweeks (1997)		X		
60	Rodgers and Chen (2005)	X		X	
61	Schobert et al. (2003)	X	X	X	

62	Takahashi et al. (2009			X	X
63	Tichon and Shapiro (2003)	X			
64	Tixier (2009)			X	
65	Turner and Fisher (2006)	X		X	
66	Turner and Grube (2001)			X	
67	Van Uden-Kraan et al. (2008)	X			
68	Walther and Boyd (2002)			X	
69	Welser et al. (2007)				X
70	White and Dorman (2000)	X			
71	Winefield (2006)	X		X	
72	Winzelberg (1997)	X			
73	Wolf (2000)	X		X	
74	Wright (1999)			X	X
75	Wright (2000)	X		X	
76	Wright (2000)			X	X
77	Wright (2002)			X	
78	Xie (2007)			X	
79	Xie (2008)	X		X	
80	Zaphiris and Sarwar (2006)				X

Appendix B: Approval from the City University Research Ethics Committee

City University London

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14 February 2007

Dear Ms Pfeil

Re: "Empathy in offline and online social networks"

I am writing to you to confirm that the research proposal detailed above has been granted formal approval from the City University Research Ethics Committee.

Should you have any further queries relating to this matter then please do not hesitate to contact me. On behalf of the Research Ethics Committee I do hope that the project meets with success and many thanks for your patience.

Regards

Dr Naomi Hammond
Assistant Registrar (Research)
Secretary to Research Ethics Committee

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