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Two Heads Are Better Than One: Knowledge Sharing in Organizational Social Networks

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DOCTORAL DISSERTATION

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Table of contents

List of figures

List of tables

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I. Introduction

I.1 Research framework and outline

In my doctoral research, I explore the internal knowledge-sharing practices of knowledge-intensive organizations with the perspective and methodological tools of social network analysis. For organizations of knowledge-intensive industries, knowledge owned by their employees is one of their most important resources. Their competitiveness depends on the efficient exploitation of acquired knowledge as well as the creation of new knowledge and innovation. In my doctoral dissertation, I explore organizational knowledge networks, with special regard to the relational conditions of advice-seeking and knowledge sharing, negative relationships affecting knowledge networks, and enterprise social media as a virtual space for knowledge transfer. I introduce my research approach and research questions as well as my paradigmatic stance before presenting the findings of my previous research papers.

I compiled my doctoral dissertation using four of my previously published papers. Details of the articles are the following:

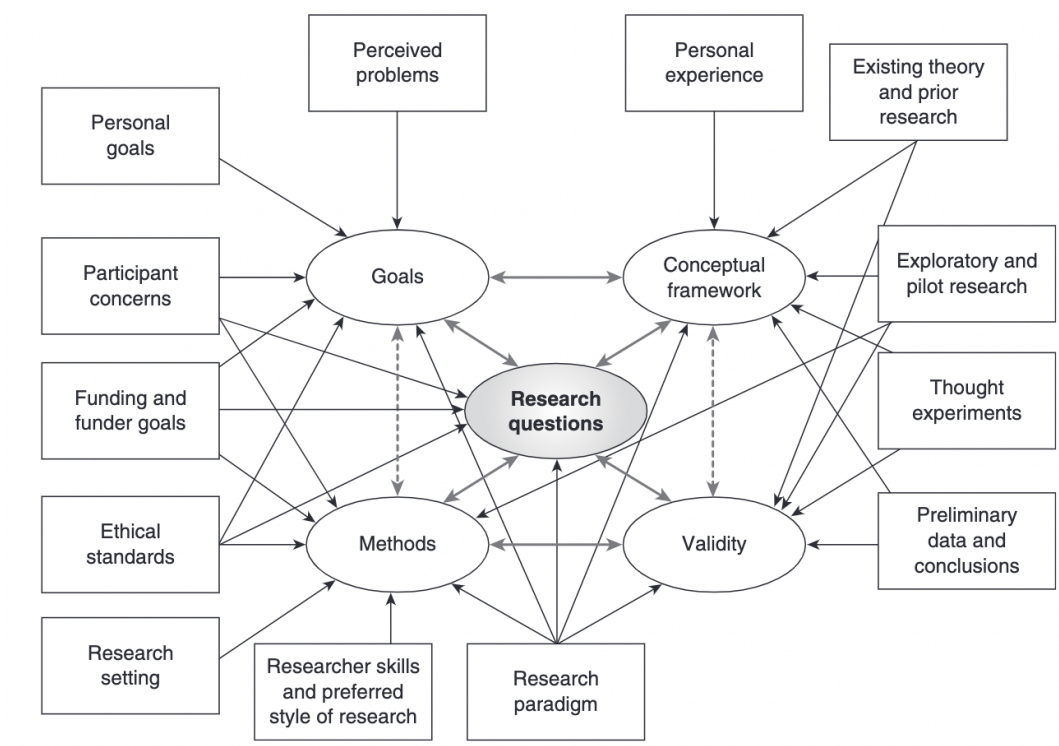
- **Baksa, M.** & Drótos, Gy. (2018). Vállalati közösségi média – A személyközi hálózatok motorja. *Vezetéstudomány / Budapest Management Review*, *49*(4), 2–11. https://doi.org/10.14267/veztud.2018.04.01
- **Baksa, M.** (2019). Negatív kapcsolatok a szervezeti hálózatokban – meghatározások, módszerek és mércék. *Vezetéstudomány / Budapest Management Review*, *50*(9), 14–25. https://doi.org/10.14267/veztud.2019.09.03
- **Baksa, M.** & Báder, N. (2020). A tudáskérés és tudásmegosztás feltételei – egy szervezeti tudáshálózat elemzése. *Vezetéstudomány / Budapest Management Review*, *51*(1), 32–45. https://doi.org/10.14267/veztud.2020.01.03
- **Baksa, M.** & Branyiczki I. (2023). The invisible foundations of collaboration in the workplace: A multiplex network approach to advice-seeking and knowledge sharing. *Central European Business Review.* In press. https://doi.org/10.18267/j.cebr.322

