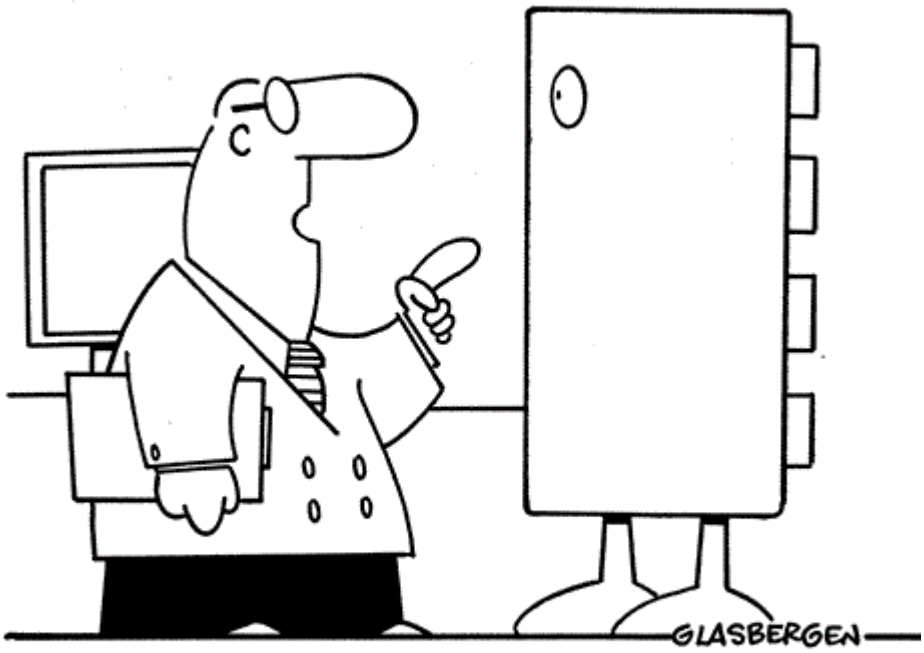
UNIVERSITEIT TWENTE.

RESEARCH PROPOSAL MASTER THESIS

The Influence of Collaborative Norms on Knowledge Seeking Behaviour in Communities of Practice among Dutch Housing Associations.



"I want everyone at the meeting to dress like Lego blocks. Then we can see exactly how each team member interlocks with other team members in the project."

June 2010,
Jorn van der Poel

Master Thesis Jorn van der Poel

The Influence of Collaborative Norms on Knowledge Seeking Behaviour in Communities of Practice among Dutch Housing Associations.

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Author
J.G.A. van der Poel

Programme	Industrial Engineering and Management School of Management and Governance
Student number	0041866
Email	j.g.a.vanderpoel@alumnus.utwente.nl

Graduation committee
Dr. R.M. Mueller
Department University of Twente, School of Management and Governance

Dr. A.B.J.M Wijnhoven
Department University of Twente, School of Management and Governance

Company supervisors
M.Sc. J.H.M.M Boers
Department WonenBreburg, Chief Operations Officer

Ing. B. Buitendijk
Department WonenBreburg, Manager Information and Automation

UNIVERSITY OF TWENTE.

WonenBreburg

PO box 217
7500 AE Enschede

J. van Oisterwijkstraat 35
5041 AB Tilburg

ABSTRACT

In the Dutch housing sector, housing associations face increasingly complex challenges such as the credit crunch, legal requirements, sustainable energy projects and an increasing social responsibility. In general, the housing associations do not compete with each other which creates many knowledge exchange opportunities. The preferred and common method for them to engage in cooperation, joint research projects and knowledge exchange is to participate in communities of practice (CoP). As a result, many communities of practice exist. Some are focused on functional areas and have a very homogeneous knowledge base, while others focus on achieving economies of scale, reducing risks and sharing capabilities. The second type of community has a very heterogeneous base with actors from different backgrounds and different jobs and hierarchy levels. Most CoP's operate using a 'linking pin' structure where one actor participates on behalf of an organization or a department. In practice, however not every CoP is successful and the knowledge diffusion between the housing associations is not as expected. Due to the economic climate, they now look for opportunities to cut back on costs or increase the benefits from the CoP.

Literature has focused on why people contribute knowledge to (virtual) communities of practice, this understanding is necessary but not sufficient to predict knowledge exchange, CoP emergence and development. We propose that especially in a linking pin structure it is critical for the benefits from participation and the development of CoP's that actors seek knowledge from other actors in the social networks in which they participate.

Therefore, we study what CoP's, organizations, and managers can do to encourage their actors to seek for their knowledge more frequently from experts in their CoP (which we measure with our dependent variable, Sourcing Frequency). We focus specifically on the knowledge seeking dyad, drawing on social network, organizational learning, planned behaviour and knowledge exchange theory. Based on a cross-sectional survey of 138 professionals, active in two different CoP's, who work at 78 different housing associations, multiple regression analysis is applied to test our hypotheses.

In contrast to our expectations we find that knowledge seeking behaviour is contingent on the structural composition of the CoP. Agents base their knowledge seeking decisions on perceived social risks (i.e. accessibility and future obligations) and the visibility of knowledge in dynamic social networks with heterogeneous shared knowledge bases. Moreover, in stable social networks with homogeneous shared knowledge bases (e.g. ICT specialists) the salient factors that influence knowledge seeking are the perceived value of knowledge and the awareness of other actors' expertise.

Additionally, we find that collaborative norms do not have a direct effect in any of the two CoP's, our data indicate that collaborative norms are subordinate to direct encouragement by manager. These findings are highly relevant for both future research on knowledge seeking as well as the daily management of CoP's and people who participate in CoP's.

Keywords: knowledge seeking, collaborative norms, knowledge sourcing, communities of practice, inter-organizational knowledge exchange.

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PREFACE

This thesis is the last milestone in my studies Industrial Engineering and Management. It has been a great research project and it is to be seen if I will ever have such support and liberty to do a similar project again. Therefore, I want to thank all the people who facilitated me in my research. Firstly, the people at WonenBreburg, in particular Jan-Hein Boers and Bas Buitendijk who offered me the opportunity to do my research at their organization. They put a lot of trust in me and allowed me to do as I saw fit while facilitating in every possible means. Furthermore, they have been great discussion partners, which sharpened my focus, they also opened many doors to other people and organizations, which has been a great help.

Secondly, the people from NetwIT and Futura, specifically Peter Baetsen, Joop Schoppens, and Leen Spaans who gave me full support and promoted my research within their communities.

Thirdly, I would like to thank my university supervisors, Roland Mueller and Fons Wijnhoven who have shown interest in my research throughout the entire process. I really appreciate their input, they have taken the role of consultant and have helped me especially in improving the research quality. Their style of coaching with tight deadlines and ambitious demands for quality has been good for me as it gave me confidence and motivation.

Special thanks go to Jeroen Cras for being a great discussion partner during in the last phases of my research. Moreover, my friends Koen Buisman and Danny Wemmenhove deserve my gratitude for their input during my research, especially in the data analysis phase, our discussions helped me to interpret results and deal with the statistical complications. Last, but not least, I would like to thank my parents, for their unconditional faith and support of me. Especially Sophie Nelissen, my mother, earns a deep thanks from me for her role as editor of my thesis.

This leaves me with nothing more to say than that I hope you will enjoy reading and will be able to find the knowledge you seek from my thesis. If you have any questions or comments, please do not hesitate to contact me, I will be happy to assist you!

Best regards,
Jorn

1. INTRODUCTION

"All men by nature desire knowledge"
- Aristotle, *Metaphysics*

1.1 MOTIVATION FOR THIS STUDY

Ever shortening product life cycles and accelerating rates of technological change create greater needs to transfer technology and knowledge more effectively across organizational boundaries (Gopalakrishnan and Santoro, 2004). In the early 90s researchers noted that this trend of accelerating technology creation and change would increase the importance of knowledge sharing (Badaracco, 1991; Nonaka, 1994). Today this appears to be an accurate prediction when we look at the top 20 of most cited papers within the Business, Management and Accounting field over the last 5 years (Topcited.com). In this top, four out of the twenty papers are on the topic of knowledge sharing which makes it a dominant topic. Business and managers improve traditional ways of knowledge sharing (e.g. meetings and memos) between people and organizations with new knowledge management interventions such as (electronic) communities and networks of practice, knowledge repositories and knowledge management systems. Scholars from various disciplines study how knowledge is exchanged in social networks and knowledge management systems (e.g. von Hippel, 1994; Szulanski, 1996; Hansen, 1999; Cross and Sproull, 2004; Levin and Cross, 2004; Inkpen and Tsang, 2005;). Researchers focus on the supply-side (i.e. the contribution of knowledge and information) of social networks often drawing on social exchange theory. Therefore, scientists have improved understanding why and how people contribute knowledge to these repositories, virtual communities and management systems (e.g. Davenport and Prusak, 1998; Bock et al., 2005; Kankanhalli et al., 2005; Müller, 2005; Wasko and Faraj, 2005; Cabrera et al. 2006) However, the demand-side (i.e. the search for knowledge, information and expertise) of social networks is studied by considerably less people, even though literature acknowledges barriers to knowledge seeking. Researchers who study knowledge seeking acknowledge this gap in literature and call for further research on knowledge and information seeking (Markus, 2001; Borgatti and Cross, 2003; Gray and Meister, 2004; Xu et al. 2006; He and Wei, 2009). We conclude from our systemic literature review of 30 papers that this call is justified. Therefore, we address the need for comprehensive theory on motivations and barriers that affect individual's decisions to seek knowledge in this paper.

Does it matter that researchers show little interest in the demand-side of knowledge sharing?

Yes, understanding the motivations of individuals to seek knowledge is relevant. Research finds that knowledge seeking behaviour has significant effects on employees' knowledge level (Gray and Meister, 2004). Knowledge seeking is also found to be important in other contexts such as successful assimilation of newcomers in organizations (Miller and Jablin, 1991) and success of knowledge repository systems (Bock et al., 2008). We are interested in the emergence and development of social networks. This happens when relational ties between actors are created and developed as a result of interaction. Knowledge seeking increases the probability that actors interact and exchange knowledge which creates and develops relational ties (Borgatti and Cross, 2003). The developed ties (i.e. strong ties) are necessary to transfer complex knowledge (cf. Hansen, 1999) while new ties are necessary to

identify and select new knowledge (Granovetter, 1973). To stimulate and support knowledge seeking, managers need appropriate tools and infrastructure. However, due to scant understanding of what knowledge seekers' motivations and barriers are, tools and management interventions are not optimally aligned with the actual needs of the knowledge seekers.

In literature the accepted paradigm is that social networks benefit organizations, although their value often has to be assessed in non traditional ways (e.g. assessing anecdotes of actors instead of immediate financial returns). A Community of Practice (CoP) is a specific form of a social network, it consists of self selected members with a purpose to develop members' capabilities. Wenger and Snyder (2000) state the following organizational benefits: "communities of practice can drive strategy, generate new lines of business, solve problems, promote the spread of best practices, develop people's professional skills, and help companies recruit and retain talent" (p. 140). Social capital theory shows that the value of these social networks is not limited to participating individuals but can be regarded as a public good, (Kostova and Roth, 2003; Inkpen and Tsang, 2005). Organizations rely on the network connections at dyadic level for knowledge exchange across organizational boundaries, which is essential to innovation and learning capabilities of an organization (Nooteboom 2000). This concept is elementary in the general theory of social capital, the value of capital which relationships provide (Nahapiet and Goshal, 1998; Adler and Kwon, 2002). The idea that whom a person is connected to, and how these contacts are connected to each other, enable people to access resources that ultimately lead them to such things as better jobs and faster promotions (Burt, 1992). In an organizational context, social capital (the network of social ties) increases the number of 'good ideas' access to opportunities that may otherwise be unavailable (Adler and Kwon, 2002; Koka and Presscot, 2002; Burt, 2004).Therefore, we intend to provide managers with guidelines which allow them to provide the infrastructure, employ the appropriate tools and motivate the knowledge seekers effectively. This will assist them in cultivating their social networks and sustain them over time, benefiting not only the actors but the organizations in the network at large.

1.2 RESEARCH SETTING

Technological acceleration and increasing importance of knowledge sharing is a trend which is also visible and relevant to housing associations in the Netherlands. In 1994 housing associations were privatized. Currently housing associations in the Netherlands are independent non-profit organizations serving specific regions of the country. Housing associations do not compete with each other, certainly not with other associations outside their specific region. However, housing associations are increasingly market oriented and value their image trying to retain tenants and sell houses. Since the privatization of housing associations, the Dutch government is transferring more social responsibility to the housing associations (e.g. subsidies on housing for low income groups and social projects). Consequently municipalities, welfare institutes and tenants expect social responsibility and commitment of the housing associations more often. This extension of role and responsibility causes housing associations to be increasingly knowledge intensive organizations and to have an expanding network of contacts and partners. The housing associations are particularly challenged by external environmental changes such as the credit crunch, fraud in the housing sector, aging of the population, ICT innovations and the demand for sustainable housing and decentralized energy exploitation. The non-competitive nature of the housing sector and the new challenges in the external environment are reasons for housing associations to create and participate in strategic networks, communities of practice and other forms of cooperation. This is a trend which is visible on national level, many housing

associations have merged over the last ten years, communities of practice exist for all departments and multiple third party organizations have been founded (KENCES, KEI, Corpovenista, Futura) to exchange knowledge and develop expertise on specific themes or levels (local, regional, national and even international).
In the Netherlands housing associations own 2,4 million rental units which house approximately 6 million people (Total population in the Netherlands is 16.6 million). The housing association sector exists of 455 housing associations employing 28 000 employees (Aedes, 2009). Our study is facilitated and sponsored by WonenBreburg, one of the larger housing associations in the Netherlands servicing the region Breda and Tilburg in the south of the Netherlands. WonenBreburg is organized in three business units, one for Breda, one for Tilburg and a staff division (e.g. Board, Finance, ICT, Operations). WonenBreburg owns approximately 30,000 rental units and employs 400 FTE. For a more detailed company profile see appendix A.
WonenBreburg participates in many social networks and strategic alliances, on department level in many separate communities of practice and on organizational level in all national initiatives with various purposes such as KENCES (student housing) AeDex (financial benchmark) KEI (network organization and knowledge broker on topics of urban renewal, international orientation) and Futura (network organization founded by 7 housing associations in the southern province of the Netherlands).
These inter-organizational initiatives enable organizations to share risks, create synergies and build on jointly shared capabilities. The housing associations are thus challenged to create synergies in the resources under their control. They manage to do so with varying success, at WonenBreburg two critical cases exist, the DEE (i.e. enterprise wide project on sustainable housing and decentralized energy exploitation) and purchase (i.e. joint purchasing and procurement with other Futura housing associations). Joint purchase is the most successful project which was hosted by Futura while DEE is an example of a project that greatly exceeded budgets and planning. WonenBreburg ran the DEE project independently and the lack of expertise and poor risk management resulted in serious problems. WonenBreburg wants to prevent project failures like the DEE happening again and is looking for opportunities to stimulate and support their employees to search for knowledge, expertise, advice and opinions within their communities of practice.

1.3 GOAL AND CONTRIBUTIONS OF THE RESEARCH

This research addresses gaps in literature on knowledge seeking and provides practical implications for the development and effective support of social networks. In this research we consider dyadic knowledge seeking in communities of practice among housing associations in the Netherlands. We consider knowledge seeking as an activity to identify and acquire expertise, experience, insights and opinions by engaging in dialogue with individual people (q.v. section 2.2).
As we noted in section 1.1 scant theory on knowledge seeking exists and the papers we did find on knowledge seeking call for further research to gather more empirical evidence (e.g. Cross & Borgatti, 2003; Bock et al., 2005; He & Wei, 2009). The literature gap expresses itself through contradicting findings on the significance and direction of the effect of independent variables and the uncertainty about the influence of social norms and organizational context. Moreover, the field lacks a convincing theory which aggregates insights from the diverse research disciplines which study knowledge seeking behaviour. Therefore, our first research goal is:

1) *Collect empirical evidence on the motivations and barriers for person-to-person knowledge seeking behaviour of individuals in a social network context.*

To our best knowledge, no prior research has studied the knowledge seeking dyad in social networks across organizational borders. Practical concerns of communities of practice exist for managers who wish to cultivate the social networks (cf. Wenger and Snyder, 2000). Which tools and information systems should they use, do the existing tools meet the requirements to support knowledge seeking and if not, what should they look like? In an inter-organizational context the ownership and responsibility of the tools and information systems are interesting problems, how do these affect knowledge seekers? Therefore, our second research goal is:

2) *Propose guidelines for the design of information services which support knowledge seeking behaviour effectively.*

However in order to sustain and develop communities of practice, managers and network organizations will need to do more than merely provide the tools. They will have to encourage desired behaviour of actors and deal with challenges and barriers. Managers need to be aware that knowledge seekers and knowledge users are important for the development of these social networks. Their strategies and interventions should not solely be designed to stimulate contributing behaviour; instead they should also encourage seeking behaviour. Therefore, our third research goal is:

3) *Provide managers with recommendations for effective interventions and strategies that stimulate knowledge seeking in communities of practice across organizational boundaries.*

In particular we are interested in how social norms influence knowledge seeking behaviour. Social norms are standards of behaviour that are typical of, or accepted within, a particular group or society (Oxford University Press, 2005) (q.v. section 2.4). Prior research (e.g. Taylor & Todd, 1995; Venkatesh et al., 2003; Gopalakrishnan and Santoro, 2004; Kankanhalli et al., 2005) finds that social norms, or comparable variables (e.g. pro-sharing norms and collaborative norms), have significant effects on knowledge sharing, usage of information systems and knowledge contribution. However, there is still no consensus on how they moderate independent variables and if the norms have a direct effect on knowledge seeking behaviour as well. Kankanhalli et al., (2005) define pro-sharing norms as "the prevalence of norms that are intended to facilitate knowledge sharing in the organization" (p.123). Bock et al. (2006) study the influence of social norms on knowledge seeking behaviour and define the relevant norms as collaborative norms. Collaborative norms narrow to the norms of teamwork and cooperation (Goodman and Darr, 1998; Bock et al., 2006) while pro sharing norms also include willingness to value and respond to diversity, openness to conflicting views, and tolerance of failure.

With the special interest in collaborative norms in mind, we formulate the following research question to reach our research goals:

How do collaborative norms influence knowledge seeking behaviour within communities of practice among housing associations in the Netherlands?

1.4 RESEARCH PERSPECTIVE

Human behaviour, social norms and social networks are broad concepts that can be studied from multiple perspectives. We choose to study the knowledge seeking dyad from the perspective of the knowledge seeker. We model the perceptions and attitudes of the knowledge seeker as determinants of the Sourcing Frequency. This approach allows us to assess the relative importance of different characteristics of the seeker (e.g. feelings of future obligation) and how the seeker's behaviour is moderated by the contextual factors (e.g. collaborative norms) within the same analytical framework.

To place our research in the existing body of theory we use the framework proposed by Cross and Sproull (2004). They propose that "a dyadic model of knowledge seeking should include characteristics of the knowledge seeker, the knowledge source, and the relationship between the seeker and the source", (p.452). Their framework covers Nahapiet and Goshal's (1998) three social capital dimensions: structural (i.e. network configuration and ties), cognitive (i.e. shared goals and shared culture) and relational (i.e. social judgement of competence and risk) (cf. Inkpen and Tsang, 2005). We adapt the framework in a graphical representation that also provides an overview of which aspects have been addressed by previous research (Figure 1.1). Cross and Sproull (2004) study characteristic of the seeker, source and the relationship between them in their research on actionable knowledge (i.e. knowledge directed at making progress on relatively short-term projects). However, Cross and Sproull (2004) acknowledge that the knowledge seeking dyad still needs a lot of research. In contrast to Cross and Sproull (2004) we choose to focus on a specific part of the knowledge seeking dyad, the relationship between the seeker and the source, from the perspective of the knowledge seeker. It is this relationship that is moderated by attitude, social norms and organizational influences and affects the individuals involved.

Antecedents of knowledge seeking

In 1983, Ashford and Cummings (1983) developed a cost-benefit model for feedback seeking based on expectancy theory (Vroom, 1964). This model conceptualizes information seeking as a process of uncertainty reduction, and focuses on the balance between anticipated benefits, both intrinsic and extrinsic, and the expected costs of obtaining the information. The Ashford and Cummings (1983) model has been the accepted paradigm within the information seeking literature until social network research (e.g. Burt, 1992; Hansen, 1999) organizational learning (e.g. Grant, 1996; Davenport and Prusak, 1998) and IS (e.g. Alavi and Leidner, 1999; Markus, 2001) studied knowledge exchange. The new insights proved that the cost-benefit perspective is too narrow to capture the external influences, relational characteristics and the different forms of knowledge that are exchanged by various communication means.

Social relationships in a network

In Figure 1.1 we model the knowledge seeking dyad according to new perspectives, we will use this perspective

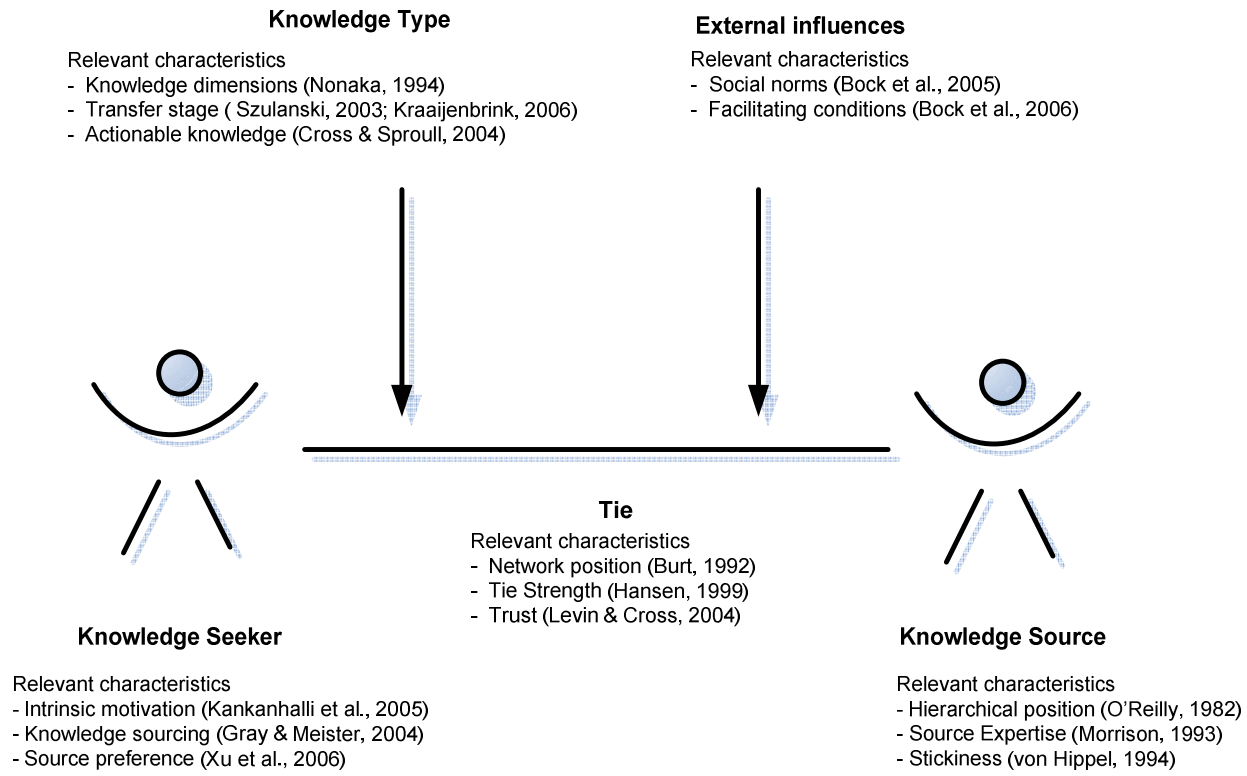


Figure 1.1 research perspective on the knowledge seeking dyad seeking, adapted from Cross and Sproull (2004)

1.5 OUTLINE OF THE THESIS STRUCTURE

Chapter two serves as a theoretical framework for this thesis, we outline our literature study method, propose the dependent variable and define commonly used terms and synonyms. Additionally, we synthesize thirty papers based on a structured literature review, which we conduct following the principles of Webster and Watson (2002). The conclusions of the literature review allow us to reduce the number of independent variables we study. In chapter three we formulate a set of testable hypotheses based on the literature review, observations (e.g. documents and small interviews,) in the host organization. In chapter four we outline the research design and operationalise the 9 independent variables we propose. In this chapter we discuss which methods we use in each stage of the research and which procedures we follow to optimize reliability and validity of the research. We collect data to test our hypotheses by conducting a cross-sectional survey among two communities of practice. In section 4.3 we analyse our research population and discuss their unique characteristics and how we chose our samples for the pilot-study and the full-survey. Chapter five covers the data analysis and hypothesis testing. In chapter 6 we draw conclusions based on the discussion of results. In this chapter additional theoretical implications, managerial implications and limitations are also provided. The findings of this research will also raise new questions of interest and give new perspectives on what a kernel theory on knowledge seeking should look like. Therefore we will conclude with recommendations on future research directions.

2. THEORETICAL BACKGROUND

This chapter provides a structured review of the current body of knowledge on knowledge seeking. In the first section we outline our literature review method. Subsequently we propose our dependent variable (DV) and provide a cognitive map to show how the dependent variable is related to and distinct from other variables used in literature. In section 2.3 we clarify how we will define and use frequently used terms and synonyms in theory on social networks and knowledge exchange. Thereafter we will provide succinct cognitive maps of independent variables (IV) which we will use as scope for our literature study. We conclude the chapter with a synthesize of literature (Table 2.1) and a discussion of the literature review results (section 2.6).

2.1 DESIGN OF LITERATURE STUDY

According to Webster and Watson (2002) a good structured literature search consists of three phases, 'scan top journals', 'go backward' and 'go forward'. Webster and Watson (2002) outline how a systemic literature review should be done and how literature should be synthesized. In our review we include 32 papers we found with a systemic literature search method, which follows the principles of Webster and Watson (2002). Figure 2.1 shows which keywords we used and how the papers are acquired. We draw from work in the scientific field of knowledge management, organizational learning, social network research, knowledge sharing and Information Systems. The literature search consists of two sweeps, during the first literature sweep we searched for literature on organizational learning, knowledge sharing and knowledge transfer. The goal of the first search was to find the fundamental papers and dominant theories in the IS field on knowledge management, we found twenty-two papers at this stage. The results of the first sweep improved understanding of the topic and allowed us to further narrow the search scope. To make sure we did not miss any important papers, the second literature search sweep then focused on knowledge seeking. It resulted in five papers, although three of them we also found with forward citation analysis. To cover all research published in the top 25 of IS journals (q.v. Appendix F, table F.2), we followed the guidelines of Schwartz and Russo (2004) and used two search engines, Web of Science, and Scopus. Additionally, we handpicked the Communications of the AIS for relevant articles. Covering the top 25 journals contributes to the quality and validity of the sources being used. Each keyword is entered in the three scientific databases and in the Web of Science database we apply a filter in the search query to get only results published in the top 25 IS journals (q.v. Appendix F, table F.1). We sorted the hits based on relevance and number of citations. Subsequently we selected the first forty search results and determined its relevance to our topic by reading the titles and abstracts. Whilst the results remained on-topic we continued reading the full text. After the search sweeps in scientific databases we did a backward and forward citation analysis on top papers to find new relevant papers. We used the Web of Science and Scopus citation analysis tools, using the same sorting criteria we employed in the search sweeps. Additionally, we handpicked frequently recurring references in papers we already included. Seven additional papers we found in this way and they are included in the literature study. We identified twenty-five papers in the search stage and seven papers in the forward and backward search stages. Thus we found 32 relevant papers to include in our systemic literature review ultimately (see Figure 2.1).

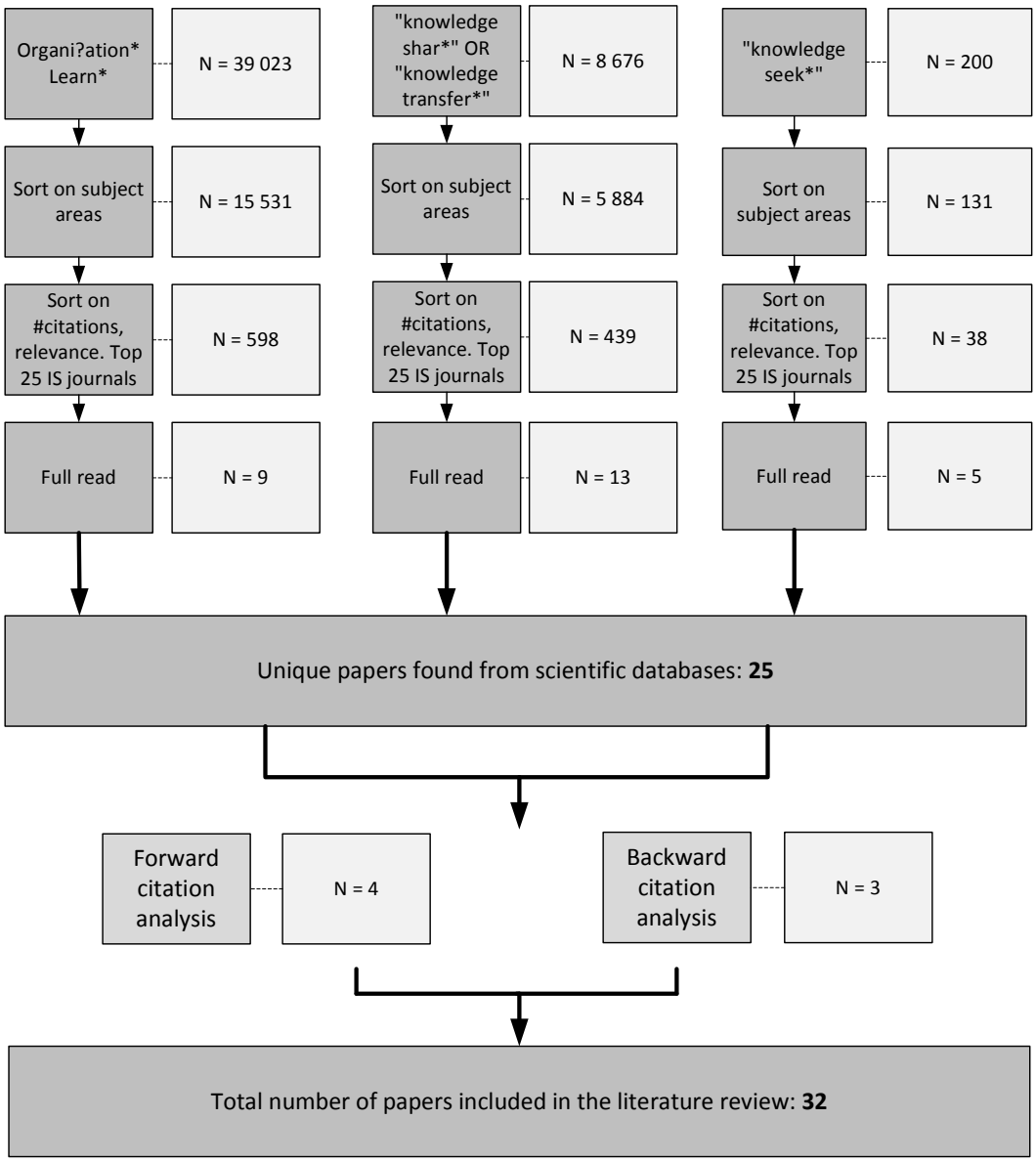


Figure 2.1 outline of our literature search method
Note1: results kept in a specific stage is presented in the light grey boxes "N="
Note2 : selection criterion for subject areas: Social Sciences & Humanities

Literature study interest and scope

Knowledge management is a domain that is studied by multiple research disciplines, therefore we will look at social exchange theory, social network research, information systems (IS) and organizational learning. The main focus will be on theories from the IS field, because knowledge management interventions increasingly rely on IT solutions and recently scholars have studied knowledge seeking in the context of knowledge management systems (Bock et al., 2006; Xu et al., 2006; He and Wei, 2009). We look at knowledge seeking from a specific angle (q.v. section 1.4), this perspective is used as a selection criterion to asses papers on relevance. Additionally, we will synthesize on a specific set of independent variables (q.v. section 2.4) to ensure comparability of the papers. The independent variables are derived from frequently cited papers we found in our first literature search.

2.2 THE DEPENDENT VARIABLE

The dependent variable in our study is *Sourcing Frequency,* the frequency with which individuals contact other people in the community of practice to access expertise, experience, insights and opinions (cf. Xu et al., 2010). It is a variable introduced by Xu et al. (2010) as a measurement for task and social information seeking on a dyadic level. We explicate the origin and relation with other (dependent) variables, used in literature, in Figure 2.2.

Knowledge seeking

Knowledge seeking is the search for knowledge sources needed for a problem or task. If we look at knowledge sharing as an exchange activity, we can distinguish two roles, supply and demand. The knowledge suppliers contribute their knowledge and experience to communities, virtual environments and answer knowledge questions. On the demand-side there are people with knowledge questions, people who seek knowledge from these communities and information services. In our research we do not consider documents and codified knowledge which is not readily available in repositories. Instead we focus on the search for knowledge that is embedded in experience, seeking expertise and experts. According to the Theory on Systemic Knowledge Integration (KI) Kraaijenbrink (2006), knowledge seeking is initiated by the recipient of knowledge and. We restrict ourselves to the sourcing behaviour, the identification and acquisition of knowledge which are the first two KI activities, we do not consider the actual utilization and application of knowledge by the knowledge seeker. However, we do recognize that this last stage is critical for the effective transfer of knowledge. Thus, we refer to knowledge seeking as an activity to identify and acquire expertise, experience, insights and opinions by engaging in dialogue with individual people (cf. section 1.4). Our scope of knowledge seeking is comparable with the frequently cited definition formulated by Hansen (1999) knowledge search is the "looking for and identifying useful knowledge in an organization" p. 84 (Hansen, 1999).

Why is Sourcing Frequency the most appropriate measurement of knowledge seeking?

Because knowledge exchange and more specifically, knowledge seeking behaviour is commonly measured by its frequency of occurrence (e.g. Borgatti and Cross, 2003; Bock et al., 2006; He and Wei, 2009; Xu et al 2009). By studying how often an actor engages in such behaviour, researchers can say something about the characteristics of the seeker, the source and their relationship that affect the behaviour. Sourcing Frequency is derived from the concept of knowledge sourcing which is studied in the organizational learning discipline as a predictor of individual learning outcomes (e.g. Gray and Meister, 2004; Gray and Meister, 2006). On a dyadic level it refers to the " .. intentional individual efforts to locate and access others' expertise, experience, insights, and opinions by engaging in dialogue with individual employees" (p.144) (Gray and Meister, 2006).

Sourcing Frequency reflects the intensity (i.e. frequency of exchange) of the relation between actors and therefore fits well with other dependent variables which have been used in previous studies to assess knowledge seeking behaviour. The frequency of information and knowledge exchange between actors is an important measurement in social network research (cf. tie strength), organizational learning (cf. knowledge sourcing) and research on knowledge sharing within the IS field (cf. EKR usage).

Tie strength characterizes the closeness and interaction frequency of a relationship between two actors (Hansen, 1999; Levin and Cross). Thus, when actors increase the frequency with which they seek knowledge in a social network, new ties emerge and existing ties develop

and become stronger. Van Baalen studies knowledge. Van Baalen et al. (2005) show with a study on innovative agricultural projects that bridging structural holes contributes to the emergence of a Network of Practice (NoP).The development and usage of ties thus implies the emergence of social networks.

Sourcing Frequency is related to the usage construct widely used in IS literature (Davis et al., 1989; Delone and Mclean, 1992;Taylor and Todd, 1995; Seddon et al., 1999; Legris et al., 2003; Venkatesh et al. 2003). In this sense usage reflects the frequency with which users use an information system. Bock et al. (2006) translate usage to the knowledge management field and show how knowledge seeking intentions influence their dependent variable 'Usage of an EKR' to find sources. In Figure 2.3 we show how the commonly used variables in this context are interlinked.

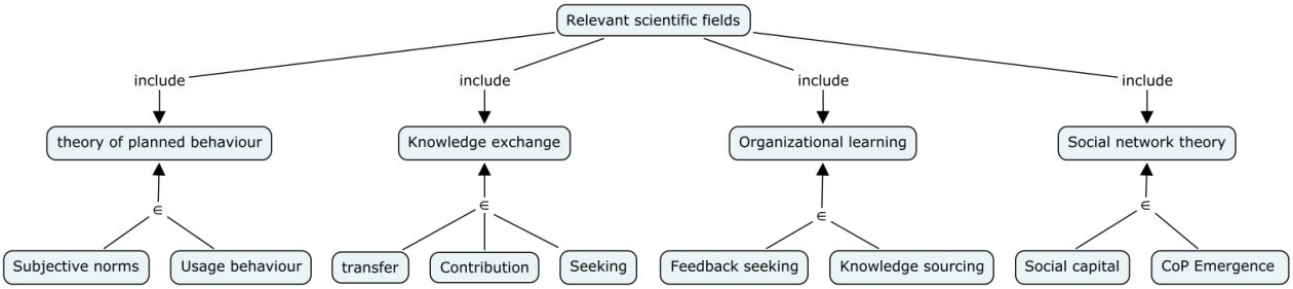


Figure 2.2 high-level concept map of scientific domains relevant to knowledge seeking

Note 1: set members are indicated with the ∈ symbol and means 'is an element of'

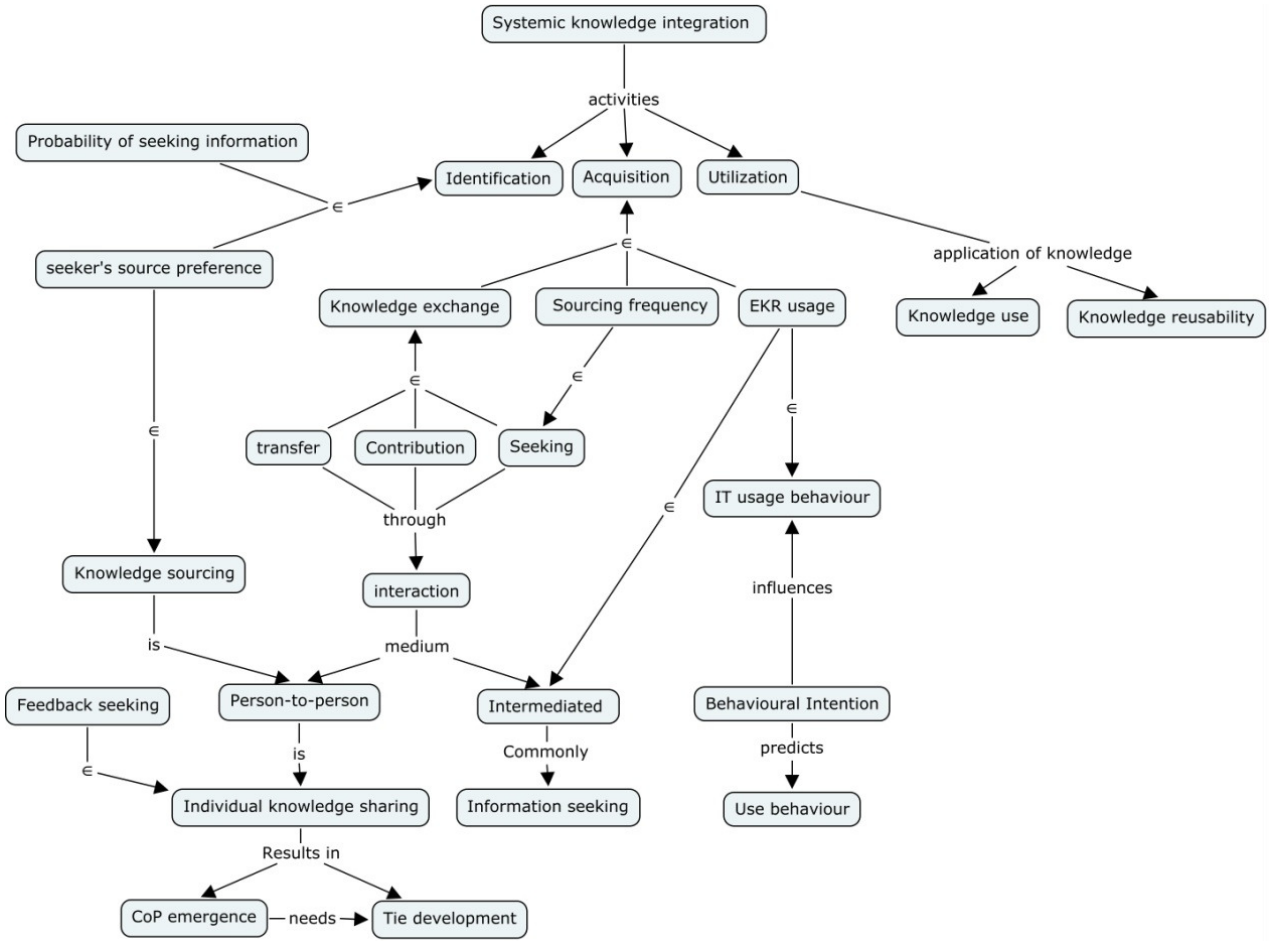


Figure 2.3 detailed concept map of independent variables related to knowledge seeking

2.3 RELEVANT TERMS AND SYNONYMS

What is knowledge and what are its relevant characteristics for the knowledge seeker? In essence the type of knowledge and its medium are the characteristics that influence the exchange process. In the first place there is a difference between information and knowledge. Information are facts or details about something or somebody. Knowledge is more complex, it is the understanding and skills that one gains through education or experience. Gray and Meister (2004) illustrate how the process of obtaining information differs from obtaining knowledge. Facts are available through multiple paths including direct learning behaviour such as observation, learning by doing and experimentation while knowledge is only obtainable from a person with experience and insight (Gray and Meister, 2004). We will distinguish knowledge and information following Gray and Meister (2006), we regard knowledge as the product of human thinking and facts as representations of reality.

Knowledge

We identified knowledge as a product of human thinking to articulate how it differs from information. But what is it exactly and what types of knowledge exist? A widely accepted definition of knowledge ".. is a justified true belief based on information" (Nonaka, 1994). Grant (1996) states that knowledge is a key strategic organizational resource and according to the knowledge-based view (Grant, 1996) it is an organization's principal function to create, integrate and apply knowledge. Sustainable competitive advantages and performance differences are the result of an organization's unique knowledge base. Knowledge exists in different forms, traditionally literature distinguishes two dimensions, explicit (articulated, codified in symbolic form or natural language) and tacit (experiences, know-how) knowledge. More recent studies study distinguish different forms of knowledge on a more detailed level. E.g. Cross and Sproull (2004) study five components (solutions, referrals, problem reformulation, validation and legitimation) of actionable knowledge (i.e. knowledge directed at making progress on relatively short-term projects).

Wijnhoven et al. (2009) classify knowledge into four types, following a linguistic analysis by Mingers (2008):

1) **Propositional knowledge**: is 'to know that x', and may be the result of direct perception of the receipt of messages by communication. This is commonly called 'information' (Wijnhoven et al., 2009).
2) **Experiential knowledge**: is 'to know x' via personal experiences.
3) **Performative knowledge**: is 'to know how to do x', and is embodied knowledge gained by learning, training, and personal experience.
4) **Epistemological knowledge**: is 'to know why x' gained by formal methods of discovery, as in science, and codified in a (formal) language.

Knowledge sourcing

Knowledge sourcing is a form of indirect learning behaviour, the actor learns from the experiences of others (Levitt and March 1988). More specifically, it is the extent to which an individual accesses other employees' expertise, experience, insights, and opinions. "Dyadic knowledge sourcing refers to a single knowledge seeker engaging in dialogue with an individual source" p.823 (Gray and Meister, 2004).

Brokerage
Brokerage of information or knowledge is an intermediation process among people across groups. An actor that occupies a central network position creates a brokerage position, enabling it to locate relevant information or knowledge and exchange it within the social network (Burt, 1992). This is also called information arbitrage. "Previous research shows that an active broker (in a coordinated or spontaneous way) helps to create the indirect linkages among members of an emerging network" (Van Baalen, 2005). "New ideas emerge from selecting and synthesizing across structural holes. People whose networks bridge the structural holes between groups have earlier access to a broader diversity of information and have experience in translating information across groups." (Burt, 2004)

Knowledge use: application or acquisition?
Knowledge use refers to a specific knowledge activity. Kraaijenbrink (2006) proposes a model on knowledge integration which consists of three knowledge activities. In this theory, systemic knowledge integration is a process which consists of three stages, identification, acquisition and utilization. Kraaijenbrink (2006) classifies knowledge use as a 'utilization' activity by the recipient actor, it is considered an application activity.

Information service
"Information services are services that facilitate the exchange of information goods with or without transforming these goods" p.93 (Wijnhoven and Kraaijenbrink, 2008). The purpose of information services is to make relevant and useful information accessible. Information services can be equipment-based (e.g., automated services) as well as people-based (e.g., consulting services). Technological innovations lead to an increase of equipment-based information services, offering a broad range of opportunities to identify, select and acquire information.

Social capital
Inkpen and Tsang (2005) define social capital as "the aggregate of resources embedded within, available through, and derived from the network of relationships possessed by an individual or organization". Based on literature review on social capital in three different types of strategic networks, Inkpen and Tsang (2005) conclude that individual social capital forms the basis of organizational social capital. This is congruent with the findings of Adler and Kwon (2002), as they note that social ties are a fundamental aspect of social capital, because social capital transactions rely on opportunities created by an actor's network of ties.

Social networks:
"A social network can be defined as a patterned organization of a collection of actors and their relationships" (van Baalen et al. 2005). Social networks support knowledge exchange between individuals who have a common practice (Wasko and Faraj, 2005). "The collection of actors would contain more than two actors to be defined as a network. A network can be viewed as a social exchange structure with its own governance structure and patterns of interaction in which flows of resources between independent units (or individuals) take place" (van Baalen et al., 2005). Van Baalen et al. (2005) suggest that both CoP and NoP, are particular forms of social networks.

Community of Practice (CoP)
"A community of practice consists of a tightly knit group of members engaged in a shared practice who know each other and work together, typically meet face-to-face, and continually negotiate, communicate, and coordinate with each other directly. In a community

of practice, joint sense-making and problem solving enhances the formation of strong interpersonal ties and creates norms of direct reciprocity within a small community" (Wasko and Faraj, 2005).

Network of Practice (NoP)
"Networks of Practice can have an enormous reach. There is relatively little reciprocity across NoP's as the members do not interact directly. NoP's are loosely coupled systems that hardly initiate collective action and produce little knowledge" (van Baalen et al., 2005). "Networks of practice often coordinate through third parties such as professional associations, or exchange knowledge through conferences and publications such as specialized newsletters" (Xu et al., 2010).

Tie
Tie refers to a social relation of some strength between persons or organizations. In our research we will mainly focus on the between-person ties. Granovetter (1973) published on the strength of weak ties (i.e. relationships with a low interaction frequency), he showed that weak ties create access to new knowledge. Strong ties among cliques have more homogeneous opinions, which reduces the amount of new information and unique insights. Hansen (1999) measures tie strength between two subunits with frequency and closeness scores. Hansen (1999) defines such inter-unit relation, as a "Regularly occurring informal contact between groups of people from different operating units in an organization" (p. 83). Through membership of a network and the resulting repeated and enduring exchange relationships, the potential for knowledge acquisition by the network members is created (Inkpen and Tsang, 2005). Social networks benefit from interrelationships of individuals, especially the boundary spanners (i.e. actors in a brokerage position)(Tushman, 1977). Boundary spanners are people whose networks bridge the structural holes between groups, they have earlier access to a broader diversity of information and have experience in translating information across groups (Burt, 2004). Van Baalen et al. (2005) show with a study on innovative agricultural projects that bridging structural holes contributes to the emergence of a Network of Practice (NoP).

Network centrality
Network centrality is an actor's position in the network. In-degree centrality is the most suitable measure to capture an actor's information or knowledge access. The higher a unit's in-degree centrality, the more knowledge sources the unit has (Tsai, 2001). While the number of relations increases access to external knowledge, a centralized position within an overall pattern of relationships determines whether such knowledge can be used beneficially (van Wijk et al., 2008).

Stickiness of information
Stickiness of information is introduced by Von Hippel (1994). It refers to the incremental expenditure required to transfer a unit of information to a specified locus in a form usable by a given information seeker. If the cost of moving information is low, the information stickiness is low and vice versa. The theory of stickiness is that these costs of bringing information and problem-solving capabilities together inhibit the flow of information.

Structural capital
Is the structure of direct ties between actors in a network. A high level of structural capital exists when dense connections in the collective exist (Wasko and Faraj, 2005).

Structural holes

"When people focus on activities inside their own group which creates holes in the information flow between groups, or more simply structural holes" (Burt, 2004).

2.4 INDEPENDENT VARIABLES USED TO SYNTHESIZE LITERATURE

In this section, we define the theoretical concepts which we use to systemically synthesize the literature. The concepts provide a high level framework to compare the theories from different research domains. Authors define similar phenomena differently or study them within another research context and from other perspectives.

Value

In our paper we consider value as a concept with two dimensions, source quality and the content relevance. On the quality dimension value refers to the perceived characteristics of a knowledge source. Value is used as a construct by social network research to predict information seeking probability (Borgatti and Cross, 2003). They define value as the perceived quality of the knowledge and skills of the person sought out in relation to the problem. In this definition quality of knowledge is the extent to which a source is believed to possess accurate and useful knowledge (Morrison and Vancouver, 2000). Braganza et al. (2009) find that quality of the knowledge source has a direct effect on the task performance. Their study, an in-depth case analysis of an intranet-based knowledge management system, shows that the quality is determined by the reliability of the knowledge source, at a dyadic level. This validity and reliability of content is what Xu and Kim (2006) name information quality. We recognize that the usefulness of knowledge is closely related to the relevance of the content for a knowledge seeker's job or task. Lane and Lubatkin (1998) find a similar relationship on organizational level. They define value as the importance of knowledge for an organization's own operations.

In the IS field, relevancy is commonly measured with the construct of perceived usefulness. This construct is used to indicate how users perceive the value of the IT artefact in performing their task (Davis et al., 1989; Taylor and Todd, 1995; Kulkarni et al., 2006). Perceived usefulness - in the context of knowledge sharing - is defined as the belief that results from an Electronic Knowledge Repository (EKR) or Knowledge Management System (KMS) will enhance their work performance (Venkatesh et al. 2003; Bock et al., 2006; He and Wei, 2009). The similarity between the aforementioned concepts is that individual knowledge workers need to evaluate their knowledge source on content quality and accuracy and relevance for their task, their work performance or their firm's operations.

Access

Access refers to the anticipated accessibility of the knowledge source (Borgatti and Cross, 2003). In our context this is the ease with which an actor expects to be able to locate and acquire knowledge from a particular source (cf. Morrison and Vancouver, 2000). Accessibility also includes the ease with which possessors of knowledge and skills are located. This perspective of *access* is also used by Grant (1996) who identifies three characteristics of knowledge integration, two of which are particularly interesting to this study, namely: efficiency and flexibility of integration. Efficiency is the accessibility of specialist knowledge of individual members. Flexibility is the capability to access additional knowledge and reconfigure existing knowledge. Access is thus comparable to the independent variable, *availability* which is used by Levin and Cross (2004) to study effective knowledge transfer. Levin and Cross define availability as a knowledge source's perceived willingness to be available and use availability as a control variable to test if it mediates the

relationship between strong ties and effective knowledge transfer. Unfortunately they do not report on the results of the variable. Xu and Tan (2006) distinguish two elements of accessibility at a dyadic level, physical proximity and scheduling difficulty. Scheduling difficulty refers to the timeliness of response and social accessibility of the knowledge source. Borgatti and Cross (2003) state that cultural issues and collaborative norms influence access through status or by power inhering in positions of formal authority or informal structure.

The access of documents, repositories and codified information is comparable to the perceived ease of use concept which is widely used in IS literature (Davis et al. 1989; Venkatesh et al., 2003; Bock et al., 2006). Perceived ease of use is an important predicting variable for the usage of IS systems (Venkatesh *et al*., 2003; Legris et al., 2003). Bock et al. (2006) adapted *perceived ease of use* to EKRs and found support for the relationship between knowledge seeking behaviour and accessibility of the EKR. Cabrera et al. (2006) consider the availability of a KMS as the degree of usability or user friendliness of the user interfaces, and on whatever practical difficulties may exist to access the necessary computer technology or communication connections. Markus (2001) discusses access of knowledge sources from the perspective of a knowledge seeker or reuser. She states that knowledge reuse involves access to experts, not access to codified expertise. The KMS has a mediating role for the identification and selection of experts. Her definition of access includes both access to experts and access to expertise. To summarize, access is a characteristic of the knowledge source which can be observed along the dimension of availability (physical, social and timely) or usability (perceived ease of use).

Knowing

Knowing is defined by Borgatti and Cross (2003) as the awareness of another person's expertise on a current problem or opportunity. Similarly to the distinction made by Markus (2001) between expertise and experts, Braganza et al. (2009) highlight the importance of identifying existing expertise (yellow pages) and secondly to identify subject matter experts (people).With a qualitative study at a large oil company Braganza et al. (2009) identify 13 significant attributes for the creation, mobilization and diffusion of organizational knowledge. Xu and Kim (2006) define information seeking as a staged process during which the knowledge seeker develops a better awareness of his knowledge needs, and his relevance judgment becomes stricter. They do not address the concept *knowing* specifically, but they do recognize the uncertainty of the information seeker.

Markus (2001) states that for shared work practitioners, the type of knowledge reusers who are active in communities of practice, location and selection are problematic. Her concept of *knowing* includes both the identification of experts in a subject matter and documentary knowledge sources as well as the knowledge of who "authored" knowledge contributions necessary to assess quality.

Cost

Cost from the perspective of knowledge seeking is defined differently by several authors. Often researchers employ the cost-benefit framework (Ashford and Cummings, 1983) to analyse seekers' information source choice decisions (Xu and Kim, 2006). Kankanhalli et al. (2005) define costs as resources given away during social exchange or negative outcomes of exchange. This definition extends the cost of exchange and takes the outcome of an exchange into account. During social exchange, costs can also be incurred in the form of opportunity costs (Kankanhalli et al., 2005; Bock et al., 2006). Opportunity costs are returns on time and resources which are missed because a knowledge user allocates time and resources to seek knowledge. Thus opportunity costs are dependent on the effort and time

needed to search for knowledge. Markus (2001) proposes effort as an inhibitor to produce and use knowledge. This perspective fits with the literature on technology acceptance. Effort expectancy is a significant predictor of the intention to use technology (Venkatesh et al., 2003; Legris et al. 2003). Bock et al. (2006) focus on the perceived costs of future obligation. Future obligation is the cost impact on the relationship between actors, the expectation of seekers that they will be in debt to a certain extent with the person sought out. This focus matches with the findings of Borgatti and Cross (2003) who state that cost of access increasingly refers to relational energy instead of resources. Expenses of relational energy involve *social risk* which refers to the embarrassment, loss of face, and revelation of incompetence associated with asking another person for information (Xu and Tan, 2006). That is an actor must believe that seeking information is not too costly in terms of either interpersonal risks or obligations incurred (Wasko and Faraj, 2000; Borgatti and Cross 2003). To summarize the independent variable cost can have multiple dimensions, perceived costs of knowledge exchange (effort, costs of opportunity, transaction and outcome, search costs) or future obligation (social risk and reciprocity).

Self-efficacy

Self-efficacy is a characteristic of the knowledge seeker, in literature it is commonly used as a cause or barrier to perform a certain task or engage in behaviour. In the context of knowledge seeking this is a complex variable, as self-efficacy can also be the result of knowledge seeking. In such scenario, a knowledge seeker is strengthened in his self-efficacy as a result of experience, advice or insights of the knowledge source. Self-efficacy is the belief in one's capabilities to organize and execute the courses of action required to produce given goals (Bandura, 1997). Bock et al. (2006) describe self-efficacy as follows: "It is a form of self-evaluation that influences decisions of behaviour, the amount of effort and persistence put forth when faced with obstacles, and finally, the mastery of the behaviour" (p. 361). Kankanhalli et al. (2005) adapt the concept to the context of EKRs, they define self-efficacy as the confidence in one's ability to provide knowledge that is valuable to the organization via EKR. He and Wei (2009) define self-efficacy as the judgment of one's ability to use a technology to accomplish a particular job or task. Cabrera et al. (2006) analyse a trend in recent research to investigate self-efficacy beyond the specified requirements of jobs and instead include proactive interpersonal and integrative tasks beyond technical requirements. This new form of self-efficacy is what they name *role breadth self-efficacy* (RBSE)(Cabrera et al., 2006). RBSE has been designed to measure an employee's self-efficacy within 'a flexible, self-directed, and interpersonally effective workforce' (Parker, 1998) and is hypothesized to be an indicator of employees' inclinations to proactively engage in organizational goal-related behaviours within jobs with broadly defined roles (Parker, 1998). To summarize, *self-efficacy* is often seen as a cause, but can also be the result of behaviour. The variable has one dimension, the belief in one's capabilities, but it can extend beyond a specific task to organizational goals and role-breadth performance.

Seeker knowledge growth

Like self-efficacy, *seeker knowledge growth* describes characteristics of the knowledge seeker. The variable measures a seekers' intrinsic motivation to grow his knowledge, competences. He and Wei (2009) define *seeker knowledge growth* as the knowledge seeker's perceived benefit of enhancing his or her own learning and experience. This intrinsic benefit perception is also recognized by Wasko and Faraj (2000), they define the intrinsic benefit as the seeker's knowledge growth as a result of using a knowledge management system (KMS). Knowledge growth has a perceptive component to it, it is the expectation of users that

seeking knowledge results in learning and personal access to new knowledge or innovations. Bock et al. (2006) link seeker knowledge growth to the motivation for knowledge seekers to obtain knowledge from EKRs. Seekers are more likely to use the EKRs if they expect to increase their expertise when they obtain knowledge from EKRs. To summarize, seeker knowledge growth has two dimensions, the intrinsic benefit expectation and the intrinsic motivation to learn and develop new expertise.