The first article explores the unique characteristics and patterns of enterprise social media and its role in organizational social networks and knowledge sharing. In the second article, I draw attention to the individual, social, and organizational effects of negative relationships that are often left out of the scope of organizational network analysis and remain in the blind spot for managers and consultants. Consequently, in the third article, I analyze the internal knowledge sharing practices of a knowledge-intensive organization by mapping its organizational knowledge network as well as a supplementary interview research. Finally, in the fourth article, I intend to convincingly investigate the research questions raised in the pilot research featured in the previous chapter. The fourth article follows the line of thought and builds on the theoretical constructs introduced in the first three papers and tests research propositions on large organizational samples.

As the published journal articles should be able to be interpreted in themselves, various parts of the doctoral dissertation (e.g., introduction, theoretical background, research goals, methodology) do not appear in one place, but rather as parts of the aforementioned papers. Theoretical concepts and models that are key for the investigation of the research topics are sometimes repeated in more detail or in a specific context.

To present my research framework, I use Maxwell's (2009) model. In this interactive model, the research questions play a crucial role, while other components, i.e., goals, conceptual framework, methods, and validity are integrated to support their inquiry. The framework's components and contextual factors affecting them are summarized in *Figure 1*. Although Maxwell proposes this model primarily for qualitative research design, I believe it is also suitable for a basis of my own research that combines the quantitative and qualitative approaches. The building blocks of the framework draw attention to questions that are equally important in qualitative and quantitative settings.

Figure 1 Contextual factors affecting the framework of research design



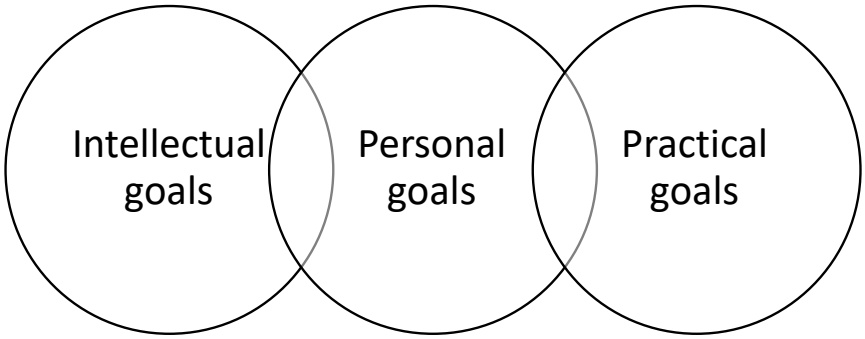
Source: Maxwell, 2009, p. 218

Based on Maxwell's model, I present the conceptual framework of my doctoral dissertation, the research questions and objectives formulated based on the research problem, and methodologies used for empirical research. I describe the paradigmatic stance of organizational network researchers and present the basic assumptions of the conducted empirical research. Finally, I present the line of thought of the doctoral dissertation and directions for future research.

I.2 Research goals

Based on Maxwell (2009) and Saunders *et al.* (2019) it is important to distinguish among three types of research goals in a study: (1) personal goals, (2) practical goals, and (3) intellectual goals (see *Figure 2*). Personal goals drive the researcher to conduct their study, motivated by a desire to change, a curiosity about a phenomenon, or a need to advance in career. Personal goals may also overlap with practical or intellectual goals but are often rooted in individual needs. Intellectual goals usually include the understanding of *meaning*, a particular context, or processes by which events and actions take place. It can also be an intellectual goal to identify unanticipated phenomena or develop causal explanations. Practical goals, on the other hand, are focused on accomplishing something (e.g., meeting a need or changing a situation). Well-articulated research should simultaneously serve all three types of research goals (Maxwell, 2009).

Figure 2 Three types of research goals



Source: based on Maxwell, 2009; Saunders et al., 2019

Through my doctoral research, I was driven by various goals, some of which stem from personal commitment, others from intellectual interest, and practical considerations. My personal goals are driven by my strong professional interest, a love of learning and discover. My intellectual goals may highlight the theoretical issues I wish to better understand, and what scientific discourse I intend to contribute to, as well as what intellectual challenges I want to meet. Finally, my practical goals ultimately ensure that my expected research findings are used in the wider socio-

economic environment of the scientific community, in some way influencing organizational decision makers and the daily lives of managers and employees.

Organizations may be interpreted as networks of interconnected relationships between members (and external stakeholders). Friendships, workplace coalitions, relationships of trust weave through organizations in which information, knowledge, emotions, and various resources flow. With my doctoral research, I would like to contribute to the scientific discourse on organizational network research. Although this discourse has a tradition that goes back almost a century, the studies of knowledge networks, enterprise social media, and signed networks (that include positive *and negative* relationships) signify relatively new research streams. Certain types of negative relationships (e.g., envy, bullying, and gossip) are investigated in the vast literature on organizational theory and social psychology, however, their analysis in a network approach is still in its infancy. Similarly, many IT papers have examined social media, and knowledge management has an own line of research – a network perspective can still inspire new discoveries in both fields. Network analysis allows us to capture patterns, relationships, and interactions that would otherwise go unnoticed, instead of examining individual phenomena.

My personal motivation for my doctoral research stems from two sources. On the one hand, my deep professional interest in the chosen field, and on the other hand, the perks of being a researcher. The network interpretation of organizations and the social environment has fascinated me ever since I was an undergraduate student. As I often think about the world in abstractions and look for overarching trends and connections, I have been impressed to see that network research can display patterns that otherwise remain hidden – even from the network actors themselves.

Being part of the academic world provides both supportive conditions and a personal freedom for discovery. Academia creates an intellectually stimulating environment where, in addition to my own doctoral subject, I can work on interesting themes, learn from excellent colleagues, and try myself as a lecturer. One of my most important personal goals with the doctoral program was to improve my consciousness and self-knowledge.

In addition to delving into my field of interest and gaining professional skills, I wished to develop the perspective of the researcher and advance my methodological knowledge. I believe that by completing the doctoral program, I can also learn a lot about my own spiritual patterns: for instance, the way I can overcome obstacles, the way I can make use of greater freedom, and the way I can focus my resources and efforts.

The intellectual goal of my research is to reach a more thorough and deep understanding of organizational life. I believe that a network approach is an effective tool for revealing the hidden patterns of complex systems. I hope that as completing my doctoral research, I can see organizations from a new approach. Reviewing the domestic and international literature on different streams of inquiry, I see that there are several research gaps along which it is possible and worthwhile to contribute to the scientific discourse.