Resource-facilitating conditions

Facilitating conditions are an aggregate of various organizational conditions such as management support, training, time and availability of technology. The variable reflects the availability of resources needed to engage in a behaviour (Taylor and Todd, 1995). Legris et al. (2003) define resource-facilitating conditions (RFC) to explain and predict use of information systems. They refer to RFC as resource-related objective factors in the environment to promote technology usage in various contexts. Venkatesh et al. (2003) provide empirical evidence that the facilitating conditions (resources and skills) have a significant effect on IS usage. Bock et al. (2006) adopt RFC to knowledge seeking behaviour in EKRs. In their model they identify resources which are likely to facilitate knowledge seeking behaviour and include time, availability of technology, training, and management support. In their set of resources they extend beyond technology and include training and management support. Also Cabrera et al. (2006) acknowledge that as knowledge will be volunteered and exchanged, sharing behaviour cannot be facilitated with technology alone. Although they do not specify which other facilitating conditions they expect to be at play and conclude that there is no consensus in literature on the specific variables or management practices. Thus we observe that facilitating conditions are nearly always an aggregate variable of several management practices and resources. This is also apparent in a more recent study on knowledge sharing by He and Wei (2009). They do not make their *facilitating conditions* variable explicit and consider it on abstract level as 'training and resources'. To operationalise the construct they adopt the measures for facilitating conditions from Venkatesh et al. (2003). Kulkarni et al. (2006) are more explicit about organizational support, they distinguish *supervisor*, *co-worker*, *leadership* and *incentives*. Supervisor and co-worker support is a subjective measure of the extent of encouragement provided to and experienced by a knowledge worker in sharing/using solutions to work-related problems, openness of communication, opportunity for face-to-face and electronic meetings to share/use knowledge (Kulkarni et al., 2006). Leadership is a subjective measure of commitment to knowledge management by the top levels of management, exhibited via understanding of the role of knowledge management in business, strategy, and goals set with respect to KM.

Reciprocity

Reciprocity is a situation in which two people, countries, etc. provide the same help or advantages to each other (Oxford University Press, 2005). In the context of knowledge seeking reciprocity involves two people or groups who agree to help each other or behave in the same way to each other (Bock et al., 2005). Reciprocity is a key extrinsic benefit identified in social exchange theory and will therefore be included in the scope of literature review.

Social norms

Kankanhalli et al. (2005) propose that a norm represents a degree of consensus in the social system, norms have the effect of moderating human behaviour in accordance with the expectations of the group or community. Thus social norms represents the relational

dimension of social capital. Norms are deeply embedded in organizational culture, according to Taylor and Todd (1995) in referent groups (e.g. peers and superiors) since their expectation may differ. The effects of social norms is also found in a knowledge sharing context (Müller, 2005). Kankanhalli et al. (2005) define specific norms for knowledge sharing, *pro-sharing norms* (PSNM). These are norms intended to facilitate knowledge sharing in the organization. Bock et al. (2006) translate the pro-sharing norms to a knowledge seeking context. They call them *collaborative norms* which are narrower than the *pro-sharing norms,* in that pro-sharing norms also include willingness to value and respond to diversity, openness to conflicting views, and tolerance of failure, in addition to the collaborative norms of teamwork and cooperation(Bock et al., 2006). One of the variables in the theory of planned behaviour which predicts intention to perform an action (Azjen and Fishbein, 1980) is the subjective norm. Which are the pressures perceived by the individual from the immediate social environment towards an action. Subjective norms result from the people's normative beliefs and their individual motivation to comply with those beliefs. People will be more inclined to perform a certain behaviour if they feel that important referent individuals are likely to approve and even applaud such behaviour (Cabrera et al., 2006). He and Wei (2009) focus on the effects of social relationships that facilitate collective action or are a barrier to knowledge transfer. They identify three aspects of social relationship that are particularly contributory to knowledge sharing: trust, norms, and tie strength.

Usage

Usage is actual behaviour of the knowledge seeker, he uses social relations, EKRs information services or applies knowledge. Tie usage reflects the intensity of the dyadic relation between actors (Hansen, 1999; Burt, 2004). Tie usage also implies the emergence of social networks (van Baalen et al., 2005; Nebus, 2006). The usage intensity of knowledge sources is indicated as *Sourcing Frequency* (Xu et al., 2010). In this study we will define knowledge source usage following Hansen (1999) and Kraaijenbrink (2006); it is the identifying, looking for and acquisition of knowledge from a source. The application, or transfer of knowledge is not included in this view for reasons of simplicity. Nor is the rate of utilization implied by the Sourcing Frequency as the transfer of knowledge from one actor to another depends on many factors such as the type of knowledge, interpretation of knowledge, stickiness of knowledge and the differences in context (Hansen, 1999; Nooteboom, 2000; Burt, 2004; van Baalen et al., 2005). Usage as a construct in IS success theory reflects the intensity with which users use an information system (Delone and Mclean, 1992; Seddon et al., 1999). Bock et al (2006) transfer usage to the knowledge management field choosing it as their dependent variable 'Usage of an EKR' to find sources. In this context 'usage' corresponds to a knowledge identification and acquisition activity defined by Kraaijenbrink (2006).

2.5 SYNTHESIS OF THE LITERATURE

We reviewed the results of our literature search which are thirty-two scientific papers, that differ greatly in scope and intention. Therefore we provide a concept map (Figure 2.2) in section 2.1 to compare the various dependent variables. In Table 2.1 we provide the results of the synthesis, the columns represent the independent variables discussed in section 2.4 while the rows indicate how the specific paper finds the variable to be related to their dependent variable.

From Table 2.1 we observe that nine papers have a dependent variable related to information or knowledge seeking. These papers generally have a relatively low explanatory power, Gray and Meister (2004) find an R^2 of 17.1% for knowledge sourcing behaviour while He and Wei (2009) formulate a model on information seeking which explains 23% of the variance. Bock et al. (2006) find a reasonable explanatory power of 42% but their model is more complex, studying also the influence of social norms, future obligation and resource-facilitating conditions. The graphical presentation (Figure 2.2) of the existing theories related to knowledge seeking make it easy to see how literature finds support or rejects the effects of the independent variables within our scope. Using this analysis we intend to identify a robust set of independent variables which explain and predict a better percentage of the variance in Sourcing Frequency.

Authors\Concepts[a]	Cost	Value	Access	Knowing	Seeker knowledge growth	Resource-facilitating conditions	Social norms	Self-efficacy	Reciprocity	Usage	Dependent Variable[b]	Focus
Adler and Kwon (2002)*		+	+				+				Value of social capital	both
Ashford (1983)*	-	+			+						Feedback seeking	seek
van Baalen (2005) **				+					n.s.		Emergence of Network of Practice	SNA
Bock et al. (2005)							+		+		Intention to share knowledge	cont
Bock et al. (2006)	-	+	n.s.		+	+	+	+			Usage of EKR for knowledge seeking	seek
Borgatti & Cross (2003)	n.s.	+	+	+							Probability of seeking information	seek
Braganza (2009)**		+	+	+							Benefits of managing knowledge	seek
Burt (2004)			+	+							Idea value	SNA
Cabrera et al.(2006)		+	+		+	+	+	+			Individual knowledge sharing	both
Cross & Sproull (2004)		+	+								Actionable knowledge	seek
Lane & Lubatkin (1998)		+		+							Interorganizational learning	AbCa
Grant (1996)*			+								Knowledge integration	
Gray & Meister (2004)			+		+						Knowledge sourcing	seek
Gopalakrishnan (2004)							+				knowledge transfer activities	
Hansen (1999)			+	+					n.s.		Project completion time	SNA
He & Wei (2009)		+			n.s.	+			n.s.		Continued knowledge sharing	both
Inkpen & Tsang (2005) *						+	+				Knowledge transfer	SNA
Kankanhalli et al. (2005)	-						+	+	+		EKR usage	cont
Kraaijenbrink (2006)		+	+	+						+	Systemic knowledge integration	both
Koka & Prescott (2002)			+								Social capital	SNA
Kulkarni et al.(2006)		+	+			+					Knowledge use	both
Levin & Cross (2004)		+	+								Receipt of useful knowledge	SNA
Marks (2008)						+					Knowledge sharing	cont
Markus (2001) **	-	+	+	+		+	+			+	Knowledge reusability	both
Morrison (2000)	-	+	+								Information seeking across sources	seek
Taylor & Todd (1995)		+	+				+			+	IT usage behaviour	
Tsai (2001)			+								BU Innovation and Performance	SNA
Venkatesh et al. (2003)		+	+			+	+	n.s.		+	Use behaviour & behavioural intention	
Wasko & Faraj (2005)			+						n.s.		Knowledge contribution	cont
Xu & Tan (2006)	n.s.	+									Seeker's source preference	seek
Xu & Kim (2006)	n.s.		+	+					n.s.	+	Seeker's source preference	seek
Xu et al. (2009)		+	+								Sourcing Frequency	seek

Table 2.1 overview of results of 32 academic papers included in our literature review

[a]For some papers we abbreviated the authors to improve readability

[b]Figure 2.3 (p. 10) outlines how the different dependent variables are related

Legend	
BU	Business Unit
EKR	Electronic Knowledge Repository
IS	Information System
KMS	Knowledge Management System
NoP	Network of practice
Cont	Knowledge or information contribution behaviour
Seek	Knowledge or information seeking behaviour
Both	Both contributing and seeking
SNA	Social network analysis
AbCa	Absorptive Capacity

*	Literature Review only
**	Qualitative explorative research
n.s.	no significant relation
+	significant positive effect
-	significant negative effect

Table 2.2 legend of literature review Table 2.1

2.6 DISCUSSION OF THE LITERATURE REVIEW RESULTS

In this section we discuss the results of the literature review. Which concepts are applicable in theory about knowledge seeking and which are not? Is there a kernel theory on knowledge seeking and what elements are essential in such kernel theory? This assists in developing the constructs for our theoretical model and finding nuances in existing theories.

Perception

Several of the independent variables we studied are about the perception of a seeker. E.g. a high score on access means that the seeker perceives the source to be very accessible. Therefore it is important to realise how these perceptions are influenced beyond factual observations. Borgatti and Cross (2003) state that at a dyadic level perceptions of value of another person are formed through direct interactions, observation and or third-party commentary.

Cost

The literature is not unanimous on the influence of costs on knowledge exchange in interpersonal relations. Seven papers study costs or a dimension of cost (e.g. future obligations), 3 papers find the effect of costs insignificant while 3 other papers find significant direct effects and one paper (Markus, 2001) hypothesizes a negative direct effect of codification effort (opportunity cost). The three papers find a significant causal relationship with usage behaviour in a context of intermediated sharing, studies on person-to-person knowledge exchange find costs to be insignificant. Interesting though, is the significant negative effect of future obligation on usage of EKRs to seek knowledge under conditions of weak collaborative norms (Bock et al., 2006). There is no competition for the usage of this knowledge and there is no direct social contact between seeker and source. Therefore we expect relational costs to be relevant for person-to-person knowledge seeking behaviour as well.

Value

Literature is unanimous on the perception of value. Although different definitions are used it is clear that perceived benefits, perceived usefulness or performance expectations have significant direct positive effects on all dependent variables studied, including knowledge

seeking behaviour such as Sourcing Frequency and information seeking (Borgatti and Cross, 2003; Xu et al., 2010) .

Access

Twenty of the studies we reviewed find access to have a significant direct effect. Although in some papers access is only under specific conditions significant and in yet other studies access is weakly significant or only elements of their access construct are significant. The one exception is the study of Bock et al. (2006), they find perceived ease of use to be insignificant to usage of the EKR. They explain this finding by explicating that their sample consisted of 'respondents who were considerably familiar with IT' (Bock et al., 2006). An important observation is that the physical component of access, proximity, is insignificant in nearly all papers we studied. We conclude that access is a key construct in social network studies.

An extra conclusion from the literature review is that social network research focuses on network ties as enabler of access to knowledge sources (Granovetter, 1973; Hansen, 1999; Tsai, 2001; van Baalen et al., 2005).Tie strength and structural holes in networks can be used to predict access to knowledge sources. Weak ties increase the access to new knowledge sources and can bridge structural holes, while strong ties negatively influence the ability to search knowledge (Levin and Cross, 2004). However strong ties improve the relationship between the recipient and the source which is necessary for knowledge transfer and exchange of actionable knowledge (Hansen, 1999; Cross and Sproull, 2004).

Knowing

In all of the nine studies in which knowing or a similar independent variable is studied, it is found to have a significant positive direct effect. In studies which were focused on structural holes and social network analysis, knowing is a key aspect which allows the boundary spanner to identify knowledge sources in his network.

Seeker Knowledge Growth

Four out of five studies which consider seeker knowledge growth, find significant positive effects on their dependent variable. Research on knowledge sourcing (Gray and Meister, 2004) shows that learning orientation has significant direct effects on knowledge sourcing and learning outcomes. Learning orientation is a seeker's belief that his own skills and abilities can be improved, and thus he "persists, escalates effort, engages in solution-oriented self-instruction, and reports enjoying the challenge" p.826(Gray and Meister, 2004). Consistent with their belief that competence can be improved, such individuals are more likely to consult with co-workers to improve their knowledge, skills, and abilities(Gray and Meister, 2004). Bock et al., (2006) find that Seeker Knowledge Growth also has a direct effect on EKR usage. However, He and Wei (2009) do not find a significant effect for seeker knowledge growth on seeking belief. In their theory *seeking belief* has a direct effect on seeking intentions. Based on the relatively low number of papers that consider seeker knowledge growth in the different contexts, we conclude that the understanding of intrinsic motivation of knowledge seeker's is low and still insufficient empirical evidence is available despite its potential relevance.

Resource facilitating conditions

RFC have a significant relationship to the dependent variables in all 8 studies which investigate these resources. An important nuance is made by the results of Venkatesh et al. (2003), they find facilitating conditions are significant to predict usage but its relation to behavioural intention is insignificant. None of the papers we reviewed studies in detail the

concept of facilitating conditions, nor is there consensus on which organizational aspects are included in the construct facilitating conditions. Venkatesh et al., (2003) reason that facilitating conditions are insignificant when effort expectancy is included in the theory. They argue that the effect of facilitating conditions is mainly based on IT infrastructure, which is also captured with effort expectancy and thus RFC are redundant in studies which consider effort expectancy. This reasoning only holds when IT infrastructure is a core concept within the facilitating conditions construct. We argue that facilitating conditions have to be studied in detail to improve understanding of the concept.

Social Norms

Social norms are studied in 10 of our reviewed papers, the definitions and context vary and cover topics in a spectrum which has relational and social capital on the one end, and perceived task benefits on the other end. All studies conclude that social norms, pro-sharing norms or collaborative norms have at least a moderating effect. Bock et al. (2006) find that norms of collaboration and cooperation not only have a direct influence on knowledge seeking from an EKR, 'they also moderate the relationship between certain costs (future obligation) or benefits (perceived usefulness) and EKR use' (Bock et al., 2006). Therefore we conclude that collaborative norms are an essential in a kernel theory on knowledge seeking.

Reciprocity

Seven studies consider reciprocity, two of these find a direct positive significant effect. Both of these papers that find reciprocity significant focus on knowledge contribution. In five studies researchers find reciprocity to be insignificant. Important to observe is that pro-social norms are relevant. Of the two papers which find evidence for reciprocity, Kankanhalli et al. (2005) find that reciprocity is only significant under conditions of weak social norms. In the papers we reviewed we did not find evidence which indicates that reciprocity has an effect on knowledge seeking behaviour. Therefore reciprocity will not be included in our theoretical model.

Self Efficacy

Four authors study self-efficacy. One these four studies (Venkatesh et al., 2003) finds self-efficacy to be insignificantly related to behavioural intention. They validate their hypothesis that Self-efficacy is fully mediated by perceived ease of use and has no direct effect on intention above and beyond effort expectancy. Two of the studies (Bock et al., 2006; Cabrera et al. 2006;) which cover self-efficacy in knowledge seeking do not cover the effort aspect, which accordingly to our study can be classified as an accessibility perception. In our model we consider the perceived ease of use of knowledge sources along dimensions of availability, timeliness and social accessibility. Following previous research (Venkatesh et al. 2000; Venkatesh et al., 2003; He and Wei, 2009) we will therefore not consider self-efficacy.

Usage

Usage is an independent variable in several contexts (e.g. IS success theory), Xu and Kim (2006) find a significant positive effect of usage on seeker source preference. In other studies usage is the dependent variable (e.g. EKR usage, knowledge usage and IT usage behaviour).

3. THEORETICAL MODEL AND HYPOTHESES

In this chapter we propose our theoretical model, which consists of hypotheses about the effects of our independent variables on Sourcing Frequency. The hypotheses are summarized in Table 3.1 and the theoretical model is outlined in Figure 3.1. Based on the conclusions of our literature review (section 2.6) we reduce the number of independent variables to 9. The semantic definition of these variables is provided in Table 3.2.

3.1 ASSUMPTIONS AND HYPOTHESES

In (section 2.6) we concluded that reciprocity and self-efficacy are not likely to influence knowledge seeking behaviour, for reasons of parsimony we therefore do not include them in our conceptual model. We also find that physical costs and proximity are often non significant. We therefore follow Bock et al. (2006) and chose to narrow the independent variable 'costs' down to future obligations. We break with Bock et al. (2006) in their resource-facilitating conditions construct. We split the construct into three distinct independent variables, time, management support and technology

Collaborative norms

As we outlined in the description of our research perspective (q.v. section 1.4) we are interested in the influence of social norms on the seeker-source relation. Based on the synthesis of previous literature on social norms (q.v. section 2.5) we conclude that social norms are likely to have both a direct effect on the frequency of knowledge seeking as well as a moderating effect on the social relation between seeker and source. The direct effect of norms is found on usage of information systems (Taylor and Todd 1995; Venkatesh et al. 2003) while users' intentions to, seek and contribute knowledge to EKRs, are both moderated as well as directly influenced by pro-sharing norms (Markus, 2001; Kankanhalli et al., 2005; Bock et al., 2005; Bock et al., 2006; Cabrera et al., 2006). Previous research also indicates that social norms have a significant influence in social networks (Adler and Kwon, 2002; Inkpen and Tsang 2005). Therefore we hypothesize that social norms, which we will refer to as collaborate norms in our context (see also section 2.4), have a direct effect on person-to-person knowledge seeking.

HYPOTHESIS 1 (H1):
Collaborative norms positively influence Sourcing Frequency.

Beside the direct effect, collaborative norms moderate human behaviour and influence collective action (Bandura, 2000). Bock et al. (2006) find that the effect of future obligation and perceived usefulness on knowledge seeking behaviour in EKRs is significantly moderated by collaborative norms. 'In a context of strong collaborative norms, where most colleagues are seen to collaborate, knowledge seekers may not be sensitive to the cost of future obligation (Bock et al., 2006)'. We expect that this influence on future obligation in a person-to-person context is at least as strong as within an intermediated context. We, therefore, hypothesize that there is a synergetic interaction effect between collaborative norms and the perception of future obligation.

HYPOTHESIS 1a (H1a):
Future obligations are negatively related to sourcing frequency and this relationship is moderated by collaborative norms such that the relationship is weaker when collaborative norms are high.

Using analogue reasoning we expect that a knowledge seeker's perception of source value is influenced by collaborative norms. Strong collaborative norms reduce the influence of perceived performance benefits in a knowledge seeker's decision to seek knowledge. Thus we expect that value is more important under conditions of weak collaborative norms than under conditions of strong collaborative norms.

HYPOTHESIS 1b (H1b):
Value is positively related to sourcing frequency and this relationship is moderated by collaborative norms such that the relationship is stronger when collaborative norms are high.

Future Obligation
The significant constructs of costs we find in our literature review are related to effort or relational costs. The research context of Kankanhalli et al. (2005)(contributing knowledge to EKRs) is very different from our context, therefore, we will not consider codification effort. However, previous research (Wasko and Faraj, 2000; Bock et al., 2006) find a significant effect of future obligation on knowledge seeking behaviour in EKRs. Wasko and Faraj (2000) estimate that this effect could be 'worse' when knowledge seeking via an EKR involves explicitly acknowledging the inputs or assistance received. Following these results we expect that the perception of future obligations is also relevant in a person-to-person knowledge seeking context. We, therefore, hypothesize that future obligations inhibit knowledge seekers to use their relationship with the knowledge source.

HYPOTHESIS 2 (H2):
Future obligation negatively influences Sourcing Frequency

Value
Social network research (Borgatti and Cross, 2003; Levin and Cross, 2004) suggest the belief that the expertise of a knowledge source is relevant to a given problem or task leads to information seeking.
Following these findings we define value as *the degree to which actors believe that the knowledge and skills of the person sought out, the knowledge source, will assist in their task performance*. Cross and Sproull (2004) find perceived source expertise to be significant for the receipt of all types of actionable knowledge except for problem reformulation. Previous research on usage of KMSs and EKRs (Markus, 2001; Bock et al., 2006; Braganza, 2009; He and Wei, 2009;) find that perceived usefulness and perceived quality of the knowledge source positively influence system usage.
We, therefore, hypothesize that a knowledge seeker's intention to engage in person-to-person sharing is influenced by his evaluation of the knowledge and skills of the person sought out in relation to his problem or task.

HYPOTHESIS 3 (H3):
Value positively influences Sourcing Frequency

Knowing

To be able to evaluate the expertise of a source, the seeker will have to have at least some understanding of the skills and knowledge of the knowledge source. Social network research suggests that awareness of an individual as a possible source is a baseline condition for turning to a given individual for information (Lane and Lubatkin, 1998; Borgatti and Cross, 2003). From research on social capital theory and network structures we learn that boundary spanners have an advantage in searching and identification of new knowledge (Granovetter, 1973; Hansen, 1999; Burt, 2004). A high out-degree is thus positively related to knowledge seeking.

Therefore, we hypothesize that the decision to seek information from someone when faced with a new problem or opportunity is likely affected by the awareness of the available skills and knowledge within the community of practice.

HYPOTHESIS 4 (H4):
Knowing positively influences Sourcing Frequency

Access

One of the conclusions from our literature review is that physical access is not a significant determinant of source usage. Even in social network research Borgatti and Cross (2003) show that physical proximity has an insignificant effect on the probability that an actor will seek information from another person. Since we chose a perspective of person-to-person knowledge seeking, we will also exclude the usability (perceived ease of use) element from the Access construct. Access in our research is, therefore, considered the perceived availability(social and timeliness) of a knowledge source. Braganza et al. (2009) show in a qualitative research on the success of an intranet based KMS that access has a significant influence on the benefits of the KMS. Social network research finds that perceived accessibility of a knowledge source is a significant predictor of information seeking (Borgatti and Cross, 2003). Moreover, Cross and Sproull (2004) find that ties spanning organizational boundaries as well as weak ties are positively related to receipt of solutions. In section 2.3 we concluded that ties closing structural holes improve access to knowledge. Thus, timeliness of access is an important predictor in KMS success, perceived availability is an important predictor for information seeking and knowledge transfer effectiveness is dependent on access to new knowledge sources. Therefore we expect that perceived availability is related to Sourcing Frequency.

HYPOTHESIS 5 (H5):
Access positively influences Sourcing Frequency

Seeker knowledge growth

We define Seeker Knowledge Growth as the extent to which a person is intrinsically motivated to learn new skills and seek new knowledge. In the studies we reviewed, only three authors did research on the intrinsic motivation of knowledge seekers. Research in the IS field finds that intrinsic motivation is an important element of intentions to contribute knowledge to virtual communities and KMS (Kankanhalli et al., 2005; Wasko and Faraj, 2005; Cabrera et al., 2006). Individual motivations have a significant positive influence on knowledge contributing behaviour. Also research on knowledge transfer success shows that recipient-motivation can be a barrier to knowledge transfer (Szulanski, 1996). The chief personnel and organization at WonenBreburg stated in an interview that he considers it a serious challenge to stimulate employees to actively pursue solutions, look for alternative

sources of information and participate in training and networks. Bock et al. (2006) studied the influence of Seeker Knowledge Growth on EKR usage and showed a significant positive relation. The concept of seeker knowledge growth has received little attention in the context of person-to-person knowledge seeking. However, previous research in the IS field and our observations at the host organization give us good reasons to expect a causal relation between Seeker Knowledge growth and the usage of knowledge sources.

HYPOTHESIS 6 (H6)*:*
Seeker knowledge growth positively influences Sourcing Frequency

Resource-Facilitating conditions
Previous research finds that facilitating conditions directly influence the user's intentions to use IT systems, contribute to EKRs and the success of knowledge transfer and knowledge management (Markus, 2001; Venkatesh et al., 2003; Inkpen and Tsang, 2005; Kankanhalli et al., 2005; Bock et al., 2006; Kulkarni et al., 2006). We, therefore, hypothesize that resource Facilitating Conditions also influence the intentions of a knowledge seeker to seek knowledge from other persons. However, we think that the items within the construct RFC are too diverse to aggregate. Hence, we will operationalise Resource Facilitating Conditions into three separate constructs, Time, Management Support, and Technology. Venkatesh et al., (2003) reason that facilitating conditions are insignificant when effort expectancy is included in the theory. They propose this because the effect of facilitating conditions is according to them mainly based on IT infrastructure which is also captured with effort expectancy. However, in our theory we do not include effort expectancy and IT is not a dominant item in Resource Facilitating Conditions, thus we continue and propose three hypotheses on resource-facilitating conditions.

RFC – Time
From an extensive literature review (Williams, 2008) of organizational learning theory, we conclude that the lack of time is a serious inhibitor of learning. Also in our literature review we find that time is included in every Facilitating Conditions construct. Time in this context should not be considered the efficiency of the usage of an IS but the time which can be allocated to knowledge sharing, IS usage or knowledge transfer. We, therefore, expect that the availability of time which can be allocated to knowledge seeking influences Sourcing Frequency.

HYPOTHESIS 7 (H7):
Time positively influences Sourcing Frequency

RFC – Management Support
Key to tapping tacit knowledge is the employees' sense of personal identification with the enterprise and its mission (Nonanaka, 1991). Our observations at WonenBreburg seem to support this finding, at departments where the manager is actively motivating employees to make use of communities or networks, people tend to be more positive regarding knowledge seeking within their networks.
Williams (2008) finds from an extensive literature review on organizational learning and learning from projects, that top management support is clearly important for employee motivation to share lessons and seek learning. Research on the effects of managerial prompts on knowledge contributing intentions by Marks (2008) finds that reminders of the importance of the goal, as well as reminders about rivals encourage knowledge sharing. Bock et al. (2006) use management values and encouragement by managers as items in their

Facilitating Conditions construct. They find that Resource Facilitating Conditions have a significant positive influence on EKR usage. While Kulkarni et al. (2006) conclude "documenting and using knowledge takes more than IT and KM systems. It takes organizational work involving the use of champions and facilitators", p337. Thus in Management Support is significant in the usage of IS, in organizational learning and has a positive influence on sharing intentions. We, therefore, hypothesize that Management Support also has a positive effect within the context of person-to-person knowledge seeking.

HYPOTHESIS 8 (H8):
Management Support positively influences Sourcing Frequency

RFC – Technology
System Quality is a widely accepted variable in IS success theory, it is a predictor of System Use. Kulkarni et al. (2006) adopt the IS success model to the context of KMS success. "Both Knowledge Content Quality and KM System Quality are significant and important determinants of Knowledge Use through their intermediate effect on User Satisfaction with KM initiatives", p33. Van Baalen et al.(2005) show that knowledge portals facilitate the exchange of knowledge between projects as it closes structural holes and decreases cognitive distance. We, therefore, hypothesize that technology has an influence on intentions to seek knowledge.

HYPOTHESIS 9 (H9)
Technology support positively influences Sourcing Frequency

All hypotheses are listed below in Table 3.1

No.	Hypothesis
1	Collaborative norms positively influence Sourcing Frequency
1a	The higher collaborative norms are, the lower is the negative effect of future obligations on Sourcing Frequency
1b	The higher collaborative norms are, the lower is the positive effect of value on Sourcing Frequency
2	Future obligation negatively influences Sourcing Frequency
3	Value positively influences Sourcing Frequency
4	Knowing positively influences Sourcing Frequency
5	Access positively influences Sourcing Frequency
6	Seeker knowledge growth positively influences Sourcing Frequency
7	Time positively influences Sourcing Frequency
8	Management Support positively influences Sourcing Frequency
9	Technology support positively influences Sourcing Frequency

Table 3.1 overview of the hypotheses

Table 3.2 provides the semantic definitions of the constructs we will use in our theoretical model. In the third column we indicate the source of the construct, in most cases we adapted the construct, or a very similar one, to our research context.

Construct	Semantic Definition
Collaborative Norms	The extent to which an individual is motivated to comply with collective beliefs stimulating knowledge sharing
Future Obligation	The extent to which a knowledge user believes seeking out a knowledge source will cause future obligations and social risks
Value	The extent to which a knowledge user perceives a knowledge source to be of high quality and relevant for his task or organization
Access	The extent to which knowledge seekers perceive a knowledge source to be timely and socially available
Knowing	The extent to which knowledge seekers are able to identify experts and expertise in the CoP
Seeker Knowledge Growth	The extent to which knowledge seekers perceive intrinsic benefits from seeking knowledge
RFC - Time	The extent to which time is available for knowledge seeking
RFC - Management Support	The extent to which actors in CoP are supported and encouraged by their manager to engage in knowledge seeking
RFC - Technology	The extent to which technology and knowledge management tools are available for knowledge seekers
Sourcing Frequency	The frequency of dyadic knowledge sourcing

Table 3.2 semantic definitions of constructs and source of original constructs

Construct	Source
Collaborative Norms	Inkpen & Tsang (2005); Kankanhalli et al.(2005); Bock et al.(2006).
Future Obligation	Wasko & Faraj (2000); Bock et al. (2006).
Value	Markus (2001); Borgatti & Cross (2003); Levin & Cross (2004); Cross & Sproull (2004), He & Wei (2009).
Access	Borgatti & Cross (2003); Cross & Sproull (2004); Braganza et al.(2009).
Knowing	Lane & Lubatkin (1998); Hansen (1999); Borgatti & Cross (2003).
Seeker Knowledge Growth	Szulanski (1996); Gray & Meister (2004); Bock et al.(2006); He & Wei (2009).
RFC - Time	Bock et al. (2006); Williams (2008).
RFC - Management Support	Bock et al. (2006); Kulkarni et al.(2006); Marks (2008); Williams (2008).
RFC - Technology	van Baalen et al.(2005); Kulkarni et al.(2006).
Sourcing Frequency	Borgatti & Cross (2003); Gray & Meister (2004); Xu & Tan (2006); Xu et al. (2009).