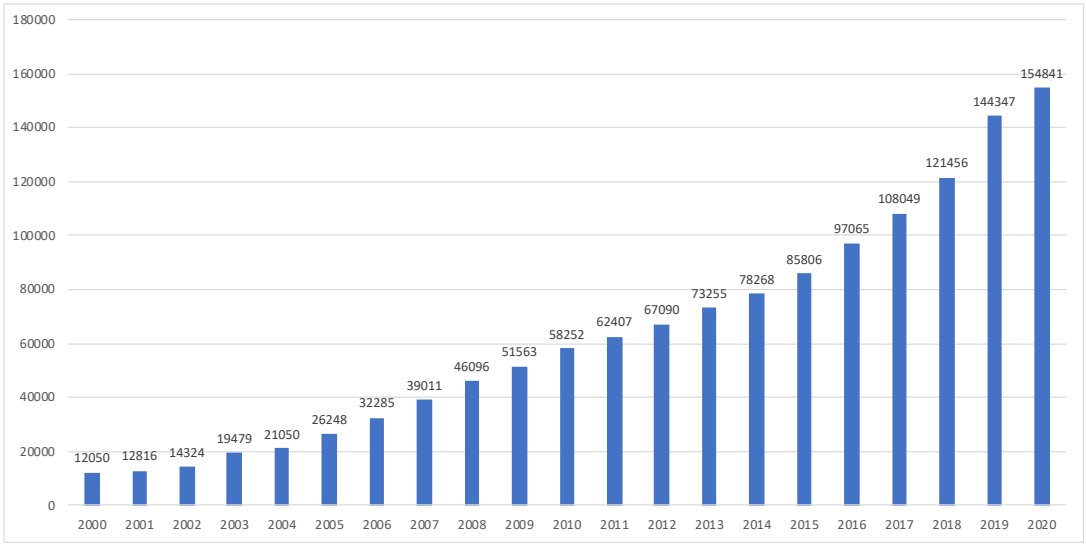
The practical purpose of my research is twofold: on the one hand I wish to contribute to the methodological development of organizational network analysis (ONA) and on the other hand, I hope that managers and employees of various organizations can use my findings to see their organizational environment more accurately. Network analysis is an increasingly popular diagnostic tool in management consulting. I believe that understanding the structure of knowledge networks and the patterns of negative relationships may help us better manage related situations and thereby create happier, healthier organizations.

I.3 Research problem and relevance of research

Over the past five years, there has been an explosion of interest in the fourth industrial revolution across the fields of technology management, strategic management, and organization studies (Demeter et al., 2020; Liao et al., 2017). A critical combination of information technology, biotechnology, and robotics seems to be the most significant driving force for the revolutionary changes around and ahead of us and has attracted the attention of many researchers. As an increasing share of low value-added, routine tasks are automated or robotized (Marciniak et al., 2020, 2021), knowledge creation and innovation fuel the competitiveness of numerous companies. Coopetition, fading organizational boundaries (Baksa & Drótos, 2021), interorganizational learning (Szabó et al., 2019) and knowledge sharing (Botelho, 2018) draw the attention of scholars and management practitioners to the dynamics of knowledge networks.

Even though network research in social sciences has a long tradition that goes back to the early 20th century, it only showed a considerable growth in the past two decades when it became popular among management practitioners and academics (see *Figure 3*). The increasing complexity of the external and internal environment of organizations, the emerging need for collaboration and co-creation in various corporate positions made network theory an attractive foundation of research (Snow & Fjeldstad, 2015) as well as a mostly standard tool of diagnosis in management consulting (Borgatti & Halgin, 2011). Its unique value lies in its ability to show "how work really gets done" in organizations (Cross and Parker 2004; Cross and Thomas 2009) by exploring and visualizing workplace relationships otherwise hidden from managers and, many times, from the network actors themselves.

Figure 3 Number of search results for the keyword "network" for papers published annually (2000-2020) in social sciences



Source: own compilation based on Scimago database

The network perspective offers a well-fitted methodological toolkit and a meaningful theoretical background for researchers and consultants to discover hidden mechanisms in organizations. The exploration of communication, knowledge sharing, advice-seeking or collaboration networks may provide useful information for decision-makers, otherwise not visible in organizational charts (Cross & Parker, 2004; Cross & Thomas, 2009). However, many times it is the detection of key actors that is the most crucial outcome for managers. Influencers, informal leaders may arise from organizational social network analysis who may play essential roles during periods of change or even through times of business-as-usual operations (Cross & Parker, 2004).

Enterprise social media is a related and increasingly popular area of social media research that has attracted the attention of organizational researchers in addition to communication and media professionals. In recent years, the majority of large companies have implemented some kind of internal social media platform. The range of solutions providing similar features has grown significantly; and an increasing number of publications have been published in international journals on the information systems of organizations (Kane, Alavi, et al., 2014; Kane, 2015).