Table 3.3 original sources from which the specific construct is adapted

3.2 OUTLINE OF THE THEORETICAL MODEL

In Figure 3.1 we model the constructs and their hypothesized causal relations. Our theoretical model consists of one endogenous variable, Sourcing Frequency and 9 exogenous variables, of which Collaborative Norms can be classified as a quasi-moderator variable. We hypothesize that the three variables resource-facilitating condition variables have independent and direct effects on sourcing frequency, but in previous studies they have been measured in the aggregate construct Resource-Facilitating Conditions therefore we model them with a dashed line.

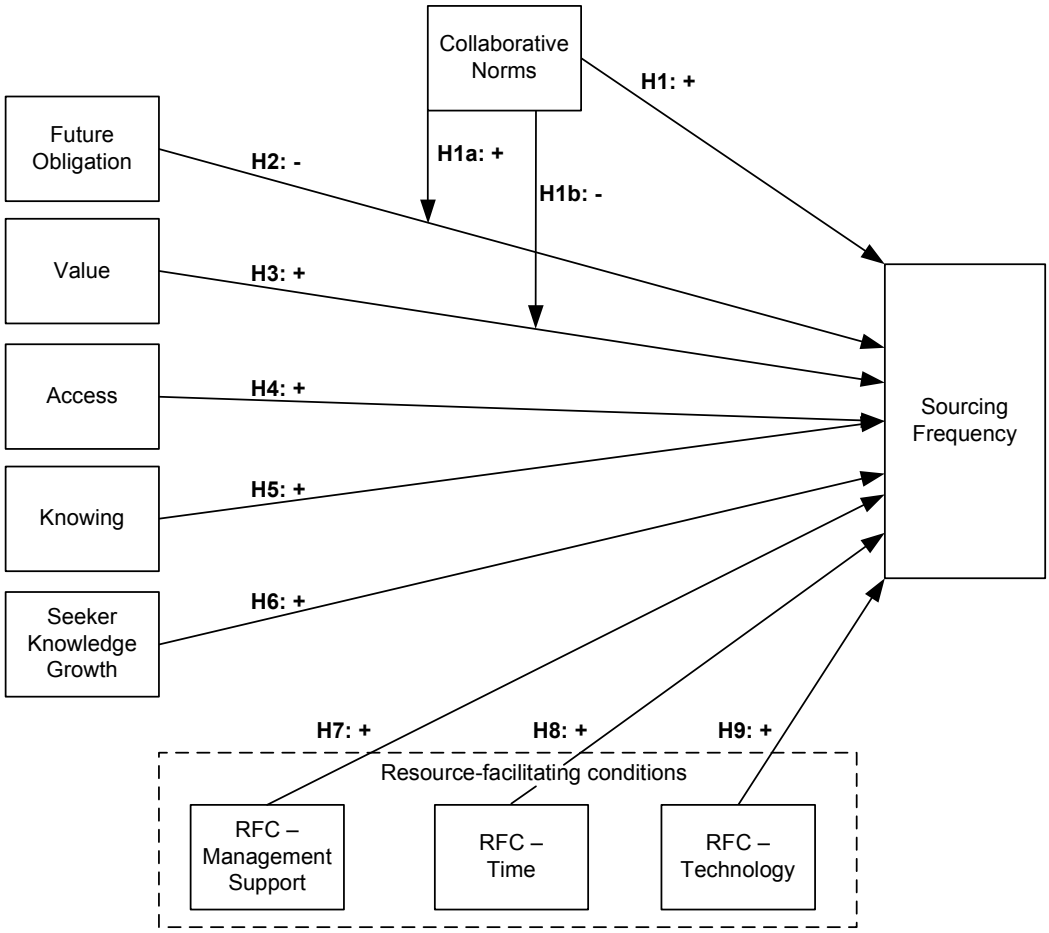


Figure 3.1 Proposed theoretical model

4. RESEARCH METHODOLOGY

In this chapter we describe our research design and selection of methods to test the theoretical model. The data are collected from two Communities of Practice which consist of people employed in the Dutch housing-sector. We discuss our choice of research method and the alternatives in section 4.1. We describe our research design and the procedures we adopt to maximize research validity and reliability in section 4.2. In section 4.3 we discuss the research population and the selection of sample. To create the items in our research instrument, we operationalise the constructs in section 4.4 and we conclude by elaborating on the instrument development process in section 4.5.

4.1 RESEARCH METHOD SELECTION

In this section we explore the appropriateness of alternative research methods to test our hypotheses. Subsequently we argue why a cross-sectional survey study is the most appropriate research method in our research setting. Limitations for our study are the availability of budget (< $1,000) and time (6 months), the geographical spread of the respondents (national), the size of the various CoP's (10-200 actors) and the nature of the study (human attitude and behaviour). We evaluate the feasibility of laboratory (field) experiments, non-reactive research, design research, action research, case-study research, social network analysis and survey research.

Other studies on knowledge seeking have either used survey research, non-reactive research or social network analysis. This previous work provides reuse opportunities of already validated existing instruments. *Survey research* is particularly well suited for quantitative research to test theories and answer questions on the relative importance of independent variables. It is also the most appropriate research method to gather opinions from larger groups of users, e.g. in the context of networks. A disadvantage of surveys is that they can miss out on the opportunity to gather qualitative data from observations and depth-questions. However, considering the state of knowledge on our topic and the benefits from reusing instruments (e.g. comparability and validity) we think that survey research fits best with our topic and context. *Laboratory experiments* work best when all variables except X and Y can be kept at constant levels. In such scenario it is an excellent research method to test causal relationships between the two variables. However, experiments need a very thorough design to be a successful method in complex environments. Moreover, it is expensive and laborious to conduct experiments in a study with many cases. Even though possibilities exist to conduct a field experiment (cf. Braganza, 2009) we consider experiments not very feasible to test our hypotheses. Pure *non-reactive research* is not desirable as the social elements and human intentions are difficult to capture. For our topic it is particularly important to build on experiences, people's opinions and people's beliefs. However, non-reactive research is always valuable to triangulate results or to reduce common method variance (cf. Podsakoff et al., 2003). This is especially relevant, as common method variance is likely to occur in studies on human behaviour and attitudes (Podsakoff et al., 2003). Non-reactive research is objective, although the interpretation of data is vulnerable to researcher bias. In social networks questions on historical events (e.g. collaboration or knowledge exchange) are difficult to recall and the frequency of interaction can be under or overestimated (Dillman et al., 2009). Non-reactive research is in these situations an excellent method to triangulate the results from respondents with objective statistics. However, non-reactive research is not always possible as it impedes anonymity of the respondents (if objective information is to be compared with a respondent's answer). We choose anonymity of the respondents over the

benefits of triangulation because we need a high response percentage to gather data for a decent sample study. We study a relatively small population (290 people) and anonymity is likely to influence our response rate, as we observe that several people have a very negative attitude towards the Futura CoP. Therefore, we will not apply non-reactive research methods to test our hypothesis. We will restrict the use of non-reactive methods to the preparation of the study and the analysis of knowledge-exchange processes at the host organization. *Design research* is well suited for research in the IS field as prototypes can be built fast and at low costs. However, the design principles should draw on strong and comprehensive (kernel) theories. We argue that (q.v. section 1.1 and 2.6) the understanding of knowledge seeking is still underdeveloped. Therefore, our intention is to propose design principles for information services and management interventions to support knowledge seekers in social networks. Future research can draw on these principles to develop prototype services. Considering the maturity of the theory on knowledge seeking, we conclude that design research is inappropriate. *Action research* is suitable to study human behaviour and to explore the relevant independent variables and relations. However the time horizon of such research is broader than the 6 months which are available for this master thesis. The requirement for the researcher to make changes is also hard to realize in a complex network of many actors employed by different organizations. Therefore, we conclude that action research is a an infeasible method for our research setting. *Case study research* is best suited for 'how' questions, where theory building, explanation and analysis are the focus of the research. The main disadvantage of the case study is the limited ability to generalize results. A lot of the external validity relies on the type of case that is studied, either two cases or one critical case are needed (Yin, 2009). A case that could serve as an appropriate critical case, is the DEE case (Sustainable Energy Exploitation) at WonenBreburg, however it is still an immature case and so far only the Futura network participates in knowledge exchange on this topic. Although it is a valid option we think other research methods are better suited for our research goals. *Social network analysis* is an interesting option and is used by several studies on knowledge seeking (Borgatti and Cross, 2003; Xu et al., 2006).However, the nature of the social networks we study makes it hard to do social network analysis. The communities are across organizational boundaries and in general, the ties are weak. The actors exchange knowledge on topics they are interested in, these topics change over time and new expertise is developed. This makes it complex to map the social network as it will show a lot of ties to experts on topics which are popular at the time of research. In the Futura network another problem exist, participants are from different disciplines and departments and will know only a small number of Futura participants. This would bias any social network analysis. Additionally, housing associations have many latent or optional, ties. Actors who have never known each other can create ties when one actor publishes about a project or results of an experiment.

In addition to our cross-sectional survey we interview managers at the host organization, WonenBreburg, for observational purposes. These interviews are not used for hypothesis testing. We interviewed sixteen managers and consultants at WonenBreburg to triangulate findings of the systemic literature review and to study the unique characteristics of the research setting. We chose to interview managers and consultants because employees on this hierarchical level make complex decisions and will have to advise the board and other employees regularly. We assume that they will seek expertise, advice, and opinions frequently. Employees on this hierarchical level at WonenBreburg are also the people who are commonly designated to participate in networks and communities of practice on behalf of their department. More details on the interviewing procedure are provided in appendix B.

4.2 RESEARCH DESIGN

The research design influences the validity and reliability of the research. This section elaborates on the research design and strategies we adopt to increase validity and reliability of the research. To ensure instrument validity and reliability we follow guidelines by Moore and Benbasat (1991). To reduce non-respondent, coverage, sampling and measurement errors we applied the Tailored Design Method (Dillman, 2009) to design the research instrument and survey strategy. Subsequently, we test our hypothesis using the multiple regression technique according to the procedures prescribed by Foster et al.(2006).

Strategies to increase reliability

Reliability is the accuracy and precision of the measurement (Cooper and Schindler, 2008), it is the degree to which a measurement is free of random or unstable error. A measurement error can still be reliable as long as the error is consistent. Reliable instruments can be used with confidence that transient and situational factors do not interfere. To assess constructs for reliability, different types of consistency can be evaluated. The most commonly used technique is to assess internal-consistency with the Cronbach's alpha (Cronbach, 1951). The pilot test will be used to assess reliability and make changes in the instrument to improve the reliability. Reliability is also assessed for the full survey. Following previous research we will use a value of at least alpha .70 to indicate adequate reliability.

Strategies to increase validity

Validity is the extent to which the survey actually measures what we intend to measure, it can be distinguished between external and internal validity. *External validity* is the data's ability to be generalized across persons, settings, and times (Cooper and Schindler, 2008). From a quantitative perspective the choice of the sample size, effect size and the significance level influence the validity of the conclusions that might be drawn from the statistical tests. From a qualitative perspective external validity is increased when the sample represents the population and is independent of time and setting. Conducting a survey that produces accurate information which reflects the views and experiences of a given population requires developing procedures that minimize all four types of survey error – coverage, sampling, non-response and measurement (Groves, 1989). To reduce these sources of survey error to a minimum we will follow the Tailored Design Method (Dillman, 2009).In section 4.3 we elaborate on the choices we face in choosing specific sampling and response strategies.

Internal validity is the ability of a research instrument to measure what it intends to measure. In our research it refers to the confidence we can have that we are actually assessing the causal relationships of our independent variables on Sourcing Frequency. If the likelihood of alternative causes that could explain our observations is reduced, we increase internal validity. Cooper and Schindler (2008) argue that the three major forms of internal validity are content validity, criterion-related validity and construct validity. Content validity is the degree to which the content of the items adequately represents the universe of all relevant items. "Content validity is the extent to which measurement scales provide adequate coverage of the investigative questions" p. 714 (Cooper and Schindler, 2008). Especially in studies on human behaviour and attitude it is important to define the relevant dimensions of constructs. We follow the instrument development process as prescribed by Moore and Benbasat (1991) to construct the survey. Their method involves judgmental and panel evaluation of the items and scales (e.g. sorting procedure). The reuse of items and constructs from literature is also a method to increase content validity.

Construct validity is the degree to which the variance is indeed explained by the measure. Alternative explanations have to be ruled out for observed causal. It is "the degree to which a research instrument is able to provide evidence based on theory" p. 714 (Cooper and Schindler, 2008). Convergent validity and discriminant validity are the main components of construct validity. Convergent validity is the relatedness of items in a scale. In factor analysis the items should load on the same factor to ensure their convergent validity. Discriminant validity is the lack of relation between measures that theoretically should be unrelated. Different measures should not measure the same thing, items for different constructs should therefore not correlate too much. In factor analysis a construct should share more variance with its measures than with all other constructs (Chin,1998).
We use the pilot-test to assess the discriminant and convergent validity of our measurements and optimize our instrument accordingly.
For our full survey we will assess construct validity, using multiple methods. We will apply factor analysis, use Average Variance Extracted (AVE) based methods, and assess zero-order correlations. The AVE index gives an indication of the amount of variance captured by a construct relative to the amount due to measurement error (Chin 1998). Brown (2006) advocates principal factor analysis over principal component analysis because factor correlations are more likely to be closer to population values. "In principal component analysis random error is included in the components because principal component analysis does not differentiate common and unique variance" p.33 (Brown, 2006). Therefore, we do the factor analysis based on principal axis factoring and request oblique rotation (promax). SPSS outputs both a pattern matrix and a structure matrix. The loadings in the pattern matrix shows the unique relationship between a factor and an indicator. Indicator variance that is explained by more than one factor is omitted from the loadings in the pattern matrix (Foster et al., 2006). The structure matrix is calculated by multiplying the pattern matrix by the factor correlation matrix. The loadings in the structure matrix reflect the relationship between the indicator and a given factor without holding the other factors in the solution constant. There is some debate about whether the pattern matrix or structure matrix should be used, by far the pattern matrix is most often interpreted and reported in applied research (Brown, 2006). Hence, we will look at the pattern matrix to interpret the results.

Control variables

Control variables are constructed to test for confounding factors, the use of control variables does increase the statistical conclusion validity as it gives insight in the unexplained variance of the dependent variable. Following Kankanhalli et al. (2005) we will use Age, Tenure (both CoP and organizational), Gender as control variables. Additionally, we include Organizational Size (in rental units) because Tsai (2001) finds this to be a significant variable in knowledge transfer in intra-organizational networks. Our choice for these control variables allows comparisons with other studies that use these variables as well, e.g. Gray and Meister (2004) find that Job Tenure has a significant negative influence on knowledge sourcing behaviour. Gender, age and tenure should, according to Armstrong and Overton (1977) be used to estimate non-respondent bias, by comparing demographics of sample with the total population.

Testing for moderating variables

The main reason we chose for multiple regression analysis is because it fits well with the application of the Moderated Regression Analysis (MRA) and other researchers have used multiple regression analysis as well in similar contexts (Borgatti and Cross, 2003; Kankanhalli et al., 2005). Kankanhalli et al. (2005) use MRA to test interaction effect. "Moderated regression is a hierarchical procedure that first tests the relationship between

independent constructs and the dependent construct, and then tests the relationship between interaction terms and the dependent construct (Sharma et al. 1981)" p.127, (Kankanhalli et al., 2005). We test our moderator variable, Collaborative Norms following the four steps prescribed by Sharma et al. (1981) in section 5.4.

4.3 SELECTION OF SAMPLE AND POPULATION

The data for our study are collected from actors in two CoP's in the Dutch housing sector. The two CoP's are distinct in their composition of actors and participating organizations. We summarize the differences in Table 4.1 to give an overview of the characteristics of both CoP's. Beginning with Futura, this community started as a strategic cooperation between seven housing associations operating in the same province (Noord-Brabant) in the Netherlands in 1997. In the beginning Futura aimed to combine the common interests of the housing operations in the region. Overtime, the CoP has developed and has become a complex network on multiple levels crossing departmental borders. The participating housing associations collaborate both on individual level (e.g. in tactical projects) or on organizational level (e.g. lobbying and procurement). The composition of the community is changing, member organizations have merged with other housing associations and partner organizations, which do not necessarily have to be housing associations, are now allowed to participate. Futura is managed by a 9-member staff organization, which consists of a director, three program managers, two consultants and three administrative employees. Currently, Futura consists of five member organizations and three partner organizations together they employ nearly 1500 FTE. WonenBreburg is their largest member, with over 400 FTE and approximately 30 000 rental units. Actors in the network can participate in seminars, meetings, trainings and project teams which work on specific topics. Around these formal structures actors develop informal ties and build social networks. Futura facilitates offline and online interaction, actors are able to use an extranet to share documents and digital information easily. Employees participate in Futura when projects appeal to them and when they choose to take part in programmes. In practice Futura consists of many temporary interactions and (working)relationships. The program manager initiates a new project team on a specific topic and then new participants from different member organizations and partners are recruited. Therefore, Futura is a dynamic multi-disciplinary network. This makes it hard to determine the Futura population exactly, since not every employee or partner and member organizations will become active in Futura. On the other hand, the relational database is too small. People are entered in the database when they show interest or have ever participated in a Futura event or project. Thus, there is a significant group of latent actors, the size of this group is hard to estimate. There are approximately 250 people in the relational database, approximately 150 of whom are relevant to our study. We chose to exclude partners and contacts who never participated in the CoP, since the Futura board did not approve including these people, as they are afraid their responses will bias the study as attitudes and opinions of these members are not based on facts and experiences.

The second CoP we collect data from is NetwIT, in contrast to Futura this network has a very homogenous knowledge base. The community consists of 164 ICT managers who work for different housing associations all over the Netherlands. NetwIT CoP consists of ICT managers and consultants only, this means that the actors all have a high level of shared understanding of the knowledge they discuss. Additionally, the participants are on approximately the same hierarchical level which increases their communalities in interests. Similar to Futura, NetwIT has its own governance structure and participation is voluntary. Their board is composed of seven ICT managers and one administrative employee. They

host several meetings per year and focus on ICT topics that they identify as relevant for the community. At these events, topical experts, academics and colleagues are invited to share their thoughts, present their projects, and discuss their experiences related to a central theme (e.g. risk management, business and IT alignment, business services). NetwIT has a website which provides opportunities to look up other members and share files, documents and exchange messages. The meetings and events provide a platform for offline interaction as well. NetwIT is, compared to Futura, a very stable network. Table 4.1 provides a short summary of the characteristics of both CoP's.

Characteristic	Futura	NetwIT
Participating organizations	< 7	>140
Hierarchical position of actors	All levels {operational, CEO's}	Managers and consultants
Network stability	Dynamic with members joining and leaving projects	Stable
Shared knowledge background	Heterogenous	Homogenous
Topics of interest	Various	ICT related
Shared goals	Members work toward a set of common goals	Compatible goals but rarely common goals
Geographic dispersion	Clustered in the province of Noord-Brabant	Spread throughout The Netherlands

Table 4.1 comparison of the two CoP on key characteristics

When not every person in the population is sampled, sampling error is a risk. This affects the precision with which the survey estimates (Dillman, 2009). Coverage error results from differences between people included and those who are excluded from the survey. This is especially a threat when not all members of the population have a non-zero chance of being included in the sample (Dillman, 2009). In our study there is little sampling nor coverage error because the survey population is small and visible enough to include all members of the CoP's. Neither of the CoP's are very representative for other inter-organizational networks of practice. By comparing the two distinct CoP's we try to give a more holistic insight in seeking behaviour within CoP's. The CoP's are both small while the moderating variables in our theoretical model and the intention to compare the CoP's benefit from a high number of respondents. Therefore we invite all members of the CoP's to participate in our survey. Consequently, NetwIT has no coverage errors, everyone who is a member will receive an invitation. Futura does have a certain coverage error because the total population is an assumption and the network is unstable. We simplify the practice and consider the relational database of Futura complete and send out surveys to all relevant (people who participate, exchange information and knowledge) actors listed in the database.

Response rate strategy

Non-response error results when people selected for a survey who do not respond are different in a way that is important to the study from those who do respond. To reduce non-response error we follow the procedures laid out by Dillman (2009) to communicate with respondents and design the instrument items. We acquired full support from both CoP's which allows us to communicate to the respondents through an authority they trust (the president of the CoP). The first communication is a pre-notice sent by the president of the CoP. The pre-notice is a letter of recommendation, it explains the purpose of the research, highlights the importance of participation, ensures confidentiality and security of all information submitted and words of thanks at the end of the letter. The letter appeals to people's helping tendencies to encourage them to respond to the survey (Groves et al., 1992). Dillman (2009) finds that pre-notice letters that explain why the survey is being conducted and that highlight the importance of participation influence people's decision to participate.
We follow a three email contact strategy, pre-notice a few days prior to sending the survey. After one week we send a first reminder, the first reminder thanks people for their

participation and asks those who have not yet responded kindly to do so. One week after the first reminder the final reminder is sent, announcing the closure of the survey and making a last appeal to people's help.
We decided not to offer gifts as an incentive to participate, since both CoP's indicated that this is something which does not fit with their ideology of 'free' helping and sharing with others.

4.4 OPERATIONALISATION OF CONSTRUCTS

In this section we operationalise the constructs and describe the items which are used and their source. Our theoretical model consists of nine independent variables and one dependent variable. As shown in chapter four, all ten constructs are adapted from existing theories to fit our specific research setting. The English survey items and their source are listed in Appendix C, the Dutch survey items are listed in Appendix D. For consistency purposes we measure items on a five-point Likert-scale when it is appropriate to do so. Although some original scales were measured with seven-point Likert-scales we feel five-point Likert-scales fit best with our intentions to make the survey instrument light and easy to use for respondents.

Items in our instrument are adapted from used and validated measurements of previous studies (e.g. Borgatti and Cross, 2003; Venkatesh et al., 2003; Bock et al., 2006). In appendix C we have listed the source of each item. Some of the original score ranges could not be used in our instrument directly, due to differences in our research setting (often the inter-organizational nature of our CoP). We extend or narrow constructs (i.e. *Knowing*) to fit with our definition based on conclusions we draw from the structured literature review. To prevent respondents to reject the survey because of language difficulties, the survey implementation is in Dutch. We asked a first grade English teacher and two graduate students to assist in the translation process to ensure the items retained its original meaning while being easy to understand for the Dutch respondents.

Collaborative Norms (CONO) is measured with a five-item-scale, three of these items are adapted from Kankanhalli et al. (2005), and two additional items are adapted from Venkatesh et al. (2003) and Bock et al. (2006). The items measure how the respondent perceives the existence of collaborative norms in his organization. The items are evaluated on a five-point Likert-scale (1="strongly disagree", 5="strongly agree").

Future Obligation (FUOB) consists of four items, three of which are adapted from Bock et al. (2006) and one additional item is adapted from Kankanhalli et al. (2005) to include social risk. The questions ask respondents if they feel pressed to pay back for knowledge acquired from the CoP. The items are evaluated on a five-point Likert-scale (1="strongly disagree", 5="strongly agree"). Afterwards we reverse coded these values to ensure that high scores can be interpreted as high perceived future obligation in the multiple regression analysis.

Value (VALU) is a scale which consist of five items. Two items are adapted from Xu and Tan (2006), two items are adapted from Venkatesh et al. (2003) and one item is from Borgatti and Cross (2003). Borgatti and Cross (2003). Respondents are asked to evaluate whether they think there are people in the CoP who can be of value for their job or task. The question is introduced with a short note to emphasize that the statements are about the value of expertise to their own job. The items are evaluated on a five-point Likert-scale (1="strongly disagree", 5="strongly agree").

Access (ACCS) is operationalised using four items. The four items are adopted from Borgatti and Cross (2003), Levin and Cross (2004), Xu et al. (2010) and Bock et al. (2006). The need to draw on four different constructs exists because Borgatti and Cross (2003) use a one item scale, which we want to avoid. Levin and Cross use availability but their construct is tailored to a social network analysis, therefore we can adopt only one item from their scale. The items of Xu et al. (2010), Bock et al. (2006) and Levin and Cross (2004) are reworded positively to ensure all items are in the same direction.
Our items ask the respondent to evaluate the general availability of people in the CoP and whether they perceive seeking of knowledge in the CoP to be easy and effortless. The items are evaluated on a five-point Likert-scale (1="strongly disagree", 5="strongly agree"). High scores indicate a high accessibility of other people in the CoP.

Knowing (KNOW) consists of four items that are adapted from Xu and Tan (2006) and Borgatti and Cross (2003). To adapt the items from Xu and Tan (2006) from a social network setting to a general CoP setting we focus the items to a specific topic instead of a specific person. The survey questions are introduced by asking respondents to take a specific topic in mind which is relevant in their current tasks. Item 4 (which has been dropped after the pilot-test) asked respondents to evaluate the number of people they know within the CoP who have expertise on this topic. All items within the knowing construct are evaluated on a five-point Likert-scale with a self-developed range (nobody – 10+ people). This self-developed range is needed for the conversion of the items from a social network analysis to a survey instrument. We created the range (1="nobody", 2= 1 person, 3=2-4 people, 4=5-10 people 5= more than 10 people) based on interviews and observations with participants in Futura, typically people have frequent contact with less than 5 people unless they are particularly involved. The other two items evaluate the general awareness of expertise in the CoP, these are measured with a five-point Likert-scale (1="strongly disagree", 5="strongly agree).

Seeker Knowledge Growth (SKGR) is measured using four items. Two items are adapted from He and Wei (2009) one from Venkatesh et al. (2003) and one from Bock et al. (2006). Respondents evaluate their personal benefit from knowledge seeking and state whether they enjoy knowledge seeking or not. The items are evaluated on a five-point Likert-scale (1="strongly disagree", 5="strongly agree").

Resource-Facilitating Conditions Time (RFCT) consists of three items which are all based on the measurements of Bock et al. 2006 for *resource facilitating conditions*. The questions ask the respondents whether they have to overextend to finish tasks and if they need to find time between their normal activities to seek knowledge. The items are reverse coded, (5="strongly disagree", 1="strongly agree") to ensure that a high rating of RFC Time matches with a high availability of time to seek knowledge.

Resource-Facilitating Conditions Management Support (RFCM) is measured with a four-item scale. Two items are based on Bock et al. (2006) and two items are based on He and Wei (2009). The items ask respondents whether they perceive their manager or boss to encourage knowledge seeking behaviour. The items are evaluated on a five-point Likert-scale (1="strongly disagree", 5="strongly agree")

Resource-Facilitating Conditions Technology (FCIT) is a scale which we operationalise with three items. We refer to facilitating technology as tools that aid in finding people, communicating with people and facilitating knowledge and information exchange (e.g.

repositories, intranet and contact information) The existing measures do not fully cover these dimensions, therefore we make use of two self-developed items (FCIT 2 and FCIT 3) and one item (KM system quality) which is used by Kulkarni et al. (2006). The items are evaluated on a five-point Likert-scale (1="strongly disagree", 5="strongly agree").

Sourcing Frequency (SCFQ) is operationalised using two items that are adapted from Bock et al. (2006) and Borgatti and Cross (2003). These two items ask respondents to estimate the frequency of interaction with other people in the CoP and the frequency of interaction with specific knowledge sourcing purposes. Following previous social network research (Hansen, 1999, Borgatti and Cross (2003), Levin and Cross (2004) the items are measured on a 7-point Likert-scale. However, the scales used in literature are tailored to intra-organizational interaction which occurs far more frequently than (1="daily", 4="twice per month", 7="less than once per three months or never") the interaction in the inter-organizational CoP's (often expressed in interactions per year) we investigate. Following guidelines by Dillman et al. (2009) we deviate from the original range. Respondents often do not have a readily available answer to this question and will assume that twice a month is 'normal' or that once a year is very rare and instead overestimate their sourcing frequencies. Therefore we choose for a range that avoids bias as much as possible. Similar to our self-developed range for knowing, we constructed the intervals based on our interviews with managers and consultants. From these interviews we learned that actors in a CoP typically participate in one or two events per year. In this context weekly interaction is considered very frequently. The items are evaluated on a seven-point Likert-scale (1="never", 2="once a year", 3="twice a year", 4="once every three months", 5="monthly", 6="weekly", 7="daily")

4.5 INSTRUMENT DEVELOPMENT PROCESS

Measurement-error results from inaccurate answers to questions and stems from poor questions wording, survey mode effects, or aspects of the respondents' behaviour. We therefore, apply the principles of Dillman (2009) in designing the instrument. The first page of our survey contains the more interesting and appealing questions while demographic questions are formulated indirectly (i.e. year of birth instead of age) and placed at the end of the questionnaire. The survey lay-out is carefully chosen and the number of questions per page is relatively low to give the questionnaire a light look and feel to reduce the perceived costs of responding (see Appendix D, Figure D.1, for a screenshot). The initial reactions of people who filled out the questionnaire indicate that the survey is short and easy to fill out.

During the first stage of item creation, items of different authors were compared. Based on the definition and scope of the constructs (defined in section 4.3) 4-5 items per category were selected. Moore and Benbasat (1991) create 10 items per category and go from there, however we chose to drop too similar items and avoided to develop items ourselves. As a result our average number of items per construct is 3.7.