The importance of the research on the topic stems from today's socio-economic and technological trends. Things (persons, objects, systems) are more closely connected than ever before, the value of knowledge has increased, and the external and internal boundaries of organizations have become blurry. New generations entering the labor market are familiar with social media from an early age, use it naturally and often expect new communication systems to be implemented in the workplace. This need meets the aspiration of companies in knowledge-intensive industries to create physical, virtual, and social spaces that support value-creating innovation and knowledge sharing.

I.4 Paradigmatic stance

Definition and history of the field

Organizational network research is an interdisciplinary field that captures, analyzes, and interprets the multitude of interpersonal relations as networks (Cross & Parker, 2004). Networks in an organizational setting are generally considered as social structures that consist of a set of network actors, their relationships, and interactions as well as flows that occur in these relationships (Borgatti et al., 2009). Organizational network research relies heavily on the findings of sociology, social psychology, cultural anthropology, statistics, and graph theory.

Sociological network research has long traditions since Moreno's experiments in the early 1930s (Scott, 2013). A psychiatrist, Moreno was investigating how he could put an end to the socially contagious escape waves from a New York training school for girls. He found that the escapes were not caused by individual factors but rather the runaway girls' pattern of relationships. By further examining these patterns, he founded a widely acknowledged methodology for the mapping of interpersonal relationships, which he named sociometry. Ferenc Mérei, a devoted follower of Moreno, conducted similar experiments in Hungarian schools and factories (Mérei, 2006) in the mid-20th century.

In the 1940s and 1950s, social network theory developed primarily due to the promising findings of mathematical graph theory and matrix algebra. For the 1960s, network theory has become one of the major directions in anthropological research (Scott, 2013). By the second half of the 1980s, network theory has evolved into an independent, high-prestige and well-founded area of social science research, which has professional organizations (e.g., International Network for Social Network Analysis, INSNA) with a regular conference (e.g., Sunbelt, Network Science) and a specialized journal (Social Networks) (Borgatti et al., 2009; Borgatti & Foster, 2003).

Organizational research using the perspective of network theory is usually considered being embedded in the functionalist (Burrell & Morgan, 1979) or positivist (Guba & Lincoln, 1994) paradigm. By paradigm we mean an established common approach and an accepted pattern of action that is collective and most often implicit in a scholarly community (Burrell & Morgan, 1979). In other words, a paradigm is a sum of the basic assumptions of researchers on the nature of reality (ontology), the nature and acquisition of knowledge (epistemology) and the methods suitable for research (methodology) (Scherer, 1995).

Papers on organizational network theory are rarely explicit about their paradigmatic stance. This could be due to the authors' perception that, as functionalist researchers, they belong to the mainstream, and thus, no further explanation is needed to frame their results. This reasoning is problematic as (1) it leads to less conscious and less self-reflective inquiries conducted by organizational network researchers and (2) there are actual differences regarding the ontological and epistemological assumptions of network researchers and other scholars in the functionalist paradigm.

From the 1970s, an increasing number of papers claim that organizational network theory should be recognized as an independent research stream (Borgatti & Foster, 2003; Leinhardt, 1977; Snow & Fjeldstad, 2015). Hummon and Carley (1993) argue that organizational network theory should be considered as normal science in a Kuhnian sense, as it is an acknowledged field of sociological (organizational sociological) inquiry.

"That is, is there an active group of authors who view *Social Networks* as their primary professional outlet; an intellectual community that defines important problems, promotes common methods of analysis, and establishes criteria of accomplishment and advance; core substantive areas in which ideas develop incrementally. If the main paths through the citation network are few in number, densely connected, extensive in the number of articles linked together, substantively continuous and incremental we have strong evidence that the field has achieved 'normal science' status (Hummon & Carley, 1993, p. 73)."

In Burrell and Morgan's (1979) taxonomy of organizational theories, organizational network theory would belong in the functionalist quadrant. As research in this field usually emphasize stability, integration, as well as cooperation and understanding between network actors, organizational network theory is apparently affiliated with the sociology of order. That is, it does not question or challenge the current social and economic order. To understand why it has an objectivist rather than a subjectivist approach, we should consider its basic assumptions about the nature of social science.

- ***Ontology (nature of existence)***: In the nominalism-realism debate, researchers of organizational network theory strengthen the realist camp. They believe in a social reality that exists regardless of the individual's perception. That is, social reality logically precedes the constructions of each actors. It still exists if perceived, interpreted, and labeled by no one. (For instance, social network structures exist even if the actors themselves are not aware of this.)

- ***Epistemology (nature of knowledge)***: Network scientists represent the positivist perspective in the philosophical debate about epistemology. They seek to explain and predict the events of social reality. To this end, they pursue causal conditions, laws, and repeating patterns in network dynamics. Network researchers assume that they do not affect and change social reality by observing it. They believe that through a systematic collection of information, and by the verification or falsification of hypotheses, the social world is gradually but eventually intelligible.

- ***Methodology***: Organizational network researchers prefer nomotetic knowledge that explains the phenomena under examination by universal laws (mechanisms) and their context. Consequently, they believe that controlled, systematic methods should be used during the process of data collection, following strict protocols. Network scientists use self-reported survey data but prefer observational data (e.g., generated based on human activities in large-scale IT systems).

- ***Human nature***: Organizational network researchers believe that individual decisions and behavior are primarily determined by the network environment in which the actor is embedded, i.e., the social context of other actors.

Based on these assumptions, we can conclude that organizational network theory is located on the objectivist hemisphere in coordinate system of Burrell and Morgan's (1979) taxonomy. Consequently, it is argued that organizational network theory belongs in the functionalist paradigm.

Despite the aforementioned basic assumptions of the organizational network research community, organizational network analysis as a tool could be useful for research projects carried out in different paradigms. Organizational network analysis is an effective instrument in uncovering hidden patterns in organizations, and thus, it could be used to unveil underlying power structures and ways in which power is reproduced. For instance, in a yet unpublished conference paper presented at the EGOS Colloquium in 2019, Dr. Mária Dunavölgyi and I examined gender differences in the informal social networks of multiple organizational samples. We found that networks of men and women were largely separated. In several social dimensions related to leadership aptitude, men tended to choose only other men, while women selected both men and women. This asymmetry in choice lead to a power structure in which not only were women underrepresented in formal leadership positions but were also generally excluded from informal leadership ("influencer") roles.

Organizational network analysis could arguably be used – though rarely is – for subjectivist research endeavors. As organizational network theory offers a powerful tool to understand how information, values, knowledge, and beliefs flow and spread around in organizations, it could be used as a basis of studying meaning making or even the generation of social constraints limiting human potentials.

Unique characteristics of organizational network theory

According to Baksa and Drótos (2021), network theory as a perspective in social research is a very attractive approach to capture and describe complex social phenomena for organizational researchers. They argue as follows (Baksa & Drótos, 2021).

1) Can capture complexity: Networks are exceptional at simplifying complex systems (Cross & Parker, 2004). With the uniformization of actors and relationships, we discard a lot of information, but we can map patterns that would otherwise go unnoticed (Borgatti et al., 2009). Examining a communication network at the workplace, for example, we may consider all actors and all relationships uniformly without dealing with unique characteristics. This is a significant simplification which, on the other hand, reveals a network structure, and helps explore the hubs and bridges in the organizational communication network.

2) Capable of handling large amounts of data: Nowadays, organizations possess more and more data on their own functioning and the interactions between their employees (e.g., emails and instant messages sent, video calls). To explore interpersonal or interorganizational cooperation, the need for self-reported survey data is decreasing: "digital footprints" left by actors in information systems provide a huge amount of data for analysis. Network models are excellent to handle high volumes of data from which we can effectively select useful and meaningful sets (Barabasi, 2016).