First sorting round

Following (Davis, 1989) and Moore and Benbasat (1991) we used two rounds of sorting to assess the content and construct validity of our instrument. To let people easily sort the items into categories, we printed the items on cards and gave them to the judges in a shuffled deck. Three judges, employees at WonenBreburg, participated in the first sorting round. The results of this first sorting round are available in Table 4.2. Prior to sorting the cards, judges were introduced to the procedure with a small set of 12 items on 4 categories related to cars. The judges were allowed to ask infinite questions and were given the same sorting

instructions. In the first sorting round respondents were not told what the underlying constructs are. We asked respondents to group the items and describe the categories they created. Judges indicated that they had difficulties grouping the items. We then decided to tell them how many categories exist. The average hit rate of judges in the first round is 76%, which is decent compared to studies by Kankanhalli et al. (2005) (86.5%) and Moore and Benbasat (1991) (78%).

	Actual scale												
Target scale	CONO	FUOB	VALU	KNOW	ACCS	SKGR	RFCT	RFCM	FCIT	SCFQ	Other	Total Qs	Hit Rate (%)
Collaborative Norms	**10**					1		3			1	15	**67%**
Future Obligation		**9**			1						2	12	75%
Value	2		**8**	1	1	2					1	15	**53%**
Knowing			1	**9**	2							12	75%
Access					**7**	1					1	9	78%
Seeker Knowledge Growth						**10**		2				12	83%
RFC Time		1					**8**					9	89%
RFC Management support	6	1						**5**				12	**42%**
RFC Technology									**9**			9	100%
Sourcing Frequency										**6**		6	100%
											Average		**76%**

Table 4.2 results of the first sorting round

Note 1: values on the diagonal are 'on target' and are marked bold

Note 2: values below the acceptability threshold are marked red

The judges thought that the formulation of items SKGR2 and CONO1 is vague, so we reformulated these. The sorting procedure also showed that there was a problem with the scales of Value, RFC Management Support and Collaborative Norms. Items of the Value scale are placed, without a visible pattern, in several different scales. General comments of the judges indicate that they have difficulties with the formulation of Value items. Especially VALU1 is consistently misplaced. After having evaluated all items in the Value scale we decided to drop VALU1 and reformulate VALU5. Additionally, we found that KNOW3 and VALU3 are too similar and reworked the translation to make the questions more distinct. The scales of Collaborative Norms and RFC Management Support consist of several items that are misplaced following a certain pattern. Items developed for the RFC Management Support scale are classified by the judges as collaborative norms and vice versa. Moreover, RFCM3 was placed in collaborative norms by all judges. The item is used by He and Wei (2009) in a aggregated construct which measures facilitating conditions. Because He and Wei (2009) do not consider the influence of social norms, they do not risk correlation with such a construct. We therefore decided not to move RFCM3 into the Collaborative Norms scale, but instead drop the item altogether to prevent multicollinearity. Furthermore, we completely reformulated RFCM4.Based on the first round we made several adaptations to the instrument. We dropped FUOB4 because all judges misplaced this item and when asked for an explanation, judges indicated that the question is too complex and different from other items.

Second sorting round

For the second sorting round we invited five new people to participate in our sorting process. The five judges we asked are ICT professionals at WonenBreburg, who are familiar with Futura and employed longer than one year. Again we asked the judges to sort the 'test' deck

of items on cars to ensure that judges understood the procedure. In contrast to our first sorting round we provided the judges of the second round with ten categories, our scales. This speeded up the sorting process significantly and judges complained less about the sorting exercise. The results of sorting round two are listed in Table 4.3. In the second round judges had an average hit rate of 85% which is a significant improvement compared to the hit rate in the first round. The results in the second round also offered some good opportunities to improve the instrument further. Value is the only scale left with a hit rate below 75%. The main reason for this is because judges did not realize the distinction between value of expertise to a task and existence of expertise in the CoP. We notice that KNOW3 and VALU3 are too similar and judges place the items in either Knowing or Value. We therefore will add an introduction to the items in the instrument to emphasize that the Value items are focused on their perception of performance benefits for their own job and tasks.

Additionally, the items KNOW1 and KNOW2 are reformulated and we add a little guiding text as introduction to these items (q.v. Appendix C). In the short note we ask respondents to take a specific topic in mind and answer the questions considering this topic. To finalize the instrument we consider the item, CONO5, which is put into the RFC Management Support scale by all judges. CONO5 is a frequently used item by other authors in social norms constructs (e.g. Venkatesh et al., 2003; Kankanhalli et al., 2005) we therefore decided not to move the item to RFC Management Support but instead drop CONO5 to prevent difficulties in comparability or convergent validity. Based on comments of one of the judges we slightly reworded FCIT3 and RFCT2. The introduction text of ACCS1 appeared to be too complex and ambiguous, based on the feedback we simplified and restructured the introduction of ACCS1. Several minor spelling and grammar corrections were made.

	Actual scale												
Target scale	CONO	FUOB	VALU	KNOW	ACCS	SKGR	RFCT	RFCM	FCIT	SCFQ	Other	Total Qs	Hit Rate (%)
Collaborative Norms	**19**		1					5				25	76%
Future Obligation	1	**13**				1						15	87%
Value			**11**	6		2	1					20	**55%**
Knowing		1	1	**18**								20	90%
Access		2			**17**	1						20	85%
Seeker Knowledge Growth						**19**	1					20	95%
RFC Time				1			**13**		1			15	87%
RFC Management support						1		**14**				15	93%
RFC Technology				1			1		**13**			15	87%
Sourcing Frequency										**10**		10	100%
											Average		**85%**

Table 4.3 results of the second sorting round

Note 1: values on the diagonal are 'on target' and are marked bold

Note 2: values below the acceptability threshold are marked red

Testing of the instrument and results of the pilot-test

After the sorting procedure we uploaded the instrument to a dedicated survey website. We tested functionality, and checked for spelling before four people were asked to test the instrument. The testers, checked for functionality, spelling, wording of questions, lay-out and the ease of use. The testing team comprised the two supervisors from WonenBreburg, a person from the Futura organization and a graduate student with experience in conducting

internet surveys. The modifications of the instrument did not include any content related changes, their advice targeted readability, user friendliness, spelling, and technical issues.
To test the reliability of the instrument we conducted a pilot survey among twenty-one people. The people we asked to participate, are all members of the Futura network, they were randomly selected from the total population of Futura. The participants did not know that the survey they received had testing purposes. They received the invitation in a formal letter from the Futura board. Thirteen people (61,9%) returned the survey, however two results could not be used because of missing values. The demographical questions at the end of the survey were skipped by five people and another three people did not fill out realistic dates of birth or employment at the organization. Based on these findings, we simplified the demographic questions drastically. We modified the demographical questions so they could all (except the gender) be answered by selecting a specific year from a single dropdown menu. We assessed the reliability based on eleven useful responses. Knowing is the only construct with an alpha value below the .7 threshold (Cronbach, 1951). Item statistics show that the alpha of knowing can be increased to .698 when we delete item KNOW4. KNOW4 is a self-developed item which is included to emphasize the 'awareness' dimension of another person's experience. The pilot study shows that KNOW4 does not fit with the underlying dimension of knowing. We therefore, dropped the self-developed item KNOW4. Future Obligation and Resource-Facilitating Condition Time have alpha values above .7. However, the reliability of these constructs can be improved significantly by deleting items RFCT3 and FUOB1. We decided not to delete these items because it would downgrade each scale to a two item scale. We prefer having three item scales for data analysis purposes, especially because the reliability of the current scales is above the .7 threshold.

5. DATA ANALYSIS

In this chapter we assess the results of the survey we conducted among 280 actors in two Communities of Practice CoP, Futura and NetwIT. On average, the participants were employed with their organization for nearly 10 years and had 4.8 years experience with the CoP. Job positions of the respondents included consultants (e.g., project or operations), managers (e.g., project or department), and analysts (e.g., IT or financial). We test our hypotheses after assessing the response, validity, reliability, as well as the requirements of multiple regression analysis.

5.1 ANALYSIS OF RESPONSE

In section 4.3 we described our response rate strategy, we followed the strategy, and in addition, we had an opportunity to present the study at the ICT-and-housing-fair 2010. A detailed overview of the response is given in Table 5.1. The Futura CoP consists of 150 actors which are relevant to our study, 21 of them received the pilot survey, 9 people in the relational database appeared to be no longer employed or active within their organization and 4 people had incorrect or missing contact information. Therefore, the total population of actors within Futura that we could approach is 116. For NetwIT we were able to send surveys to all of their 164 members. In total, we sent out 280 surveys, of which 149 were returned. 11 surveys were incomplete, typically a construct should not have more than 10% missing cases. Because we still meet this condition if all incomplete responses are excluded, we eliminate all cases with missing values. This results in a useful response of 138, which equals a net response rate of 49.3%. The response rate is substantially above the average 40% response rate for web and email surveys (Dillman, 2009). We also note that the response rate does not differ much for the two CoP's. The relatively high response rate indicates a relatively low non-respondents error.

Community of Practice	Population	Useful responses	Response rate
Futura	N= 116	60	51.7%
NetwIT	N= 164	78	47.6%
Total	N= 280	138	49.3%

Table 5.1 detailed response statistics

To assess the non-respondents bias we also analyse the demographics of the CoP's and the respondents. The results are presented in Table 5.2

	Futura		NetwIT	
Variable	Total	Respondents	Total	Respondents
Actors	116	60	164	78
Age	44	42	46	42
Organizational Size	17,523	16,500	10,975	16,650
Male	54.8%	61.7%	94.5%	94.7%
Female	45.2%	38.3%	5.5%	5.3%

Table 5.2 demographic comparison of respondents and sample population

Because keeping track of members is not a primary task of the CoP staff, the relational databases are recorded in simple spreadsheets and contain limited information (i.e. contact information and name). In none of the CoP's we were granted access to their database due to their privacy policy allowed. Therefore, only aggregate demographics are available. It limits us in the ability to calculate the standard deviations for the entire population per indicator. We were only able to retrieve mean values which makes it impossible to test the differences statistically.

If we look at Table 5.2, the most remarkable difference is between the average organizational size of the NetwIT respondents and the average organizational size of the total NetwIT population. We expect that this is due to the large variance in organizational size. We observe this variance from our NetwIT respondents, the size of their organizations ranges from 300 to 82,500 with a standard deviation of 16,591, which is very close to the mean (16,650). In this group of respondents, 25% of the organizations have over 20,000 rental units, which is substantially above the national average (11,1%, Aedes 2009). From the interviews we learned that large housing associations are often engaged in larger projects (construction, innovation) which are seen as showcases for the housing-sector. We also expect that the large housing associations feel an above average responsibility to participate in our study as they expect it to have a positive effect for their image (e.g. show commitment to the CoP). The participation of the largest housing associations bloats the average Organizational Size of respondents, but we do not expect this to be a problem as the NetwIT respondents represent 78 different organizations. Compared to the national distribution of housing organizations the large associations are overrepresented in both CoP's. We expect that this is because of the perceived benefits for the organizational image (innovative and cooperative) that participation in CoP's provides. Large associations have more stakeholders and a stronger position in political discussions. We expect that they are therefore also more concerned about their (innovative and cooperative) image. Based on the demographic differences between the respondents and the sample population we do not expect non-respondents bias to have a significant influence on our results.

5.2 ASSESSING RELIABILITY AND VALIDITY

In this section we ascertain that our data meet the validity and reliability requirements, to do so we follow the procedures as described in section 4.2.

Reliability

We use (1) Cronbach's alpha and (2) Composite reliability to assess internal consistency and test the assumption of unidimensionality. The value of the Cronbach's Alpha should be greater than .7. Table 5.3 shows that all constructs meet this criterion. When we study the reliability analysis in detail, we find that no items should be dropped to improve the reliability of a specific construct. To calculate the composite reliability and the Average Variance Extracted (AVE), we use SmartPLS version 2.0.M3 (Ringle, Wende, and Will, 2005).The PLS approach takes the relationships among constructs into account to compute the composite reliability. Hair et al. (1998) recommended 0.8 as an indication of adequate composite reliability. Except for Collaborative Norms (.77) all constructs meet this criterion. The composite reliability of Collaborative Norms is well above .7, which is the threshold defined by Gefen et al.(2000).

Construct	Items	M	SD	Range	α	Composite Reliability
Collaborative Norms	4	3.96	.52	1-5	.71	.77
RFC Management Support	3	3.46	.69	1-5	.74	.85
Access	4	3.58	.53	1-5	.82	.97
RFC Technology	3	2.96	.63	1-5	.85	.96
Sourcing Frequency	2	2.98	1.26	1-7	.86	.95
RFC Time	3	3.28	.76	1-5	.70	.93
Value	4	3.55	.61	1-5	.86	.97
Knowing	3	2.32	.85	1-5	.79	.93
Seeker Knowledge Growth	4	3.52	.54	1-5	.80	.97
Future Obligation	3	3.07	.68	1-5	.70	.94

Table 5.3 descriptive statistics of the constructs, Cronbach's Alpha (α), and the composite reliability

Convergent validity

To assess construct validity we discuss both convergent and discriminant validity. Beginning with convergent validity, we assess (1) reliability of items (2) average variance extracted (AVE) (3) factor analysis, following previous studies (Hu et al. 2004; Komiak and Benbasat, 2008). As is shown in Table 5.3 the reliability of items is well within limits, all α are above .7. According to literature (e.g., Fornell and Larcker, 1981; Hu et al., 2004) the AVE value should be at least .50 (i.e. the variance explained by the construct is greater than measurement error) to display convergent validity. Table 5.4 shows that AVE score for every construct, ranging from .46 to .91, meets this requirement except Collaborative Norms. The construct is slightly below the norm, by studying the factor analysis and the reliability analysis we can decide if it is prudent to remove one or more items from the construct.

From the confirmatory factor analysis (Appendix H), the Cross-factor loadings matrix (Appendix I) and the reliability analysis we observe that CONO4 is the item causing trouble. This item loads on both the Collaborative Norms and the RFC Management Support factor. If we drop the item, it would increase the AVE value of the Collaborative Norms construct to .52, but simultaneously it will reduce the Cronbach's alpha to .62 which is below the .7 threshold of acceptability. From the factor analysis it becomes clear that CONO4 does load more on the Collaborative Norms factor, than on the RFC Management Support factor. Furthermore, we tested the content validity during the instrument development process (sorting procedure, q.v. section 4.5). The CONO4 item is adapted from Bock et al. (2006), which is the key on Collaborative Norms. Therefore, we think that the disadvantages from dropping the item outweigh the advantages and choose to continue with all 4 items within collaborative norms.

We look at the pattern matrix to interpret the results from the factor analysis, following Brown (2006) (q.v. section 4.2). Appendix H shows the results of the confirmatory factor analysis. Item "loadings of 0.45 to 0.54 are considered fair, 0.55 to 0.62 are considered good, 0.63 to 0.70 are considered very good, and above 0.71 are considered excellent" p.127 (Kankanhalli et al., 2005). Hair et al. (1998, p. 11) suggest that loadings over 0.3 meet the minimal level, over 0.4 are considered more important, and 0.5 and greater practically significant. All items load at least .40 on their intended factor, however Value and Seeker Knowledge Growth load on the same factor. Moreover, the zero-order correlations show a correlation of .68 (Futura) and .71 (NetwIT) which is high but not problematic. We expect that this is factor represents a 'perceived benefits' factor as both constructs measure the perceived benefits of seeking knowledge. Value measuring the benefits for the seeker's own job or task and Seeker Knowledge Growth the perceived intrinsic benefits of participating in the CoP. Based on our experience with the sorting procedure (q.v. section 4.5), the distinct

content validity, and the cross-loadings matrix we are confident that both constructs are distinct enough. We do not see any need to combine the two constructs in a new construct 'perceived benefits'. Congruent with this explanation is the observation that SKGR4 does not load above .3 on the factor 'perceived benefits', SKGR4 asks respondents if they enjoy participating (which is clearly an intrinsic motivation but less clearly a benefit). SKGR4 is not an item that causes problems in the other methods to determine convergent validity.
We therefore conclude that overall the data meet the criteria well and in general the convergent validity is adequate. Only point of concern is the Collaborative Norms construct, which we will elaborate on in chapter 6.

	AVE	Access	Collaborative Norms	Future Obligations	Knowing	RFC Management Support	RFC Technology	RFC Time	Seeker Knowledge Growth	Sourcing Frequency	Value
Access	**.88**	**.94**									
Collaborative Norms	**.46**	.09	**.68**								
Future Obligation	**.84**	.54	-.09	**.92**							
Knowing	**.81**	.67	.13	.47	**.90**						
RFC Management Support	**.66**	.19	.34	-.18	.20	**.81**					
RFC Technology	**.90**	.81	.05	.43	.55	.1	**.95**				
RFC Time	**.81**	.59	-.09	.56	.47	.03	.49	**.90**			
Seeker Knowledge Growth	**.89**	.70	-.02	.65	.74	.16	.52	.64	**.94**		
Sourcing Frequency	**.91**	.65	.10	.37	.75	.31	.45	.45	.70	**.95**	
Value	**.90**	.76	-.01	.52	.70	.20	.59	.68	.84	.70	**.95**

Table 5.4 Validity assessment on Average Variance Extracted (AVE)

Discriminant validity

We assess discriminant validity based on (1) factor analysis results, (2) cross-loadings, (3) the relationship between correlations among constructs and the square root of AVEs (Chin 1998; Fornell and Larcker 1981), and (4) the correlational method. We already observed that Value and Seeker Knowledge Growth load on the same factor in our assessment of convergent validity. Analogously to our reasoning for convergent validity we find that there is a concern, but that both constructs are distinct enough given the results from the sorting procedure and the content validity. Furthermore, the factor analysis results (Appendix H) show good discriminant validity, because all of the measurement items load well on their predicted factor and below a value of .35 on any other. FUOB1 is the only exception as it loads -.48 on the factor intended for RFC Management Support. We use the exact same set of items to measure Future Obligation as Bock et al. (2006) and the item has a negative loading instead of a positive. We therefore choose to keep all three items in the Future Obligation construct. Examination of cross-factor loadings (Appendix I) also indicates good discriminant validity, because the loading of each measurement item on its assigned latent variables is larger than its loadings on any other constructs (Chin 1998; Gefen et al. 2000; Straub et al. 2004). The results of the cross-loadings matrix strengthen our confidence in the decision to keep FUOB1, CONO4 and the Value constructs as they are. The issues that were encountered in the factor matrix are inexistent in this test.

Subsequently we evaluate discriminant validity by means of the AVE method. It specifies the relationship between correlations among constructs and the square root of AVEs. The

square root of the AVE should be greater than the absolute value of the standardized correlation of the given construct with any other construct in the analysis (Fornell and Larcker, 1981). The square root of the AVE is listed in bold on the diagonal of Table 5.4. Consistent with the cross-factor loadings test we observe that discriminant validity is adequate, all AVE values are greater than the correlation with all other constructs, (the values listed in the column below the value). We conclude with an analysis of the zero-order Pearson correlations (Table 5.5). Constructs are rejected if they correlate higher with another construct than r =.85, a correlation above .85 would indicate that both constructs measure the same phenomena. In our dataset there are no correlations which exceed this threshold.

Zero-Order Correlations of Control Variables. Independent Variables and Sourcing Frequency

CoPtype		Tenure	CoP XP	Age	Gender	Size	RFCM	CONO	FCIT	RFCT	ACCS	VALU	KNOW	SKGR	FUOB	SCFQ
Futura	Tenure	1														
	CoP XP	0.64**	1													
	Age	0.35**	0.38**	1												
	Gender	-0.06	-0.14	-0.24	1											
	Size	0.20	0.01	-0.06	0.06	1										
	RFCM	0.04	0.07	-0.05	-0.16	0.01	1									
	CONO	0.10	0.23	0.15	-0.14	0.03	0.45**	1								
	FCIT	0.2	0.22	0.01	-0.04	-0.07	-0.07	0.11	1							
	RFCT	-0.23	0.07	-0.09	0.17	0.01	0.18	-0.11	-0.04	1						
	ACCS	0.10	0.11	0.08	-0.17	-0.01	0.14	0.23	0.34**	-0.06	1					
	VALU	-0.17	0.11	0.19	-0.11	-0.13	0.14	0.09	-0.10	0.04	0.24	1				
	KNOW	-0.10	0.19	-0.16	-0.16	-0.06	0.14	0.17	0.15	-0.06	0.26*	0.47**	1			
	SKGR	-0.20	0.06	-0.03	-0.08	-0.12	0.32	0.03	-0.06	0.14	0.11	0.68**	0.34**	1		
	FUOB	0.03	-0.14	-0.01	0.19	-0.12	-0.37**	-0.11	-0.12	-0.16	-0.14	-0.34**	-0.26*	-0.47**	1	
	SCFQ	-0.16	0.01	-0.12	-0.29*	0.02	0.31*	0.10	0.18	-0.04	0.52**	0.45**	0.65**	0.46**	-0.47**	1
NetwIT	Tenure	1														
	CoP XP	0.55**	1													
	Age	0.52**	0.52**	1												
	Gender	-0.15	-0.18	-0.10	1											
	Size	-0.02	0.18	0.10	-0.19	1										
	RFCM	0.00	0.02	0.03	0.01	0.00	1									
	CONO	0.15	0.08	0.20	-0.05	0.04	0.46**	1								
	FCIT	0.27*	0.23*	0.28*	-0.08	0.02	0.19	0.12	1							
	RFCT	-0.18	-0.08	-0.18	-0.07	-0.09	-0.22*	-0.11	-0.19	1						
	ACCS	0.10	0.31**	0.09	0.07	0.18	0.33**	0.21	0.49**	-0.11	1					
	VALU	-0.12	0.10	-0.11	0.16	-0.03	0.43**	0.14	0.02	0.12	0.47**	1				
	KNOW	0.11	0.33**	0.05	-0.07	0.21	0.37**	0.28*	0.39**	-0.06	0.62**	0.47**	1			
	SKGR	-0.19	0.08	-0.13	0.05	0.00	0.43**	0.16	0.08	-0.08	0.43**	0.71**	0.48**	1		
	FUOB	-0.08	-0.10	0.00	-0.22	0.03	-0.26*	-0.30**	-0.18	0.00	-0.22	-0.23*	-0.23*	-0.27*	1	
	SCFQ	-0.05	0.13	0.00	-0.05	0.26*	0.39**	0.20*	0.02	-0.07	0.44**	0.56**	0.57**	0.52**	-0.11	1

*=p <0.05, ** =p <0.01

Tenure = Job Tenure, CoP XP = Experience in the Community of Practice (years).

Table 5.5 zero-order Pearson-correlations of control variables, independent variables and Sourcing Frequency

Note 1: SPSS 17.0 is used to calculate the correlations and significance for the split dataset

Considering all tests, we conclude that our data are reliable and have adequate construct validity. Nevertheless, it is a serious concern for future research to improve the discriminant validity of Collaborative Norms compared to RFC Management Support. That this issue did not occur before with the data of Bock et al. (2006), is because they used an aggregate construct for Resource-Facilitating Conditions in which management support was a minor dimension.

5.3 TESTING ASSUMPTIONS

Before we do the multiple regression analysis we verify how our data meet the requirements and assumption on which the method is based. In this section we evaluate our data from this perspective and assess whether adaptations to our instrument are necessary.

Normality assumption

Multiple regression assumes that the scores on the variables are normally distributed, linear and homoscedastic. We test the unstandardized constructs using the Kolmogorov-Smirnov test (Chakravart, Laha, and Roy, 1967) to decide if the scores in our sample are normally distributed. The test statistics show significance for five of the ten constructs. Significance of the K-S test means that the normality assumption is rejected because the data are significantly different from the hypothesized normal distribution. Sourcing Frequency, Knowing, Value, Seeker Knowledge Growth and Future Obligation have different distributions. Our initial reaction is to look at the descriptive statistics to see if there are indications for a fit with other distributions. We use a goodness-of-fit test and Q-Q plots to test for their fit with these alternative distributions. E.g. the scores on Sourcing Frequency could fit the lognormal distribution when we look at the histogram and descriptives. However, the goodness-of-fit tests fail for this alternative distribution, moreover, the Q-Q plots show a better fit with normal than with lognormal distribution. We have similar experiences with all five constructs that failed on the initial Kolmogorov-Smirnov. We failed to find alternative distributions, which could have helped us in transforming the data.

We therefore decide to split the dataset and test the distributions of subgroups. Splitting the data can be done based on the median of a variable (e.g. high Collaborative Norm and low Collaborative Norms) or a control variable (e.g. Age, Organization Size). The most intuitive split is by one the different CoP. From preliminary tests of the data, we find that both the CoP's in which the actors participate (Futura or NetwIT), and the Organizational Size have a direct significant effect on Sourcing Frequency. Because of the characteristic differences between the two communities from which we gathered our data (q.v. Table 4.1, p. 35) our first choice is to split the dataset by CoP type.

The split dataset contains two-groups, Futura (N= 60) and NetwIT (N=78). Testing the distributions of the constructs in the split dataset shows great improvement, we find that most responses are normally distributed. There are still a few problems, for the Futura CoP the normality assumption is rejected for two constructs, Future Obligation and RFC Technology (p<0.05). In the NetwIT group, the normal distribution is rejected for RFC Management Support, RFC Technology, RFC Time, Value and Future Obligation (p<0.05). If we look at the descriptive statistics and histograms of the split dataset test we see that for Futura the problems are caused by outlier, RFC Technology has a surprising peak at 2.0 while Future Obligation has a surprising peak at 5 (strong sense of obligation) otherwise the data are fairly normally distributed. We do chose to keep the outliers as the cases are sensible and their responses are natural. Moreover, we think that the split has a positive effect on the requirements for the Futura CoP. For the other subgroup, the NetwIT CoP, we observe that

the data are strangely distributed and do not fit with any alternative distributions. Analogously to our previous reasoning to split the data, we decide to split the dataset again based on Organizational Size. To do so, we first have to convert the continuous variable of size to a discrete variable. We do this by creating five classes of Organizational Size, initially we follow the class distribution that is used in Aedes' publications (i.e. national housing-sector organization). However, the classes that Aedes uses are not appropriate for our sample. Aedes classifies organizations over 10,000 rental units as the largest class, 'class V'. In our sample we find only 1 association below 1,800 rental units. While we do note a difference between organizations with rental units between 10,000 and over 20,000 rental units. Difference between 10k - 20k and associations larger than 20,000 rental units. We assume that the Aedes classifications are outdated due to the large number of mergers between housing associations recently. Therefore, we proceed and create our own classes based on our observations, Table 5.6 shows how the new control variable Organizational Size is composed.

Class	Size of Housing Association	N	Percentage
I	From 0 to 2,000 rental units	2	1.4%
II	From 2,001 to 5,000 rental units	13	8.8%
III	From 5,001 to 10,000 rental units	50	33.8%
IV	From 10,001 to 20,000 rental units	46	31.1%
V	20,000 rental units or more	37	25.0%

Table 5.6 classification of organizational size of the housing associations in rental units

First we split the data into another five groups so that the dataset has 10 groups (2 x 5). Second we test the data again for normality. The Kolmogorov-Smirnov test statistic shows that all constructs are normally distributed. However, due to the split, groups are very small with N per class around 20.This shows that indeed there is no alternative fit for the alternative scores. Which disables the opportunity to transform the data to a normal distribution. Hence, we face a dilemma, our aggregate dataset with all 138 cases does not meet the normality requirement for five out of ten constructs. Upon further analysis we find that splitting the data is a promising resolution, but still does not resolve issues in particular for the NetwIT subgroup. We show that Organizational Size has an important effect, if we split the dataset by both CoP and Organizational Size, then the goodness-of-fit test shows that all constructs are normally distributed. First we evaluate our dataset on other assumptions before we make a definite choice.

Minimum number of respondents

In literature there are different thoughts about the minimum number of cases (*N*), the general rule of thumb is to use at least 10 times as many respondents as there are variables. Although Howell (2002) notes that *N* should be at least 40 + *k* (where *k* is the number of independent variables). If we keep the data together, then we easily meet the requirements as our model consists of ten variables and our *N* is 100. In case we split our dataset by CoP, then we would have two subgroups $N = 60$ and $N = 78$. Those sizes satisfy the Howell criterion, but are too low by the rule of thumb. One solution could be to remove independent variables, this does not have our preference as the independent variables were all carefully selected based on our literature review. We can, however, do a post-hoc analysis of the model including only the significant and weakly significant variables. The risk of too few respondents is mainly a failure to reject the null hypothesis (i.e. the independent variable has no effect). This type

II error may be the result of low statistical power when an important effect actually exists and the null hypothesis of no effect is in fact false (Hoenig and Heisey, 2001).

Linearity assumption

Multiple regression assumes that the relationship between variables is linear. Based on the analyses of the bivariate scatter plots (regressing the dependent variables on Sourcing Frequency individually) we conclude that all constructs meet the condition.

Outlier analysis

Outliers can seriously bias results as extreme values can have a big impact on the direction of the regression line. All of our scores are distributed on a 5-point Likert scale, Sourcing Frequency being an exception with a 7-point scale. This reduces the absolute maximum distance of outliers. An extreme value is classified as outlier when it is more than 3* SD away from the mean. When we analyse the values for the split dataset we find that there are two constructs that have values outside of the range(Q1 – 1.5 * IQR, Q3 + 1.5 * IQR) . We find that in the Futura CoP outliers can potentially be a problem for Collaborative Norms (7 cases) and RFC Time (13 cases) while in the NetwIT CoP outliers can be a problem for Collaborative Norms (10 cases). Further investigation of these cases shows that their responses on other items are fairly normal. When This indicates that they have an explicit opinion about Collaborative Norms and the RFC Time questions. When we calculate the distance from the mean in terms of SD we find that only 1 case in the NetwIT case fails to stay within the 3*SD limit, this case is 3.11 * SD away from the mean. Concluding, we have a few explicit answers but the data are well within the 3*SD limit. The analysis indicates no complications due to outliers.

Homoscedacity

The data are assumed to be homoscedastic, which means that the dependent variable shows an equal amount of variance at different levels of the independent variable (Foster et al., 2006). This homoscedacity assumption is typically evaluated by assessing the plot of the standardized residuals (q.v. Appendix F). Analysis of the plot and the histograms of the residual shows that the residuals are normally distributed. Our split dataset meets the homoscedacity requirement. Furthermore, the skewness and boxplots can be assessed, for the Futura CoP the kurtosis a little negative, but residual plot doesn't show much reason for doubt.

Multicollinearity

"Multicollinearity means that the predictor variables are themselves correlated to an undesirable degree" p.37 (Foster et al., 2006). Multicollinearity is a symptom of variance inflation, the degree to which variance inflation occurs in the data is expressed with the VIF Variance Inflation Factor (VIF*)* index. We test the multicollinearity assumption by assessing this index, a value of VIF > 4.0 indicates a problem of multicollinearity. Although in weaker models values above 2.5 may can be troublesome. VIF is 1/tolerance, therefore tolerance should be greater than .25 (O'Brien, 2007). In our dataset the collinearity test-statistics are good, Futura tolerance ranges from .34 to .83 and VIF ranges from 1.21 to 2.96. In NetwIT tolerance ranges from .36 to.80 and VIF ranges from 1.25 to 2.78. All are well within the limits and thus we conclude that multicollinearity is not a problem for our dataset.

Independence
The cases should be independent and identically distributed (i.i.d), we use the Durbin-Watson test statistic to assess if autocorrelation is an issue. The D-W coefficient values are as follows Futura: 1.7, NetwIT 2.04 this meets the criterion, the value of D-W should lie around 2 for independence.

Conclusion of assumption testing
In general our data meet the assumptions well. However, despite our rigid instrument development process, we find that there are a number of complications with the score distribution of our constructs. In order to satisfy the requirement of normality, we have to split the dataset into two groups, NetwIT and Futura. The split dataset might create a new problem regarding the number of respondents for both groups, doing so we stay within the limits as noted by Howell (2002). To cover for the low number of respondents per subgroup, we need to pay attention to type II errors and do a post-hoc analysis of the model including only the independent variables that are (weakly) significant or likely to have an effect.

Hence, we will perform the multiple regression analysis on the dataset which is split into two subgroups, Futura (i.e. all Futura respondents) and NetwIT (i.e. all NetwIT respondents).

5.4 TESTING HYPOTHESIS

Before we present the results of the multiple regression analysis, we discuss the correlation matrix among all variables in each CoP. Table 5.5 (p. 46) shows the zero-order correlations of the control variables, the independent variables and the dependent variable.

Observations from the correlation matrices
Beginning with Futura, we observe several interesting values. First, correlations involving the control variables and the independent variables (bottom left quadrant of the matrix) are very low and not significant. Second, except for Collaborative Norms, RFC Technology and RFC Time, all of the independent variables are strongly correlated with Sourcing Frequency. Third, some of the independent variables correlate with each other, (especially Value and Future Obligation) but within acceptable limits. In addition to these basic considerations, it is desirable that the hypothesized moderator variable (Collaborative Norms) is uncorrelated with both the independent and the dependent variable to provide a clearly interpretable interaction term. (Baron and Kenny, 1986). In Futura Collaborative Norms meets this requirement while in NetwIT there is a bit of correlation with Future Obligation, Sourcing Frequency and Collaborative Norms, we will elaborate on the moderator variable later.
When we observe the NetwIT correlation matrix the same correlation pattern among the control variables can be seen. Age, job tenure, and experience in the CoP are strongly correlated. This is to be expected, because older people are more likely to work for the organization as well as participate in the CoP longer. Except for the CoP experience the control variables have small and mainly insignificant correlation with the independent variables. CoP experience has a significant correlation with Access and Knowing, which can be expected, as people who have been with the CoP for a longer period are more likely to be confident about accessing other actors and are more aware of the available knowledge in the CoP. The correlations are well within limits so we don't expect problems.
Interesting to observe is the difference in correlations among the independent variables in the lower right quadrant. RFC Management Support is strongly correlated to all independent variables except RFC Technology. The correlations are within limits, but it is an indication

that management support might be an independent variable with indirect effects on sourcing frequency. Future Obligation has lower correlations with other independent variables than in the Futura CoP, neither is it significantly correlated to sourcing frequency. All except Future Obligation, RFC Time and RFC Technology are significantly correlated to sourcing frequency. No hard conclusion can be drawn from these observations, but it is interesting to observe that the correlation patterns among the dependent variables are different between the two CoP's. The independent variables that differ mostly between the two CoP's are the RFC Management Support, Collaborative Norms, and Future Obligation. This can indicate that there are different social forces influencing the attitude of the knowledge seeker, depending on the type of community they are participating in.

Multiple regression analysis procedure and identifying moderator variables

To define the regression equation we investigate the moderator variable (Collaborative Norms) prior to our hypothesis testing. To do so, we will follow the four step framework by Sharma et al. (1981) (p. 296). They distinguish two basic methods for identifying the presence of moderator variables, subgroup analysis and moderated regression analysis (MRA). According to their framework researchers must use both methods in tandem. To prepare for the MRA we construct two new variables for the interaction effects by multiplying the moderator with the independent variable, CONO*FUOB and CONO*VALU.

In applying Moderated Regression analysis to test the moderating variable, three regression equations should be examined to assess the equality of the regression coefficients (Sharma et al., 1981). The first equation contains the error term and the predictor variable. In the second equation the moderator variable is added to the equation and in the third equation the interaction effect between the predictor and the moderator variable is added. If equations 2 and 3 are not significantly different, then the moderator variable is simply an independent variable. If equation 3 is significantly different while equation 1 and 2 are not different then the moderator variable is a pure moderator. If all three equations are different, the moderator variable is classified as a quasi moderator. The second part of the framework is a subgroup analysis. This method prescribes to split the sample into subgroups on the basis of the hypothesized moderator.

Step 1. Applying the Moderated Regression Analysis procedure, we find that the interaction effects are not significant for Futura, however for NetwIT the equations significantly differ when we add the interaction terms. Adding Collaborative Norms * Value results in a weakly significant F change ($p < .069$) and adding Collaborative Norms * Future Obligation results in a significant change ($p < .027$) effect. When we construct the model in which all control variables, independent variables, the moderator variable and the interaction effects are present, we find that Collaborative Norms * Value does not have a significant unique contribution in contrast to Collaborative Norms * Future Obligation which has a positive and significant effect ($\beta = .193$, $p<.065$).

Step 2. In this step we determine whether the moderator variable is related to the dependent variable. We find that Collaborative Norms is not significantly related to Sourcing Frequency in either Community of Practice. Following Sharma et al. (1981) we therefore conclude that Collaborative Norms is a pure moderator in the NetwIT Community of Practice.

Step 3. Because we found only a significant interaction effect for Collaborative Norms * Future Obligation and none in the Futura network we need to determine if Collaborative

Norms are significantly related to either the dependent or the independent variables. Beginning with the independent variable, for neither CoP does Collaborative Norms have a significant relation. Regressing Collaborative Norms on Value and Future Obligation shows no significance for the relations we test. We therefore proceed with step 4, the subgroup analysis for Futura.

Step 4. We choose to split our dataset into two subgroups, low Collaborative Norms, and high Collaborative Norms by applying median split. In the Futura network we find that the model is not significant for low collaborative norms, we therefore cannot draw unambiguous conclusions about the difference of R^2 between the Futura subgroups. In NetwIT both models are strongly significant and a difference of .16 in R^2 can be observed. This is in line with our findings from step 2, Collaborative Norms have a moderating effect in NetwIT.

Based on these steps we conclude that Collaborative Norms can be classified as a pure moderator within the NetwIT CoP, however it is an insignificant variable within the Futura setting. Thus for NetwIT, Collaborative Norms affects Sourcing Frequency through interaction with Future Obligation and represents the pure moderator form. This relationship is given by the following equation:

$Y = a + bx + dxz + \varepsilon$

In which Y is Sourcing Frequency, a, b, and d are constants, ε is the error variable. The independent variable is represented by x (Future Obligation) and z represents the moderator variable (Collaborative Norms).

The regression equation

The predicted values of the dependent variable in regression analysis can be considered as a line, $Y = a + bX$, where X is the predicting independent variable, a is the constant, and b the slope (Foster et al., 2006). The constant is referred to as the *intercept*, and the slope as the *regression coefficient*. In the multivariate case, when there is more than one independent variable, the regression line cannot be visualized in the two dimensional space, but the computation is similar. The additional variables are added with their slope. In general then, multiple regression procedures will estimate a linear equation of the form:

$$Y = a + b_1X_1 + b_2X_2 + \ldots + \varepsilon$$

With standardized regression parameters the equation has the general form:

$$Y = \beta_1X_1 + \beta_2X_2$$

Filling the equation for the subgroup Futura, the regression equation is as follows:

$$\mathbf{Y = .368X_1 + .447X_2}$$

Where

Y= Sourcing Frequency
X_1= Access
X_2= Knowing

For the NetwIT subgroup, the regression equation is as follows:
$\mathbf{Y = .365X_1 + .248X_2 + .193X_3 + .199X_4}$

Where

Y = Sourcing Frequency
X_1= Access
X_2= Knowing
X_3= Collaborative Norms * Future Obligation
X_4= Organizational Size

Results of multiple regression analysis

Based on the results from the assumption tests (q.v. section 5.3) we concluded that it is prudent to split the dataset into two subgroups, one containing the Futura respondents and NetwIT respondents in the other. We evaluate the regression results for both subgroups and determine the explanatory power for the model in both CoP's. Prior to the multiple regression analysis we prepare the data by standardizing the variables, removing cases with missing values, creating the interaction variables, and recoding the data for Future Obligation and Access so that low item scores can be interpreted as 'low perceived accessibility'. The explanatory power of the theoretical model is evaluated by looking at the R^2 values. The steps for model construction are summarized in Table 5.7 while the graphical representation of the resulting models are given in Figure 5.1 (p. 56). We enter the variables in four steps in the equation. The first model is constructed by adding all control variables. This model is weakly significant for Futura, $F(5, 59)= 2.21$, $p =.077$, $R^2 = .164$. Only gender has a significant unique effect. For NetwIT the first model is insignificant. In the second step we enter the independent variables, this increased the fit of the model to the data for Futura, $F(8, 46) = 10.57$, $p < .001$, $sr^2=.541$. The resulting model R^2 is significantly greater than zero, $F(13, 46) = 8.48$, $p < .001$, $R^2 =.706$. Model 2 is also significant increase for NetwIT, $F(8, 64) = 7.52$, $p < .001$, $sr^2=.443$. In the third step we add Collaborative Norms, this addition does not significantly increase the model R^2, $F(1, 45) = 2.70$, $p = .11$, $sr^2 =.017$ for Futura and $F(1, 63) = .00$, $p = .965$, $sr^2 = .000$ for NetwIT. The fourth and final step consists of adding the interaction terms between Collaborative Norms and Future Obligation, and Collaborative Norms and Value. For Futura this does not result in a significant change in the model R^2, $F(2, 43) = .00$, $p = .999$, $sr^2 = .000$. The resulting model is significantly greater than zero, $F(16, 43) = 2.63$, $p < .001$, $R^2 = .722$. For NetwIT the addition of the interaction terms does significantly increase the model R^2, $F(2, 61) = 3.55$, $p = .035$, $sr^2 =.049$. The resulting model is significantly greater than zero, $F(16, 61) = 5.23$, $p < .001$, $R^2 = .578$.
Because we measure Sourcing Frequency for two different subgroups, we will examine the specific hypothesis independently by assessing the t-statistics for the standardized path coefficients and the p-values.

Predictors of sourcing Frequency in Futura

The adjusted R^2 for the Futura Sourcing Frequency model is .62. With our hypotheses we proposed positive and direct links from Collaborative Norms (H1) and Value (H3) to Sourcing Frequency. Observing the standardized coefficients and its significance, we find that both relations are not significant. In line with our expectations, the relation between Knowing and Sourcing Frequency (H4, $\beta = .45$, $p < .001$) and the link between Access and Sourcing Frequency (H5, $\beta = .37$, $p < .001$) are positive and significant. In contrast to our expectations we find Seeker Knowledge Growth (H6), as well as the Resource-Facilitating Condition Management Support (H7), Time (H8), and Technology (H9) to be insignificant. We also proposed a negative and direct relation between Future Obligation and Sourcing

Frequency(H2). In our analysis we find this relation to be negative (β = -.17) but not significant (t= -1.59, p=.119). However, when we look at the correlation matrix (Table 5.5) there is a significant and negative zero order correlation. Upon further investigation of the Future Obligation construct, we find that when we test the model without control variables (which are insignificant in the Futura subgroup) Future Obligation becomes significant (β = -.20, $p < .05$). Due to the small subgroups, the risk of type II errors is increased and we are therefore especially careful with rejecting the null hypotheses. In Section 6.1 we will further elaborate on this issue. We already showed in our moderated regression analysis (p. 51) that Collaborative Norms does not have any moderating effects in the Futura subgroup, we therefore reject Hypothesis 1a (Collaborative Norms have an interaction effect with Future Obligation on Sourcing Frequency) and Hypothesis 1b (Collaborative Norms have an interaction effect with Value on Sourcing Frequency).

Predictors of Sourcing Frequency in NetwIT

The adjusted R^2 for the NetwIT Sourcing Frequency model is .47, which is .15 less than the adjusted R^2 for the Futura CoP. It is an interesting difference which is in contrast to the equality of groups we expected. Consistent with the Futura CoP we find no support for Hypothesis 1 (Collaborative Norms), Hypothesis 6 (Seeker Knowledge Growth), Hypothesis 7 (RFC Time), Hypothesis 8 (RFC Management Support), and Hypothesis 9 (RFC Technology). Also consistent with the Futura CoP we find support for Hypothesis 4, the relation between Knowing and Sourcing Frequency (β = .25, $p = .05$) is positive and significant. However, contrarily to the Futura CoP we do not find support for Hypothesis 5, in the NetwIT CoP there is no significant relation between Access and Sourcing Frequency. Also different from the Futura CoP is the support for Hypothesis 3 that we find in the NetwIT CoP, there is a significant and positive direct relation between Value and Sourcing Frequency (β = .37, $p = .01$). Another difference we observe between the two Communities of Practice is the 'pure' moderator effect that Collaborative Norms has on the relation between Future Obligation and Sourcing Frequency. Even though we do not find support for a direct relation between Future Obligation and Sourcing Frequency (Hypothesis 2) we find support for Hypothesis 1a, the interaction effect between Collaborative Norms and Future Obligation is positive and significant (β = .19, $p = .065$). In contrast with our expectations, we find the interaction effect between Collaborative Norms and Value on Sourcing Frequency (Hypothesis 1b) to be insignificant (p.51).

(a) Futura CoP	Model 1	Model 2	Model 3	Model 4
	Control variables	Control variables	Control variables	Control variables
		Independent variables	Independent variables	Independent variables
			Moderator variable	Moderator variable
				Interaction variables
R-Square change	.164[t]	.541***	.017	.000
Adj. *R*-Square	.087	.622	.636	**.619**
(b) NetwIT CoP	Control variables	Control variables	Control variables	Control variables
		Independent variables	Independent variables	Independent variables
			Moderator variable	Moderator variable
				Interaction variables
R-Square change	.087	.443***	.000	.049*
Adj. *R*-Square	.023	.434	.425	**.468**

[t] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 5.7 summary of hypotheses support and standardized Beta coefficients

Testing for control variables and assessing type II error

A summary of findings with respect to each hypothesis is given in Table 5.8. We find substantial differences between both CoP's, Access is an important predictor for Sourcing Frequency in Futura but this relation is non-existent in NetwIT while Value is a relationship that is strongly significant only in NetwIT. In contrast, Knowing consistently predicts Sourcing Frequency while the Resource Facilitating Conditions (H7, H8, H9) are insignificant in both models. The betas designate the relative strength of the statistical relationships. Figure 5.1 and Table 5.7 present the results obtained with the multiple regression analysis. In Table 5.7 we also included the results for the complete dataset, although we cannot draw solid conclusions from this dataset because the multiple regression requirements are not fully met (q.v. section 5.3). We tested the complete dataset to get a better understanding of the results and see if there are indications for type II errors (i.e. false negative). As we mentioned before, A type II error is frequently due to sample sizes being too small. Heimbach and Super (1996) show that simulations with limited responses have little likelihood of detecting an effect with confidence in meteorology studies. Thus, the type II statistical error is more likely to occur when the number of experimental units is limited. In section 5.3 we noted that the split of the dataset into two subgroups has one big disadvantage concerning the number of respondents. Our multiple regression analysis is therefore somewhat likely to fail to reject null hypotheses. We investigate this with a post-hoc analysis. In this analysis we will include Future Obligation and the RFC Management support as their regression results and zero-order correlations indicate that type II error is likely for these two constructs.

Furthermore, we assess the direct effects of the control variables. We observe that Organizational Size exerts a significant effect on Sourcing Frequency, actors from large housing associations are more likely to seek knowledge than are actors from small organizations. This makes sense for multiple reasons, (1) large housing associations are often active in large cities which face more complex problems (with respect to infrastructure, social dilemmas and the financial budgets) and thus urgency of knowledge questions is likely to be higher. (2) Large housing associations which operate in large city have more stakeholders and political influence, their participation in communities of practice can have benefits for their professional image. (3) The organizational size can be a result of organizational success and operational excellence in which good knowledge management practices can be important. We observe such effect also in the demographics of our respondents (q.v. section 5.1), more large associations responded to our survey than small housing associations. From the correlation matrix (Table 5.5) we observe that Organizational Size is not correlated to any of the independent variables, therefore we conclude that the direct effect of Organizational Size on Sourcing Frequency is not a threat for the validity of our model. The other control variables did not have a significant impact on Sourcing Frequency.

	Futura	Netwit	All data	Support	
Hypothesis	β	β	β	Futura	NetwIT
H1 : CONO to SCFQ	-.163	-.052	-.055	No	No
H1a: CONO * FUOB	.002	.193^{t}	.077	No	**Weakly**
H1b: CONO * VALU	-.005	.144	.082	No	No
H2: FUOB to SCFQ	-.168	-.053	-.105	**Partially**	No
H3: VALU to SCFQ	-.033	.365**	.202*	No	**Yes**
H4: KNOW to SCFQ	.447***	.248*	.334***	**Yes**	**Yes**
H5: ACCS to SCFQ	.368***	.090	.194*	**Yes**	No
H6: SKGR to SCFQ	.153	.110	.093	No	No
H7: RFC Time to SCFQ	-.097	-.090	-.067	No	No
H8: RFC mgt. Support to SCFQ	.175	.150	.140^{t}	No	No
H9: RFC Technology to SCFQ	.033	-.120	-.037	No	No
CTRL 1: Age	-.010	.049	-.033	n.s	n.s
CTRL 2: Gender	-.117	-.041	-.124^{t}	n.s	n.s
CTRL 3: Job Tenure	-.145	.017	-.048	n.s	n.s
CTRL 4: CoP Experience	-.033	-.048	-.057	n.s	n.s
CTRL 5: Organizational Size	.088	.199*	.106^{t}	n.s	**significant**
CTRL 6: CoP type	n.a.	n.a.	-.282***		
Adjusted R^2	.62	.47	.49		

^{t}p <.10, *p < .05, ** p < .01, *** p < .001.

Table 5.8 results of multiple regression analysis for both CoP

Post-hoc analysis

After our hypothesis testing, we test our model again to see how the results are if we reduce the number of variables. The lower number of independent variables (k) reduces the minimum requirement for the number of respondents (rule of thumb is $N = 10 * k$). The post-hoc model we test for includes the following: independent variables {Access, Value, Knowing, Future Obligations, RFC Management Support}and the interaction effects { Collaborative Norms * Value, Collaborative Norms * Future Obligation} we control for the Organizational Size control variable. The results are summarized in Table 5.9, interesting result is that the R^2 values for both CoP's does not change much, NetwIT is slightly higher. In general, the t-statistics are stronger for the variables that were found significant in the model with all variables included. Additionally we observe, as expected, that we indeed falsely failed to reject the null hypothesis for Future Obligation in Futura and RFC Management Support in NetwIT. Future Obligation now has a negative significant direct effect (β = -.25, p = .014) in the Futura subgroup. In the NetwIT subgroup we observe that the interaction effect between Collaborative Norms and Value was correctly rejected while Collaborative Norms * Future Obligation is now strongly significant (β = .22, p = .025). Furthermore we find that RFC Management support has a direct, positive significant effect on Sourcing Frequency (β = .18, p = .062).

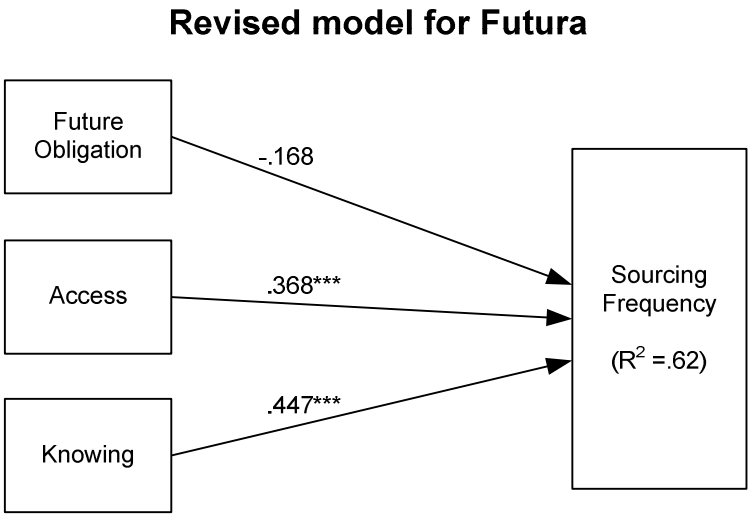
Hypothesis	Futura β	Netwit β
H1 : CONO to SCFQ	n.a.	n.a.
H1a: CONO * FUOB	.073	.222**
H1b: CONO * VALU	-.004	.117
H2: FUOB to SCFQ	-.251**	-.038
H3: VALU to SCFQ	.050	.431***
H4: KNOW to SCFQ	.482***	.237**
H5: ACCS to SCFQ	.333***	.030
H6: SKGR to SCFQ	n.a.	n.a.
H7: RFC Time to SCFQ	n.a.	n.a.
H8: RFC mgt. Support to SCFQ	.097	$.179^{t}$
H9: RFC Technology to SCFQ	n.a.	n.a.
CTRL 1: Age	n.a.	n.a.
CTRL 2: Gender	n.a.	n.a.
CTRL 3: Job Tenure	n.a.	n.a.
CTRL 4: CoP Experience	n.a.	n.a.
CTRL 5: Organizational Size	.029	.211**
CTRL 6: CoP type	n.a.	n.a.
Adjusted R^2	.60	.50

$^{t}p < .10, *p < .05, **p < .01, ***p < .001.$

Table 5.9 results of the post-hoc analysis with reduced number of independent variables

Revised model

Based on the results of the regression analysis we revise our theoretical model. We graphically represent our theory in Figure 5.1. In the revised model we plot the regression coefficients from the analysis of the split dataset with all variables included. We do model the variables that we found with the post-hoc analysis, but we do not give a significance indication to their effects', because that would force us to mix two different results in one model. We will elaborate on this in chapter 6.



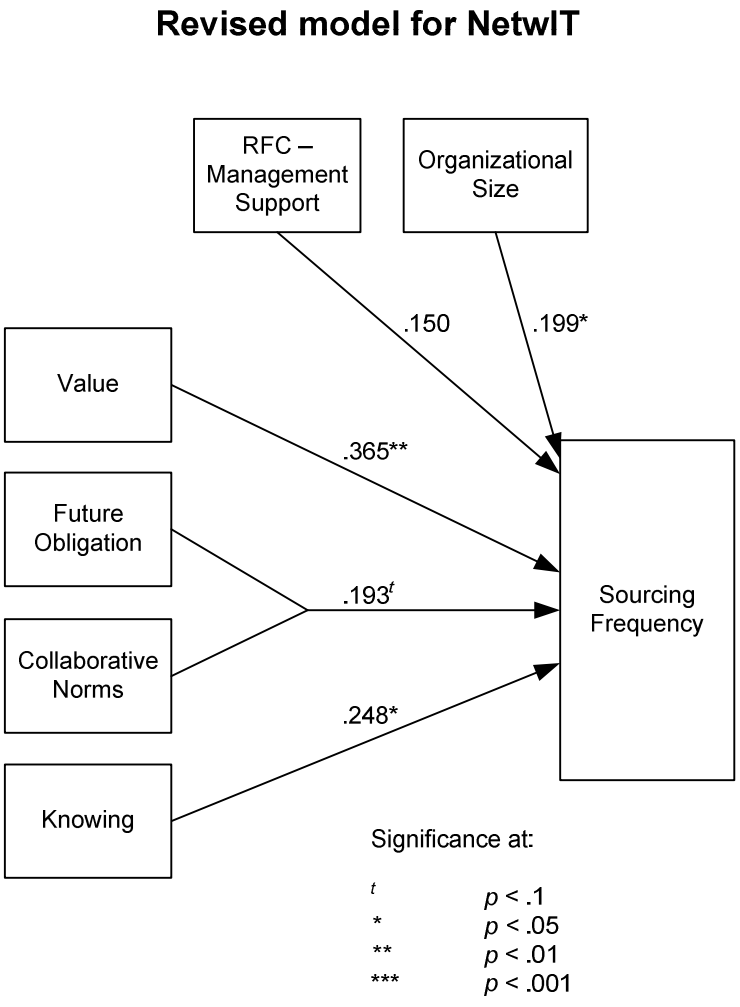


Figure 5.1 the revised theoretical models for both type of CoP's

6. CONCLUSION

In this chapter we analyse the results from the survey, based on these we draw conclusions and present the implications for practice and literature, and identify the limitations of our research. We conclude the chapter with recommendations for further research.

6.1 DISCUSSION

It is common knowledge that relationships are important for acquisition of knowledge (Granovetter 1973; Burt, 1992; Borgatti and Cross, 2003; Bresnen et al., 2003) and that the value for social networks is not limited to participating individuals but can be regarded as a public good (Kostova and Roth, 2003; Inkpen and Tsang, 2005). Yet, despite the importance of social interaction as a means for knowledge acquisition, we know little about relational characteristics, nor about the contextual variables that facilitate knowledge seeking. Our study strengthens the evidence for at least three relational characteristics that explain and predict the behaviour of knowledge seekers: (1) knowing what another person knows, (2) valuing what that other person knows in relation to one's work, and (3) being able to gain timely access to that person's thinking. These are exactly the three variables that Borgatti and Cross (2003) also found to be significant predictors of information seeking at two separate research sites. We are able to elucidate their findings, as we consider two dissimilar social networks, analyse the social dimension of costs (i.e. social risk and future obligations), and evaluate the effects of social stimuli (i.e. Collaborative Norms and RFC Management Support).

Our salient finding is that Sourcing Frequency is a function of different variables dependent on the social structure of the CoP. This sheds new light on a long standing problem in philosophy and social theory, what is at the basis of human action, structure or agency (e.g. Giddens, 1990)? Agency in this discussion refers to the agents' (i.e. an individual engaging with the social structure) capacity to make their own free decisions, whereas structure refers to the contextual and social variables which influence the opportunities that individuals have. Our results indicate that agents (i.e. actors) make rational choices (we can explain 60% of their choices) about their knowledge sourcing behaviour. Hence, they choose whether to seek knowledge from other agents, with what frequency, based on quantifiable arguments. Previous research already showed that knowledge seekers base their source selection on the type of knowledge (e.g. Cross and Sproull, 2004). However, literature has not tested these findings in different social structures before. We provide evidence that agents make different rational choices dependent on the social structure they are acting in.

The findings about the negative effect of Future Obligations are another salient result from the perspective of the cost-benefit discussion (e.g. Ashford and Cummings, 1993; Nahapiet and Ghoshal, 1998). Although we fail to reject the null hypothesis in both CoP's, we are confident that Future Obligations have a direct negative effect on Sourcing Frequency. In the full model the t-statistic is insufficient but very close, however, in the post-hoc analysis we find a significant negative direct effect of Future Obligations. Nahapiet and Ghoshal (1998) discuss the cost of the creation and maintenance of forms of social capital, they state that in particular relational and cognitive dimensions of social capital are costly. They hypothesize that the costs are "likely to be influenced by the size and complexity of the social structure in which social capital is embedded, since the costs of maintaining linkages usually increase exponentially as a social network increases in size" p. 261 (1998 Nahapiet and Ghoshal). Based on our evidence we propose that not only the size of the social network, but also other

characteristics determine how costs, in particular relational costs, are determined by the stability of the network and the shared knowledge base among actors (e.g. heterogeneous).

Why do we find two different models?

So far we have focused our discussion on the impact of the differences we observe between the two CoP's. In section 4.3 (e.g. Table 4.1) we have discussed the composition of both social networks, here we intend to generalize from these specific characteristics, so we can explain why not a single model can explain all knowledge seeking behaviour in inter-organizational networks. How dissimilar are the two social networks exactly and how should the two different models be interpreted?

The first salient difference is contrarily to the NetwIT model, Access and Future Obligations influence Sourcing Frequency in the Futura model. Access represents both the perceived social accessibility and physical accessibility of a knowledge source. Apparently actors in Futura evaluate the accessibility of another actor before they decide to seek knowledge from this source, while in NetwIT actors do not weigh accessibility in their decision. Additionally we find, albeit in the post-hoc analysis, that Future Obligation affect the seeker's decision in Futura, the actor thus evaluates the social risks of sourcing knowledge from other actors. Therefore, we conclude that search costs limit knowledge seeking behaviour in Futura, and define search costs along the dimensions of social accessibility and future obligations.

This result is remarkable as Futura seems to be the closest and strongest community of the two (q.v. Table 4.1, p. 35) considering the shared goals, geographical dispersion, and the number of different organizations participating (and thus cultural influences). Hence, there must be another characteristic of the CoP's that causes actors in Futura to take search costs into account while the actors in NetwIT don't. The alternatives are: *hierarchical distance*, *network stability*, and *shared knowledge background*. Borgatti and Cross (2003) controlled for the effects of *hierarchical distance* in a comprehensive social network analysis study, they found it to be insignificant. *Network stability* (i.e. the variance in membership of individuals) is known to affect the opportunities for the creation of social capital and disturb the development of trust (Nahapiet and Ghoshal, 1998; Inkpen and Tsang, 2005). When actors leave the network, ties disappear, this can create new structural holes. The duration and stability of social relations also influence the clarity and visibility of mutual obligations (Misztal, 1996). Thus, we expect that network stability is a distinguishing characteristic that influences the behaviour of knowledge seekers. Another distinguishing characteristic that we expect to be relevant is the composition of the CoP in terms of *shared knowledge background*. This expectation is based on the work by Markus (2001) as she proposes that knowledge reusers exchange knowledge differently when they share a community of practice opposed to when knowledge users differ substantially. People who share a community of practice (which she defines as a homogeneous group of specialists who occupy the same roles in different locations, work units, or organizations), share general knowledge while in a heterogeneous network, people may not know what aspects of local context are important and need the information to be presented to them in a very accessible way. Markus (2001) summarizes this discussion in the following manner: "The more dissimilar the reusers are from the knowledge generators in terms of knowledge, the more difficulty they may have in defining the search question, locating and selecting experts and expertise, and reusing even carefully packaged knowledge." (p. 70).

Classification of both social networks

Based on the analysis above, we conclude that the relevant distinguishing characteristics of the two CoP's are the *network stability* and the *shared knowledge background* (e.g. homogenous or heterogeneous) between actors. We classify the Futura CoP as a dynamic

(i.e. low network stability), and heterogeneous (i.e. multi-disciplinary composition) community of practice. Analogously to this reasoning, NetwIT can be classified as a stable and homogenous community of practice.

6.2 CONCLUSIONS

The aim of this thesis is to examine the role of collaborative norms on knowledge seeking within communities of practice. Our findings indicate that collaborative norms can indeed reduce the influence of social barriers such as future obligations, but they cannot reduce the impacts of motivators such as perceived value of knowledge nor do they have a direct positive relationship with knowledge seeking behaviour.

We studied our proposed model in two different settings, the first is Futura which is a community of practice composed of actors with multi-disciplinary knowledge bases . The actors are all employed by seven housing associations which operate in the Province of Noord-Brabant in the Netherlands. Their network is dynamic as actors combine efforts in temporary cross-functional teams, and take seat in expert task forces. The second network we tested our model in, is NetwIT. It is a CoP which is composed of actors with a homogeneous knowledge base, all their actors are ICT consultants or managers who work at housing associations in The Netherlands. NetwIT is a stable network and organizes seminars, fairs, and workshops around ICT related topics.
We measure knowledge seeking behaviour with our dependent variable, Sourcing Frequency. Remarkably enough, we find that this variable is not predicted by the same independent variables for both CoP's. Our model has an adjusted R^2 value of 0.62 for the multi-disciplinary CoP, Futura. Furthermore, our model has an adjusted R^2 value of .47 in NetwIT, albeit with another set of predictors. These values indicate that our theory explains the variance in Sourcing Frequency quite well, both adjusted R^2 are substantially better than previous theories. Moreover, Gray and Meister (2004) find a R^2 of 17.1% for knowledge sourcing behaviour while He and Wei (2009) formulate a model on information seeking which explains 23% of the variance. Furthermore, Bock et al. (2006) propose a theory to predict usage of EKR for knowledge seeking with a reasonably good R^2 value of .42 although their model is less parsimoniously. The latest paper on sourcing frequency by Xu et al., 2010 find adjusted R^2 values of .29 and .28 for two types of information seeking (i.e. task and social information). The existing theory with the highest explanatory power is the model by Borgatti and Cross (2003) which explains .56 and .34 of the information seeking variance. Interestingly, we find evidence for the variables that are at the core of their model, Knowing, Value and Access.

Findings
In contrast with our expectations, our results indicate that collaborative norms do not play an important role in encouraging knowledge seeking. We find that norms of cooperation and collaboration do not directly influence dyadic knowledge seeking in either Futura or NetwIT. Nor do they moderate the relationship between social risks (future obligations) or benefits (value) and Sourcing Frequency. However, there is one exception. We do find support for the interaction effect between Collaborative Norms and Future Obligations in NetwIT, the stable and homogeneous CoP.
Collaborative norms have not often been studied in the context of knowledge seeking, although multiple researchers have examined the role of collaborative norms in the setting of knowledge contribution (e.g. Bock et al., 2005; Kankanhalli et al., 2005; Cabrera et al,

2006). From our results we expect that there is an important role for management support that possibly mediates the relationship between collaborative norms and knowledge workers' behaviour. In the aforementioned studies the effect of direct stimulation and encouragement by managers was not explicitly investigated. Not only does our post-hoc analysis show that RFC Management Support is significant in the stable, homogeneous CoP, moreover, the zero-order correlations show that RFC Management Support is correlated higher and to more variables (including Sourcing Frequency) than Collaborative Norms. Another explanation could be that we tested our model in multiple organizations, whereas previous research were carried out in a single-organizational setting, which increases the risk that confounding factors are undetected.

Our results provide weak evidence that perceived future obligations reduce the frequency of knowledge seeking. The t-statistic is very close to the significance cutoff value (p=.12), moreover, in the post-hoc analysis we find support for its negative effect on Souring Frequency in dynamic social networks with a heterogeneous structural composition.
In stable social networks, with actors that have a homogeneous shared knowledge base, future obligations do not have any influence. From the perspective of theory on network stability (e.g. Nahapiet and Ghoshal, 1998; Inkpen and Tsang, 2005) these findings are sensible because trust and social barriers are particularly important in instable social settings. Therefore, our results can shed new light on the findings by Bock et al. (2006), as their evidence for future obligations was gathered in a setting of working professionals at a large university. These scholars have a heterogeneous knowledge base and interaction is likely to be project and event based. Our research contributes to knowledge, in this regard, by explicating the role of future obligations contingent on the stability and structural composition of a social network.

In stable and homogeneous CoP's, knowledge seekers base their knowledge seeking decision mainly on the perceived value of the knowledge to their job or task at hand. This is in line with our expectations and extends previous literature (e.g. Borgatti and Cross, 2003; Cross and Sproull, 2004; He and Wei, 2009) by indicating the conditions (network stability and shared knowledge base) under which these perceived benefits are salient. We do not find perceived value to be related to knowledge seeking behaviour in Futura. This result can be explained by the observation of Misztal (1996) that trust (i.e. low social risks) is likely to increase anticipation of value and opens up people for the exchange of intellectual capital. Our results indicate that under conditions of low trust (e.g. network instability, different shared knowledge bases) value anticipation is subordinate to social risks.

Consistent with the consensus on access as a relevant factor on multiple related dependent variables (q.v. section 2.5), we find that Access is an important predictor of Sourcing Frequency. Moreover, our results indicate that access is not unconditionally related to knowledge seeking. When knowledge workers share general and specialist knowledge, they have less problems formulating questions (q.v. Markus, 2001). Furthermore, in stable social networks search costs (cf. Nahapiet and Ghoshal, 1998) are lower. Our findings suggest that under such conditions of shared knowledge and high network stability, access is not a salient motivator for knowledge seeking. Previous literature provides indications of the contingency of access on the composition of social networks. E.g. Cross and Sproull (2004) show that willingness of a source to actively think with a seeker is important when a problem is not well defined (due to heterogeneous knowledge bases).

Knowing is a salient factor enabling knowledge seeking. In both CoP's we find strong significant evidence for the relationship between Knowing and Sourcing Frequency. This is in line with results from previous studies (e.g. Lane and Lubatkin, 1998; Borgatti and Cross, 2003; Cross and Sproull, 2004; Xu and Kim, 2006). This finding also indicates that the existence of this relationship does not depend on the composition of the social network. Although, our data indicate that in Futura it is even more important to know what knowledge is available and in which area other actors have expertise. Knowing has a high regression coefficient in Futura ($\beta = .48$), while in NetwIT this coefficient ($\beta = .25$) is only slightly higher than that of the interaction effect, the control variable and RFC Management Support (q.v. Figure 5.1). This would be in line with Markus' (2001) suggestions, as she proposes that users may not know about the work of other actors, particularly those in cross-functional teams. Compared to the Ashford and Cummings(1983) theory, the relevance of knowing about the expertise of another is one of our most important additions as it cannot be regarded as either a cost or benefit factor.

The results indicate that Value is strongly significant and has the highest regression coefficient in stable and homogeneous CoP's. Which is in line with our expectations and the existing consensus in literature (e.g. Wasko and Faraj, 2000; Borgatti and Cross, 2003; Xu et al., 2010). However, the perceived value of knowledge does not have an influence on knowledge seeking when search costs are high in heterogeneous and dynamic social networks. Either people need a certain level of trust and shared knowledge before they can value the knowledge that is available in the CoP, or value is subservient to visibility (i.e. Knowing), and accessibility under conditions of low network stability and low general shared knowledge. Further research should study the precise direction of this contingency.

Contrary to the commonly held notion, a seeker's knowledge growth shows to be an insignificant factor in dyadic knowledge seeking (e.g. Gray and Meister, 2004; Bock et al., 2006). Although, He and Wei (2009) found Seeker Knowledge Growth not significant in their study as well. We can elucidate this antithesis. In the first place we note that Bock et al. (2006) study working professionals at a large university while Gray and Meister (2004) focus on the learning orientation and learning outcomes of knowledge sourcing. Learning goals and academic motivations are likely to be aligned with knowledge growth. Our results imply that corporate employees' do not evaluate the intrinsic benefits of knowledge seeking when they decide to do so. This supports the notion of He and Wei (2009) that corporate employees' motivation for seeking knowledge for the sake of growing knowledge may not be as salient as that of students in the educational setting.

Our results also indicate that Resource-Facilitating Conditions cannot be measured in an aggregate construct which is common practice for studies on knowledge exchange (e.g. Kankanhalli et al., 2005; Bock et al., 2006; Marks et al., 2008; He and Wei, 2009). Both our factor analysis (q.v. section 5.2) and the multiple regression analysis (q.v. section 5.4) show that the dimensions Time, Management Support, and Technology are distinct variables with each a unique influence in knowledge exchange.
Moreover, RFC Time is not correlated to any of the independent variables and does not have an effect on Sourcing Frequency either. On the other hand, RFC Management Support is shown to have a direct and positive influence on Sourcing Frequency in NetwIT (q.v. post-hoc analysis) and correlates with many independent variables in both CoP's. Furthermore, we do not find support for a direct relationship between RFC Technology and Sourcing Frequency but our data indicate that there might be indirect effects as RFC Technology correlates with Access and Knowing, two salient factors in knowledge seeking.

Finally, we conclude that organizational size is a relevant control variable, it has a strongly significant direct positive effect on knowledge seeking. This could indicate that actors from large organizations seek more knowledge (e.g. face complex challenges) or that large organizations have more advanced knowledge management strategies in place which stimulates the knowledge seeking activities. Either way, we propose that future literature on knowledge seeking in the inter-organizational setting should control for organizational size as it appears to be a relevant contextual factor.

6.3 IMPLICATIONS FOR PRACTICE

Our findings show that knowledge management strategies that consider the needs of knowledge seekers should be contingent on the type of social network that is at hand. Generally, when the CoP has good network stability and the actors have shared knowledge bases, then management interventions should cover value and knowing. While in dynamic networks with heterogeneous knowledge bases, interventions should be focused on reducing search barriers such as future obligations and accessibility of people.
In this chapter we describe shortly what kind of interventions could be included in an integral management strategy:

Access

a) Information services that facilitate finding the right people
b) Personal contact and bonding to increase perception of social accessibility
c) Communication technology to improve physical access

Knowing

a) Information services that inform subscribers about interesting projects, studies, events and news
b) Opportunities for informal contact and discussion to discover shared goals or interests, these could also be organized dialogue sessions in which actors present their work to other actors
c) Make more detailed information available to the participant in the social network on experiences, formal roles, education, and interests. These can be tagged with keywords so that other actors can search them.

Value

a) Acknowledge context barriers and look for solutions to eliminate them so that the perceived value of knowledge to an actor's own job and context can be improved.
b) Let participants seed the discussions and events rather than passively consume the offered knowledge. This increases usefulness and value of the content for participants.

Future Obligations

a) Communicate and establish collaborative norms within the social network.
b) Personal contact and bonding to decrease the social distance between actors

Management support

a) Encourage knowledge seeking and participation in CoP through management rather than through 'social norms' and organizational culture
b) Managers should emphasize long-term benefits of knowledge seeking rather than short-term gains. (cf. Wenger and Sneyder, 2001).
c) Managers should stimulate actors to take responsibility to keep discussions interesting and offer their input rather than merely follow the programme offered by the CoP board.

These considerations can be targeted by IT-oriented solutions and organizational interventions.

Information System oriented solutions

1. Extend intranet functionality. Facilitate searching for key words (e.g. sustainable energy) that match with personal information such as experiences and formal roles.
2. Develop information services (e.g. customizable personal news feed) which facilitate informing other actors about relevant or innovative studies, projects and conferences in an informal manner.
3. Use knowledge repositories which can contain reports, documents, FAQs, lessons learned, presentations and best-practice stories. Especially useful for operational staff and newcomers.
4. Video conference rooms. Geographical spread is an issue, video conferencing might overcome social risks and future obligations.

Organizational interventions:

1. Introduce a new role of *knowledge brokers* for projects (cf. Bresnen, 2003)
2. Develop *facilitator* roles to encourage participation, facilitate and evoke discussion and keep events and community activities engaging and vibrant (Bourhis et al., 2005) - organization
3. Introduce *content coordinators* (search, retrieve, transfer and respond to direct request for CoP knowledge and content) - CoP staff. (cf. Bourhis et al., 2005)
4. Further develop *journalist* roles in both CoP and organizations. Journalist record lessons learned, new approaches, best practices in presentations, articles and news feeds and reports. (cf. Bourhis et al., 2005)
5. Let *facilitators o*rganize dialogue-sessions (suggestions from CoP members) between actors who are interested in a certain theme. In dialogue-sessions actors shortly present how they are dealing with a specific topic and discuss afterwards analogies and differences between their strategies. (to prevent issues due to different contexts)

6.4 IMPLICATIONS FOR LITERATURE

Drawing on the TRA, Social Network Research, Learning organizations and IS knowledge exchange literature, this study empirically tests two models for dyadic knowledge seeking in communities of practice. One of the strengths of this study is that we have drawn from existing literature and tested the model with data from multiple organizations. The majority of work on knowledge exchange in social networks has drawn conclusions based on a single social network within one organization in one industry. Moreover, because we tested our model in two distinct CoP's we were able to find a unique result. Our results indicat that

agents' behaviour is not only dependent on the relational characteristics of the dyad, it is also contingent on the social structure of the network in which they act.
This distinction between social networks based on the characteristics of network stability and shared knowledge base allows us to elucidate several suggestions of previous literature. Another salient contribution are the new insights on collaborative norms, we chose to measure the, commonly aggregate construct, facilitating conditions along three dimensions (i.e. time, management support and technology) and we found that management support is a salient and factor in knowledge seeking behaviour. Our results indicate that management support might be a mediator variable that has been missed previously. We summarized our implications for practice and literature in Table 6.1

6.5 LIMITATIONS AND FURTHER RESEARCH

This study has several limitations that should be discussed. Firstly, we collected our data with a cross-sectional study, this makes it impossible to draw conclusions about the direction of causality. However, Cross and Borgatti (2000) found in a qualitative study that informants choose who they seek information from based on their perceptions of, and relationships with, other actors. This is indicative of causality in the hypothesized direction (e.g. perceived access influences the information seeking decision). Furthermore, our research ignores the dynamic effects of changes in the communities over time. It would be interesting to examine the dynamic effects of social network development over time. In particular because we found knowledge seeking to be contingent on the structural composition of CoP's.

A second limitation of the study are the small number of respondents for our subgroups. Regarding the complexity of our proposed model and the unexpected, though necessary, split of our data, we had too few respondents. We would have liked to have at least 90 respondents in each subgroup. We failed to do so, and thus there is an elevated risk for type II errors. The results from our post-hoc analysis indicated that we, indeed, failed to reject the null hypothesis for RFC Management Support and Future Obligations when we actually should have. The data were not perfect in that sense that we also had a few complications with the regression assumptions. It may be valuable to do a similar study using SEM methods in the future.

Finally, the specific nature of inter-organizational social networks among Dutch housing associations limits the external validity of our research. We do not have cases from literature that indicate the extent to which these types of social networks are good surrogates for general inter-organizational social networks among competitors or in a for-profit-industry.

Further research
Regarding the limitations of our study, it would be very interesting to do a longitudinal study among multiple social networks in competitive industries. This would give new insights on how actors behaviour is contingent on the network development and characteristics. Furthermore such study should include a set of network characteristics as control variables. Because there is still little known about the network characteristics that influence knowledge seeking behaviour, studies in this direction would be valuable as well.

Furthermore, we have found that collaborative norms do not have a direct relationship with dyadic knowledge seeking. Instead, our results indicate that management support can be a

mediator in this relationship as we found support, albeit in the post-hoc analysis, for direct relationship between management support and knowledge seeking behaviour.
Future research should control for the influence of management support when they study social norms. Not in the last place because the consequences for practice will be great if face-to-face stimulation turns out to be more effective than interventions intended to influence corporate culture.

In our research the scope of knowledge seeking was on the identification and acquisition activities in dyadic knowledge seeking. Further research should also include the application and utilization of knowledge. Additionally, it is interesting to investigate how the theory can be extended to intermediated or group-based knowledge seeking.

Finally, we expect that the type of knowledge can be a relevant factor in knowledge seeking behaviour as well. Further research should investigate if our findings hold for specific types of knowledge (e.g. best practices or epistemological knowledge).

	Implications	
Relationship	Literature	Practice
H1: Collaborative Norms to Sourcing Frequency	We do not find a direct effect of collaborative norms for knowledge seeking. Salient is the correlation with management support. Our results indicate that there is possible mediation by management support. Further research should control for the overlap between collaborative norms and management support.	At this point there is not enough evidence to state that interventions aimed at corporate culture are without effect.
H1a: CONO * FUOB	Collaborative Norms are a pure moderator in stable, topical communities with homogenous knowledge. In dynamic, heterogeneous communities, this effect is not significant.	CoP management should invest in social norms and norms of collaboration for their social network. This will reduce the limiting effects of perceived future obligations.
H1b: CONO * VALUE	Our results do not indicate that there is an interaction effect between value and collaborative norms.	n.a.
H2: Future Obligations to Sourcing Frequency	Social risks have a direct negative influence on knowledge seeking behaviour in dynamic, multi-disciplinary communities with heterogeneous knowledge. This is in contrast with the stable, homogenous communities, where future obligations are not significant.	Future obligations are salient in dynamic and heterogeneous networks, in these CoP's managers should create opportunities for personal contact and bonding to decrease the social distance between actors
H3: Value to Sourcing Frequency	Value is the most important predictor of sourcing frequency in in stable, homogeneous CoP's. However, in dynamic, multi-disciplinary communities with heterogeneous knowledge there is no significant effect.	Knowledge seekers are particularly motivated if they perceive knowledge to be valuable. Make sure the facilitator and journalist roles are covered in a community to improve the value perception for all actors
H4: Knowing to Sourcing Frequency	Knowing is the only factor that has a significant and positive relationship with Sourcing Frequency in both CoP's. Knowing about other actor's expertise is especially important in dynamic and heterogeneous social networks. Our research indicates that knowing what is 'out there' triggers knowledge seeking behaviour.	Managers should: (1) Improve the extent to which actors are informed about projects, studies and interests of each other (2) Stimulate informal contact and discussions to discover shared goals or interests. (3) Invest in information services that keep knowledge seekers updated on trends and news.
H5: Access to Sourcing Frequency	In dynamic and heterogeneous CoP's, access is strongly related to sourcing frequency. While in stable and homogeneous CoP's access is not a significant factor.	In heterogeneous CoP's information services should facilitate finding the right people (e.g. Journalist roles, and content coordinators). Additionally, the CoP's should organize sufficient opportunities for personal contact and bonding to decrease social barriers.

H6: Seeker Knowledge Growth to Sourcing Frequency	We find additional evidence that Seeker Knowledge Growth is a not a significant direct factor in both type of CoP's. However, the construct is correlated to constructs that are directly related to Sourcing Frequency, future research should focus on possible indirect relationships.	n.a. the orientation of management is seldom on the intrinsic benefits of actors. However, if future studies find that Seeker Knowledge Growth has a direct positive effect, then managers should start to appoint participants in a CoP based on their character traits (e.g. extravert and eager) rather than solely on their function.
H7: RFC Management Support to SCFQ	RFC Management Support is correlated to multiple independent variables in our model, in fact it has a weakly significant positive relationship with Sourcing Frequency in stable and homogenous CoP's. Our data indicate that the relationship between Collaborative Norms and RFC Management Support is interesting for further research.	Although strong conclusions cannot be drawn, we propose that organizations should encourage their people to participate in social networks through individual management rather than through Collaborative Norms. Managers are especially well positioned to take the facilitator role.
H8: RFC Time to Sourcing Frequency	Time is often hypothesized to be an important dimension in resource-facilitating conditions. Our results indicate that there is no direct relationship with Sourcing Frequency. It should thus not be included in resource facilitating conditions.	In contrast to what many actors seem to think, that time is their dominant limitation to seek knowledge from others in the CoP, we show that the availability of time is not significantly related to actual seeking behaviour.
H9: RFC Technology to Sourcing Frequency	Not directly related to knowledge seeking behaviour. However, the zero-order correlation suggest that there might be a relationship between Access and Technology. (e.g. information services).	Focus interventions around the dominant predictors (e.g. knowing), technology should be a means to achieve results in those areas rather than a goal.
Control variables	(1) CoP type, in particular stability and shared background knowledge, are strongly significant. (2) Organizational Size is significant positively related to Sourcing Frequency.	(1) CoP management needs to be contingent on the CoP. Actors base their decisions differently depending on CoP type and thus require other information services and need to be stimulated differently.

Table 6.1 summary of implications for practice and literature

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APPENDIX A: LITERATURE REVIEW PAPERS SECOND SWEEP

Authors\ Items	Dependent Variable	Research method	Response rate	Unit of analysis	Context
Burt (2004)	*Idea value*, 'good ideas'.	Web-based network analysis	68%, N=673	Individuals; supply-chain managers	Single organization; person-to-person discussion
Bock et al. (2006)	*Usage of EKR for knowledge seeking*	Survey research	100%, N=143	Individuals; knowledge seekers via electronic means.	Multiple knowledge-intensive organizations; working professionals pursuing a part-time graduate degree
Hansen (1999)	*Project completion time*	Survey research & social network research	89%, N=143	Projects; divisional level	Single organization; interunit relations
Kraaijenbrink (2006)	*Knowledge Integration system*	Literature review & survery research & interviews	24%, N= 1306	Organizations; High-Tech SME	SME; single respondent representing his organization.
Van Baalen et al. (2005)	*Emergence of Network of Practice*	Interviews & non-reactive study	-, N=25	Projects; industry-level, innovation projects	Agricultural industry; people and projects initially unaware of each other
Wasko and Faraj (2005)	*Knowledge contribution*	Survey research	29%, N=593	Individuals; contributing in eNoP	Single eNoP supporting professional legal association.
Xu et al. (2010)	*Sourcing frequency*	Survey research	53%, N=800	Individuals; information seeking dyad	Single organization; task and social information seeking at dyadic level.
This research	*Sourcing frequency*	Survey research	49.3%, N=280	Individuals; information seeking dyad	Communities of Practice; expert networks among housing associations.

Table A.1 comparison of existing research with my research proposal

Authors	Research Question	Key findings
Burt (2004)	What advantages do people have whose relations span the structural holes between groups in detecting and developing good ideas.	"Managers whose networks spanned structural holes were more likely to express an idea and to discuss it with colleagues, have the idea engaged by senior management, and have it judged valuable"."Positive performance evaluations and promotions were disproportionately given to managers who brokered connections across structural holes."
Bock et al. (2006)	how do collaborative norms in an organization impact knowledge seeking with regard to a common knowledge management system type – the electronic knowledge repository (EKR).	"Collaborative norms positively impact individuals' knowledge seeking behavior through EKRs, both directly and through reducing the negative effect of future obligation on seeking. However, collaborative norms could also undermine the positive impact of perceived usefulness on knowledge seeking behavior".
Hansen (1999)	Why are some subunits in an organization able to share knowledge among themselves whereas others are not?	"Weak interunit ties help a project team search for useful knowledge in other subunits but impede the transfer of complex knowledge, which tends to require a strong tie between the two parties to a transfer. Weak interunit ties speeds up projects when knowledge is not complex but slows them down when knowledge to be transferred is highly complex."
Kraaijenbrink (2006)	RQ1: "What theoretical and empirical material for developing a systemic KI model can be derived from the current understanding of the KI process?" RQ2: " What systemic KI model can be derived from the framing of the gathered material into parsons' social system theory?" RQ3: "what is the soundness and relevance of the developed systemic KI model and how should it be improved".	"The systemic Knowledge Integration model should be a conceptual thinking model that is based on the analogy of a system and that is used to select, interpret and organize Knowledge Integration phenomena".
Van Baalen et al.(2005)	How does a knowledge portal facilitate the diffusion of knowledge among rather loosely coupled and often disconnected innovation projects.	"A developed knowledge portal will lead to overcoming structural holes and a closer cognitive distance among the projects". "Knowledge was shared between the project level and the platform and public level". "However findings show no direct effect of the knowledge portal on sharing tact knowledge nor on the receprocity of knowledge exchange among the projects ".
Wasko and Faraj (2005)	How individual motivations and social capital influence knowledge contribution in electronic networks.	"People contribute their knowledge when they perceive that it enhances their professional reputations, when they have the experience to share, and when they are structurally embedded in the network. Surprisingly, contributions occur without regard to expectations of reciprocity from others or high levels of commitment to the network."
Xu et al. (2010)	RQ1: "Understand the motivations, particularly relational need, in interpersonal information seeking." RQ2: "Compare the impact of different motivations in employees' task and social information seeking".	"KMS should not just be content repositories, but also relational systems". "Perceived information relevance is a significant motivator of sourcing frequency in both task and social information seeking. However, perceived relational motivation is significant to preference for a source only in task information seeking".
This research	How do collaborative norms influence intentions to use social contacts for knowledge seeking within networks of practice among housing associations in the Netherlands?	Knowledge Seeking behaviour is influenced by the context of the CoP in which the actor participates. In CoP with homogenous knowledge and topical structure, actors source their knowledge more frequently from other actors if they know what their expertise is and if they perceive their knowledge as valuable to their own job. On the other hand, in heterogenous CoP with dynamic ties, actors perceive future obligations and source their knowledge mainly from people who they perceive to be knowledgable and accessible.

Table A.2 comparison of research question and results

APPENDIX B: INTERVIEWS FOR PROBLEM DESCRIPTION

This appendix contains more information about the 16 observational interviews with both managers and consultants at WonenBreburg. These interviews are not used for hypothesis testing, instead they were conducted to get a qualitative perspective of the independent variables, the housing sector and the knowledge management practices that are applied in WonenBreburg and CoP (general). By describing the methodology, approach, questions, interviewees and findings, we intend to give insight in the methodological value of the interviews.

B.1 Interview goals

The goal of the operational interviews was to get insight :
- Respondents' perspective on knowledge exchange (both inter and intra organizational)
- Communities, networks the respondent (or his department) is and has been involved in
- The respondent's general experience with these cooperatives, successes and failures
- Respondent's current issues and opportunities regarding social networks and the value they perceive
- General feeling for what kind of knowledge is exchanged and how the networks operate

B.2 Interview methodology

Setup and processing results

The interviewees did not have to prepare anything and the interviews lasted for approximately an hour. All interviews were face to face. We did not record the interviews instead, we took notes at all interviews. Immediately after the interview we wrote a 1-page summary based on the notes and the impressions we had. This summary we then sent to respondents for suggestions and comments.
The interviews with the employees on operational level took place in the period from the 9th of November 2009 until the 15th of January 2010. The consolidation of its outcomes we discussed during various meetings with the supervisors from WonenBreburg.

Selection of interviewees

The interviewees were selected because of their participation in communities of practice, their hierarchical position in departments or their consulting role on tactical level at WonenBreburg. People on this hierarchical level make complex decisions and advise the board and other employees regularly. We assume that they will seek expertise, advice, and opinions frequently or at least have experience with the knowledge sourcing process.

APPENDIX C: SURVEY INSTRUMENT – ENGLISH

Construct	Item	Question	Source
Collaborative Norms	CONO1	There is a norm of Collaboration in my organization	Kan. (05)
	CONO2	There is a norm of openness to conflicting views in my organization	Kan. (05)
	CONO3	There is a norm of tolerance of mistakes in my organization	Kan. (05)
	CONO4	Knowledge sharing is important in my organization	Boc. (06)
	CONO5	People who influence my behavior think that I should seek knowledge within the CoP	Ven. (03)
Future Obligation	FUOB1	I Feel obliged to contribute to the CoP in the future	Boc. (06)
	FUOB2	I have a strong sense of duty to pay back for knowledge sought within the CoP	Boc. (06)
	FUOB3	I feel pressure to pay back for seeking knowledge within the CoP	Boc. (06)
	FUOB4	I am afraid that my questions in the CoP will evoke additional requests for assistance	Kan. (05)
Value	VALU1	Within the CoP there are people with broad knowledge related to my Job	Xu (06)
	VALU2	Within the CoP there are people with unique knowledge which can be used in my job	Xu (06)
	VALU3	Within the CoP there is expertise in areas that are important for my Job	Bor. (03)
	VALU4	Using the expertise within the CoP can increase the quality of output on my job	Ven. (03)
	VALU5	Using the CoP would make it easier to do my Job	Ven. (03)
Access		People are not equally acessible for advice or information. At one end there are people who do not make themselves available to you quickly enough to help solve your problem. At the other end of the spectrum there re those who are willing to engage actively in problem solving with you in a timely fashion.	
	ACCS1	With this continuum in mind, how would you rate your overall ability to access knowledge from people in the CoP?	Bor. (03)
	ACCS2	It is not laborious to acquire knowledge from people in the CoP	Boc. (06)
	ACCS3	It is easy for me to get in touch with people in the CoP	Lev. (04)
	ACCS4	The people I approach might think I am incompetent if I ask them for technical information	Xu (10)
Knowing	KNOW3	I understand what skills and domains the people within the CoP are knowledgeable in	Bor. (03)
	KNOW4	I know which topics are on the agenda of other actors in the CoP	Self dev.
		Please take in mind a topic that will be on your agenda for the next few weeks. Answer the following question considering this topic.	
	KNOW1	How many people in the CoP do you know who have experience with this topic?	Xu (06)
	KNOW2	How many people in the CoP do you know who are expert in this topic	Xu (06)
Seeker Knowledge Growth	SKGR1	Seeking knowledge within the CoP promotes my knowledge growth and development	Boc. (06)
	SKGR2	Seeking knowledge within the CoP helps me strengthen my concepts in my field	He (09)
	SKGR3	Seeking knowledge within the CoP reinforces my competence	He (09)
	SKGR4	I have fun participating in the CoP	Ven. (03)
RFC Time	RFCT1	I have limited time to participate in the CoP	Boc. (06)
	RFCT2	I have to find time between work to participate in the CoP	Boc. (06)
	RFCT3	I have to overextend to get work done on time	Boc. (06)

RFC Management Support	RFCM1	My manager encourages participation in the CoP	Boc. (06)
	RFCM2	My organization values learning of other associations in the CoP	Boc. (06)
	RFCM3	My organization supports participation in the CoP	He (09)
	RFCM4	My organization gives a high priority to participation in the CoP	He (09)
RFC Technology	FCIT1	There are systems/tools available to me to locate knowledge in the CoP	Kul. (06)
	FCIT2	The systems/tools allow me to find the right person in the CoP	Self dev.
	FCIT3	Knowledge seeking in the CoP is well supported by ICT	Self dev.
Sourcing Frequency	SCFQ1	How often do you communicate with other people in the CoP?	Lev. (04)
	SCFQ2	How often have you turned to someone in the CoP for information or knowledge on work-related topics in the past year	Bor. (03)
Age	CTRL 1	What is your year of birth?	
Gender	CTRL 2	What is your gender?	
Job Tenure	CTRL 3	In which year did you start at your organization ?	
CoP Experience	CTRL 4	In which year did you participate in the CoP for the first time?	
Organizational Size	CTRL 5	What is the size of your organization? (Expressed in Rental Units of the Organization)	
CoP Type	CTRL 6	Are you a member of NetwIT or Futura?	
Open question		What is your personal motivation to participate in the CoP?	

Table C.1 survey items (English) and the source from which the items are adapted
Note 1: Xu (06) is the abbreviation of Xu and Tan (2006).
Note 2: Self Dev. are items which were self developed based on the dimensionality of the construct defined based on the literature review (q.v. section 2.5).
Note 3: Grey items indicate items that were dropped during the instrument development process (q.v. section 4.5)

APPENDIX D: SURVEY INSTRUMENT – DUTCH

Construct	Item	Question
Collaborative Norms	CONO1	Samenwerken is een kernwaarde in mijn organisatie
	CONO2	In mijn organisatie staat men open voor conflicterende visies
	CONO3	In mijn organisatie mag je fouten maken
	CONO4	Mijn organisatie vindt kennisdeling belangrijk
	CONO5	Personen die mijn gedrag beïnvloeden vinden dat ik kennis ook in het CoP moet zoeken
Future Obligation	FUOB1	Ik voel me verplicht om in de toekomst bij te dragen in Futura
	FUOB2	Ik vind dat het mijn plicht is om terug te betalen voor kennis gehaald in Futura
	FUOB3	Ik voel een druk om iets terug te doen voor het halen van kennis in Futura
	FUOB4	Ik ben bang dat mijn vragen aan mensen in het CoP zullen leiden tot extra verzoeken om hulp aan mij
Value	VALU1	In het CoP zijn er mensen met brede kennis gerelateerd aan mijn werk
	VALU2	In Futura zijn er personen met unieke kennis die waardevol is voor mijn werk
	VALU3	In Futura zijn er personen met expertise op de gebieden die belangrijk zijn voor mijn werk
	VALU4	Het gebruik van de expertise binnen Futura verhoogt de kwaliteit van de resultaten in mijn werk
	VALU5	Het gebruik van expertise binnen Futura vergemakkelijkt mijn werk
Access		Niet iedere persoon is even bereikbaar voor advies of informatie. Er zijn personen die zichzelf geheel niet beschikbaar stellen om u te helpen met uw probleem. Aan de andere kant zijn er ook mensen die zeer bereid zijn om tijdig en actief mee te denken met uw probleem.
	ACCS1	Met dit spectrum in gedachte, hoe zou u in het algemeen de toegankelijkheid van personen in Futura beoordelen?
	ACCS2	Het kost weinig moeite om kennis te verkrijgen van personen in Futura
	ACCS3	Het is gemakkelijk om met personen in Futura in contact te komen
	ACCS4	Ik kan personen in Futura vragen om technische informatie zonder dat zij daardoor denken dat ik incompetent ben
Knowing	KNOW3	Ik weet op welke gebieden personen in Futura, met een vergelijkbare functie, kennis en vaardigheden hebben
	KNOW4	Ik weet welke onderwerpen er de komende tijd bij collega's in het CoP op de agenda staan
		Neemt u een onderwerp in gedachte dat voor de komende tijd op uw agenda staat. Beantwoord de volgende vragen met dit onderwerp in gedachten.
	KNOW1	Hoeveel personen kent u binnen het NoP die ervaring hebben met dit onderwerp?
	KNOW2	Hoeveel personen kent u binnen Futura die expert zijn op het gebied van dit onderwerp?
Seeker Knowledge Growth	SKGR1	Het zoeken van kennis in Futura bevordert de groei en ontwikkeling van mijn eigen kennis
	SKGR2	Het zoeken van kennis in Futura verduidelijkt de concepten in mijn werkveld
	SKGR3	Het zoeken van kennis in Futura versterkt mijn competenties
	SKGR4	Ik vind het leuk om actief te zijn in Futura
RFC Time	RFCT1	Er is beperkt tijd beschikbaar om kennis te zoeken binnen Futura
	RFCT2	Ik moet tussen het werk door tijd vinden om actief deel te nemen in Futura
	RFCT3	Er is te weinig tijd om al mijn werk op tijd af te krijgen

RFC Management Support	RFCM1	Mijn leidinggevende stimuleert mij om gebruik te maken van kennisnetwerken
	RFCM2	Mijn organisatie vindt het belangrijk dat ik ook leer van andere corporaties
	RFCM3	Mijn organisatie steunt deelname aan het CoP
	RFCM4	Mijn organisatie geeft een hoge prioriteit aan het deelnemen in Futura
RFC Technology	FCIT1	Er zijn systemen / tools die ik kan gebruiken om informatie te zoeken in Futura
	FCIT2	Deze systemen / tools maken het mij mogelijk om de juiste persoon te vinden in Futura
	FCIT3	Informatie Technologie ondersteunt het zoeken van kennis binnen Futura optimaal
Sourcing Frequency	SCFQ1	Hoe vaak heeft u contact met andere personen binnen Futura?
	SCFQ2	Hoe vaak heeft u zich het afgelopen jaar tot iemand binnen Futura gericht voor informatie of kennis over werk gerelateerde onderwerpen?
Age	CTRL 1	In welk jaar bent u geboren? - Jaar
Gender	CTRL 2	Wat is uw geslacht? M/V
Tenure	CTRL 3	Wanneer bent u in dienst gekomen bij uw organisatie? - Jaar
CoP experience	CTRL 4	Wanneer heeft u voor het eerst deelgenomen in het netwerk? - Jaar
Organizational Size	CTRL 5	Hoe groot is uw organisatie ongeveer? (uitgedrukt in verhuur eenheden, VHE)
CoP type	CTRL 6	In welk netwerk neemt u deel, NetwIT of Futura?
Open vraag		Wat is voor u de toegevoegde waarde van deelname aan Futura?

Table D.1 Dutch translation of the survey items (q.v. Appendix C)

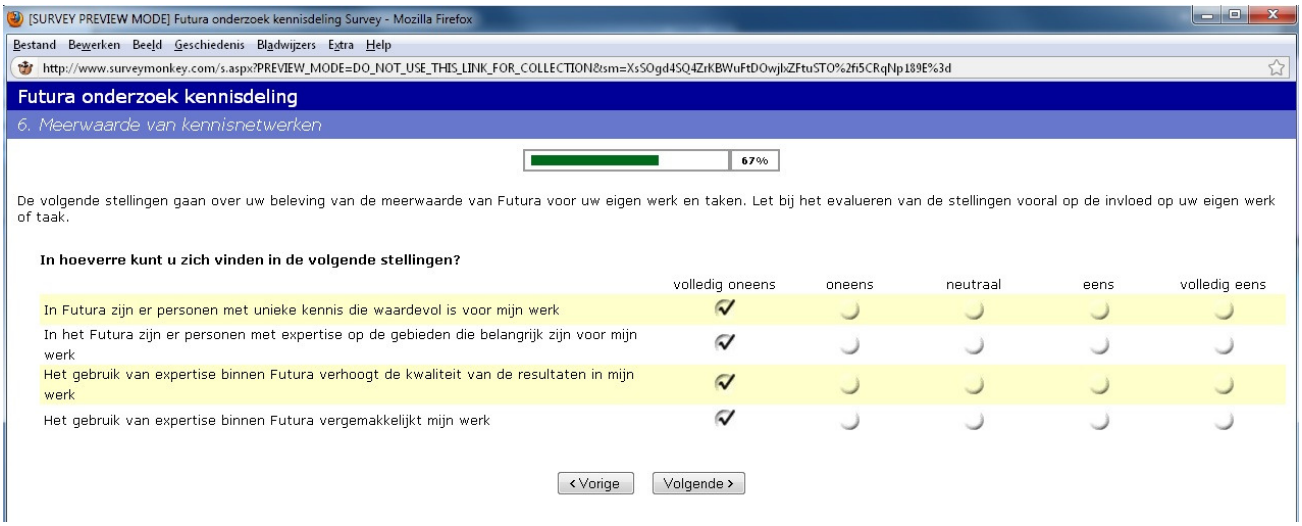

Figure D.1 screenshot of page 6 of the survey instrument

APPENDIX E: COMPANY PROFILE – WONENBREBURG

Key statistics on 31 December, 2008		2008	2007	2006	2005	2004
1	Number of houses	26,123	26,702	26,830	27,195	26,955
2	Number of garages and parking lots	2,614	2,584	2,572	2,546	2,504
3	Number of commercial units	177	132	123	111	106
4	Number of rental units	28,914	29,418	29,525	29,617	29,355
5	Annual rent per rental unit	4,668€	4,480€	4,408€	4,230€	4,121€
6	Turnover rate of rental units	14.5%	14.7%	15.3%	16.5%	13.8%
7	Total equity x 1,000	266,801€	264,619€	309,157€	239,817€	257,513€
8	Return on equity	2.5%	-1.6%	9.9%	1.2%	5.0%
9	Current ratio	0.41	0.23	0.16	0.19	0.16
10	Annual rent x 1,000	123,079€	120,514€	118,073€	113,214€	107,640€
11	Net result x 1,000	2,182	(44,538)	69,340	(17,695)	17,409
12	Personnel (FTE)	397.3	394.6	393.6	374.0	364.8

Table E.1 key statistics and performance indicators of the host organization WonenBreburg

	Fulltime	Part-time	Employees	%
Women	66	108	174	39%
Men	251	17	268	61%
Total	317	125	442	100%

Table E.2 detailed overview of personnel on 31 December, 2008

APPENDIX F: TOP 50 IS JOURNALS

WORLD RANK	TITLE	WORLD RANK	TITLE	WORLD RANK	TITLE
1	MIS Quarterly	18	Communications of the AIS	35	Journal of Information Systems
2	Communications of the ACM	19	IEEE Computer	36	The Information Society
3	IS Research	20	Journal of Strategic IS	37	Journal E-U Computing
4	Journal of MIS	21	Admin. Science Quarterly	38	Info Resources Mgmt Journal
5	Management Science	22	Academy of Mgmt Review	39	Interfaces
6	IEEE Transactions (various)	23	Int'l Journal of E-Commerce	40	EM - Electronic Markets
7	Harvard Business Review	24	ACM Computing Surveys	41	Journal of CIS
8	Decision Sciences	25	Accounting, Management & IT	42	European Journal of OR
9	Decision Support Systems	26	ACM SIG Publications	43	Operations Research
10	Information and Management	27	IT and People	44	Int'l Journal of H-C Studies
11	European Journal of IS	28	IBM Systems Journal	45	Journal of the ACM
12	Sloan Management Review	29	OMEGA	46	Australian Journal of IS
13	ACM Transactions (various)	30	Journal of the AIS	47	Org. Behavior and Human Dec.
14	Data Base	31	Journal of Org., Comp. and EC	48	Behavior and IT
15	Organization Science	32	Human-Computer Interaction	49	Scandinavian Journal of IS
16	Information Systems Journal	33	Information Systems Management	50	Computer Journal
17	Academy of Management Journal	34	Int'l Journal of Man-Machine Studies		

Table F.1 overview of the top 50 IS journals in 2004 source: Schwartz and Russo (2004)

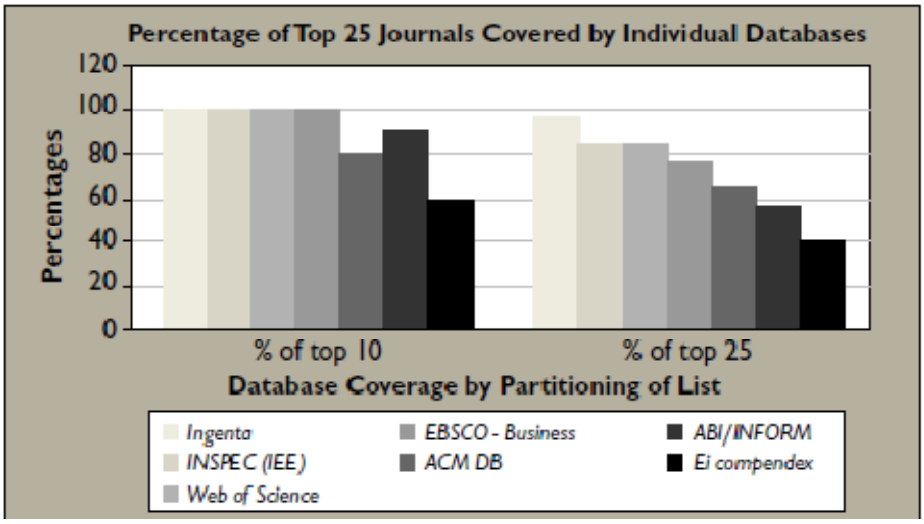

Table F.2 overview of the database coverage of top 25 journals source: Schwartz and Russo (2004)

APPENDIX G: RESIDUAL ANALYSIS

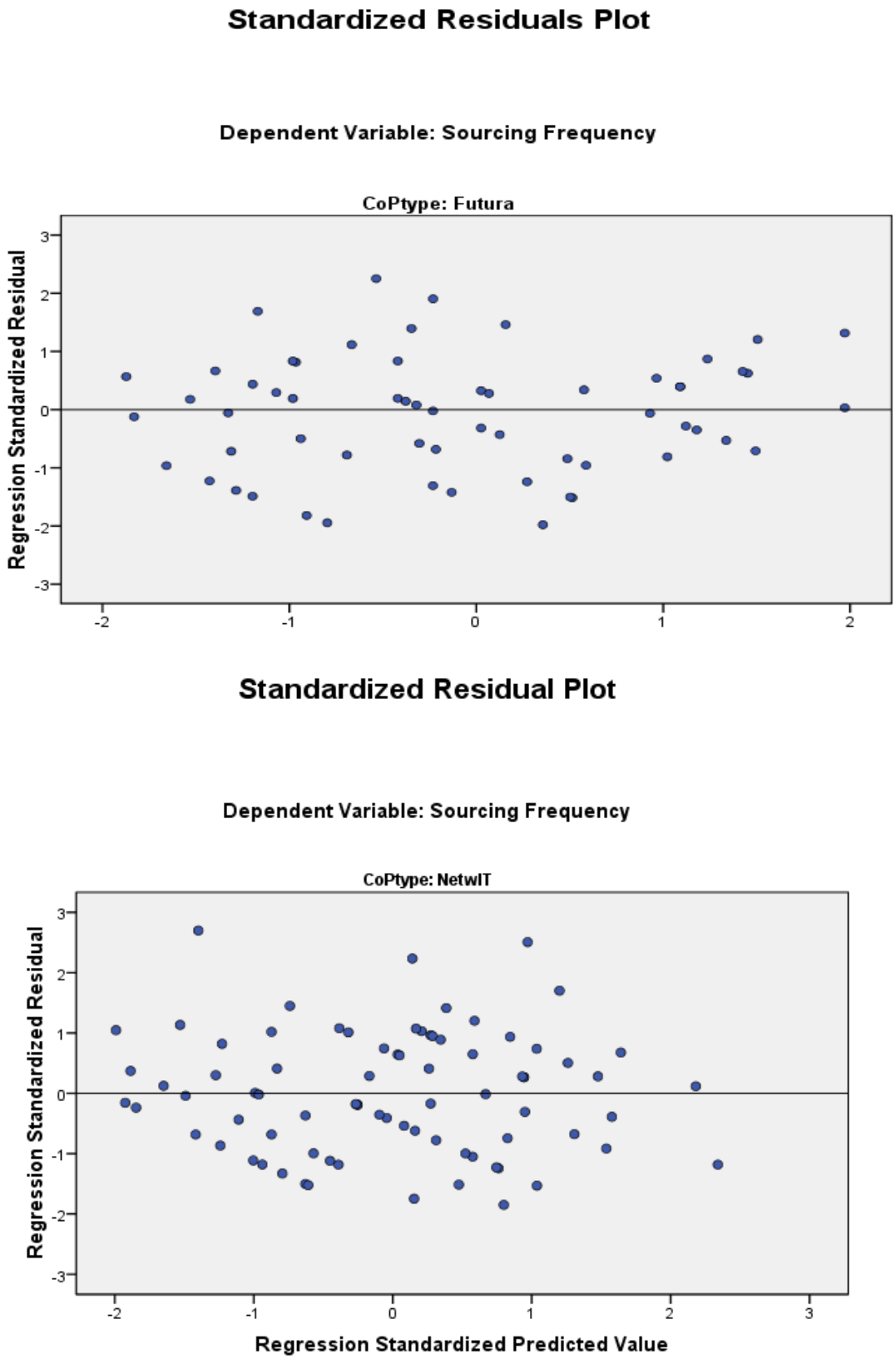

Figure G.1 standardized residuals plots of the split dataset, used to test for homoscedacity

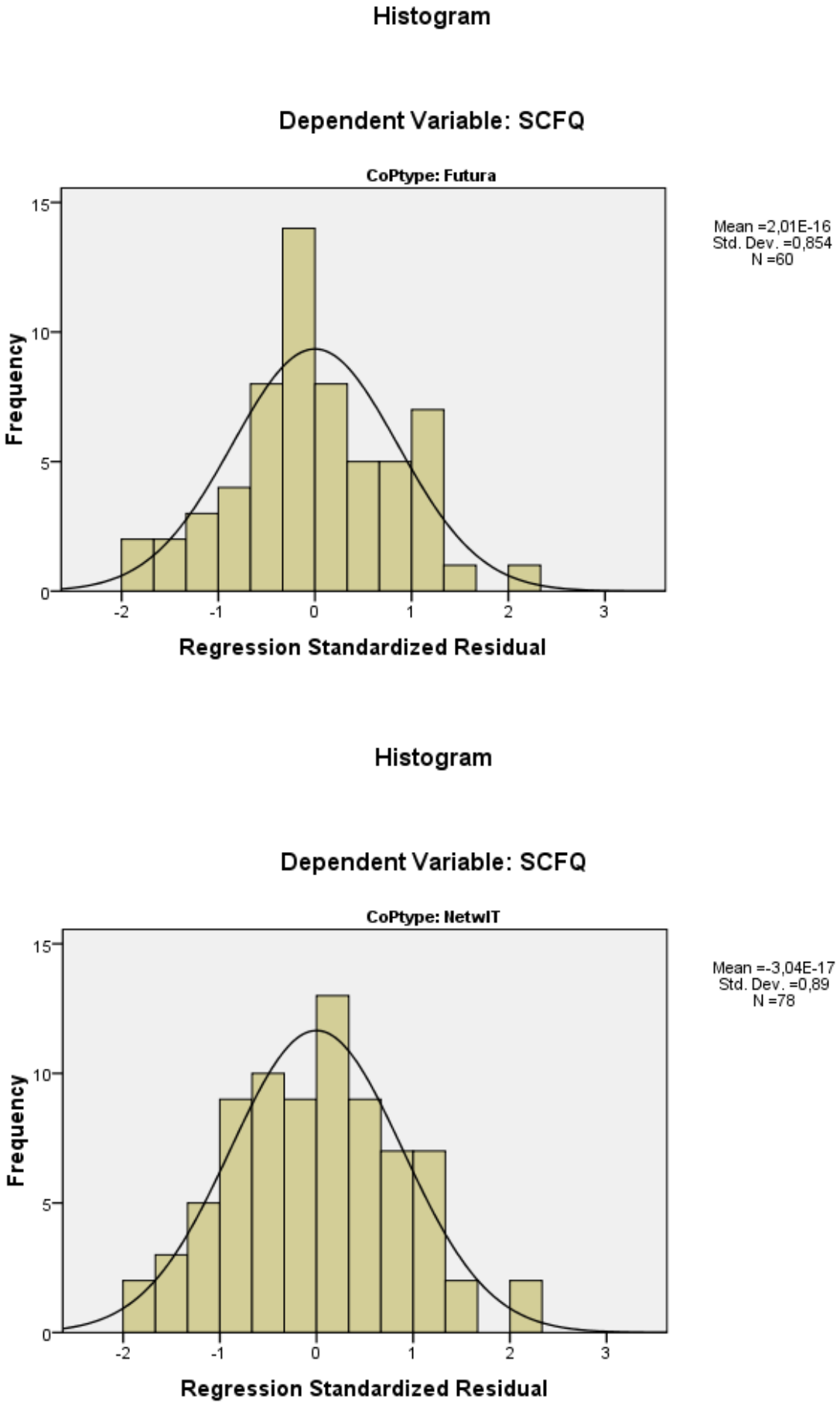

Figure G.1 Histogram with normal distribution curve of standardized residuals for both CoP, normality is required.

APPENDIX H: CONFIRMATORY FACTOR ANALYSIS

Pattern Matrix

	Factor									
	1	2	3	4	5	6	7	8	9	10
CONO1	.51									
CONO2	.82									
CONO3	.53									
CONO4	.55	.34								
RFCM1		.75								
RFCM2	.35	.50								
RFCM4		.58								
ACCS1			.67							
ACCS2			.69							
ACCS3			.71							
ACCS4			.56							
FCIT1				.84						
FCIT2				.89						
FCIT3				.60						
SCFQ1					.59					
SCFQ2					.80					
RFCT1						.67				
RFCT2						.77				
RFCT3						.60				
VALU2							.59			
VALU3							.66			
VALU4							.77			
VALU5							.70			
KNOW3								.49		
KNOW1								.80		
KNOW2								.57		
SKGR1							.78			
SKGR2							.66		-.31	
SKGR3							.73			
SKGR4										
FUOB1		-.48								.44
FUOB3										.70
FUOB2										.74

Table H.1 results of confirmatory factor analysis

Note 1: SPSS 17.0 is used for factor analysis. Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization. Kappa = 2.

Note 2: For reasons of parsimony, values below .30 were omitted.

Structure Matrix

	Factor									
	1	2	3	4	5	6	7	8	9	10
CONO1	.53									
CONO2	.86									
CONO3	.51									
CONO4	.57	.41								
RFCM1		.80								
RFCM2	.38	.57								
RFCM4	.33	.66							-.31	
ACCS1			.72		.34					
ACCS2			.77	.45				.36		
ACCS3			.76					.37		
ACCS4			.65		.31					
FCIT1			.32	.87						
FCIT2			.44	.92						
FCIT3				.64						
SCFQ1		.40	.45		.75		.43	.48		
SCFQ2			.40		.87		.33	.41		
RFCT1						.66				
RFCT2						.79				
RFCT3						.60				
VALU2							.67	.41		
VALU3			.30				.73	.30	.32	
VALU4			.36		.34		.84	.35		
VALU5							.77			
KNOW3			.37	.31	.33			.58		
KNOW1			.41		.35		.38	.87		
KNOW2			.36				.34	.66		
SKGR1					.30		.80			
SKGR2							.71	.32		-.33
SKGR3		.33					.69			
SKGR4		.39	.34		.42		.45	.43		
FUOB1		-.57					-.32	-.36		.51
FUOB3										.74
FUOB2										.76

Table H.2 results of confirmatory factor analysis: structure matrix

Note 1: SPSS 17.0 was used for factor analysis. Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization. Kappa = 2.

Note 2: For reasons of parsimony, values below .30 were omitted.

APPENDIX I: CROSS-FACTOR LOADINGS MATRIX

Cross-Factor Loadings matrix

	ACCS	FCIT	SCFQ	RFCT	VALU	KNOW	SKGR	FUOB	CONO	RFCM
ACCS1	**.93**	.73	.62	.55	.71	.62	.66	.53	.04	.18
ACCS2	**.94**	.81	.59	.55	.70	.65	.63	.48	.08	.16
ACCS3	**.95**	.76	.61	.59	.75	.65	.67	.53	.07	.17
ACCS4	**.93**	.76	.60	.55	.72	.61	.65	.50	.13	.22
FCIT1	.77	**.96**	.44	.47	.55	.54	.50	.40	.09	.11
FCIT2	.82	**.97**	.46	.48	.58	.52	.51	.44	.00	.10
FCIT3	.72	**.91**	.37	.43	.53	.49	.47	.38	.05	.09
SCFQ1	.64	.46	**.99**	.45	.69	.73	.70	.36	.10	.32
SCFQ2	.58	.37	**.89**	.38	.60	.69	.60	.33	.11	.24
RFCT1	.54	.45	.45	**.91**	.62	.43	.61	.49	-.04	.05
RFCT2	.49	.42	.33	**.90**	.60	.39	.56	.46	-.06	-.03
RFCT3	.56	.45	.40	**.89**	.61	.44	.56	.55	-.14	.04
VALU2	.69	.53	.58	.65	**.92**	.66	.77	.48	-.07	.17
VALU3	.75	.57	.67	.70	**.95**	.66	.81	.57	-.03	.17
VALU4	.74	.58	.70	.61	**.96**	.69	.80	.46	.04	.18
VALU5	.71	.54	.67	.62	**.95**	.65	.79	.47	-.01	.22
KNOW3	.65	.57	.70	.49	.65	**.88**	.71	.50	.06	.20
KNOW1	.60	.44	.71	.40	.65	**.93**	.66	.41	.11	.14
KNOW2	.56	.46	.60	.37	.59	**.89**	.61	.35	.18	.19
SKGR1	.66	.50	.68	.63	.82	.69	**.96**	.61	-.02	.15
SKGR2	.66	.50	.65	.59	.80	.70	**.96**	.59	.02	.15
SKGR3	.61	.47	.57	.60	.78	.63	**.94**	.61	-.06	.17
SKGR4	.68	.50	.73	.60	.76	.74	**.93**	.63	-.02	.14
FUOB1	.44	.38	.24	.55	.45	.34	.54	**.87**	-.10	-.31
FUOB3	.51	.40	.36	.49	.48	.45	.61	**.93**	-.09	-.10
FUOB2	.52	.41	.38	.52	.50	.48	.62	**.95**	-.06	-.13
CONO1	.12	.07	.09	-.02	.03	.18	.03	-.08	**.79**	.27
CONO2	-.02	-.05	.02	-.19	-.11	.02	-.09	-.18	**.66**	.31
CONO3	.02	.02	.08	-.1	-.04	.01	-.04	-.03	**.73**	.22
CONO4	-.07	-.06	.00	-.16	-.05	.04	-.06	-.16	**.49**	.43
RFCM1	.17	.06	.31	.06	.20	.17	.16	-.12	.27	**.90**
RFCM2	.10	.02	.19	.02	.12	.14	.08	-.18	.38	**.73**
RFCM4	.19	.18	.24	-.03	.15	.17	.15	-.15	.22	**.79**

Table I.1 results of cross-factor analysis: loadings matrix