3) Can be used at any level of analysis: Relationships between actors can be examined as parts of a network at any level of organizational research. The network perspective could be equally revealing for either interorganizational, intergroup, or interpersonal relationships (Baksa & Drótos, 2018; Zappa & Lomi, 2015).

4) Suitable for exploring the context: Contingency theorists regard organizations and business phenomena not in themselves but embedded in their social, economic, and technological context. Organizational network theory, on the other hand, highlights more than direct relationships and effects: it claims that individual action is not only influenced by direct relationships but indirect ones (two or three steps away) as well as the structure of the network they are embedded in (Christakis & Fowler, 2010).

5) Capable of analyzing the spread of flows: Analyzing the patterns of network ties, researchers can also investigate the paths in which information or resources spread between actors. Where in the network are these moving faster and slower and on which actors does their dissemination depend the most? In an organizational context, the analysis of flows can help understand network learning (Csontos & Szabó, 2019), knowledge and innovation networks (Baksa & Báder, 2020) and the patterns of the distribution of critical resources.

6) Can be used to describe unconventional settings: Nowadays, a growing number of practical examples indicate the fading of organizational boundaries. Sharing economy and crowdfunding appear as alternatives to traditional employee and ownership roles. Collaborations needed for the generation of innovations frequently cross organizational boundaries, e.g., in the form of communities of practice. An advantage of the network perspective is that it can handle those new phenomena that conventional models struggle to describe.

7) Well visualized: Graphic displaying of networks provides quick overview even for those people who are less knowledgeable in the field. That is, networks visually support the presentation of relevant patterns. This excellent data compression and displaying ability makes networks particularly suitable for supporting managerial decisions.

Although network-related phenomena can be investigated from other paradigms' perspective and with the respective methodological toolbox, in this section, I outlined the particularities of the conventional approach of organizational network researchers. Although in one empirical setting in the dissertation, I used netnography, a qualitative method, the functionalist-positivist approach is still prevalent in organizational network research.

I.5 Research setting: knowledge-intensive organizations

In the empirical papers incorporated in my doctoral dissertation, I concluded research in knowledge-intensive organizations. The knowledge enterprise or the knowledge-intensive firm is a company that offers knowledge or knowledge-based products to the market and where, as opposed to the labor-intensive firm, the creation and exploitation of knowledge is essential to competitiveness (Alvesson, 2004). While to some extent, knowledge is important for the functioning of all organizations, interpersonal knowledge sharing is more crucial for those who actively seek to acquire, safeguard, and combine knowledge related for their primary activity (Swart & Kinnie, 2003).

According to Løwendahl et al. (2001), typical knowledge enterprises include client-based companies (e.g., law offices and accounting bureaus), problem-solving companies (e.g., advertising and software development agencies), as well as output-based knowledge companies (e.g., management consultancies). Alternatively, Alvesson (2004) distinguished (a) professional service companies and (b) research and development companies.

From the perspective of the resource-based theory of the firm (resource-based view, RBV), knowledge-intensive organizations are unique in a way that a large portion of their resources is human capital (Meso & Smith, 2000) which is an asset or quality that is not listed on the company's balance sheet and includes employees' knowledge, experience, and skills. Employees of a knowledge enterprise are generally highly trained college graduates and possess valuable intellectual skills. Nonetheless, much of this knowledge is difficult to externalize, and thus, hard to be controlled by the company.

Consequently, knowledge-intensive organizations are interested in fostering knowledge sharing between employees and apply a complex system of knowledge management tools to make necessary knowledge available at the right place, in the right time. These knowledge management tools include different pieces of information technology (such as company intranet or enterprise social media) and events, processes, and cultures purposefully organized to promote the sharing, recombination, and generation of knowledge.

In conclusion, the research questions investigated in the empirical chapters of this doctoral dissertation are examined in knowledge-intensive organizations as (1) knowledge and knowledge sharing possess a higher strategic importance in these companies; (2) almost all employees have some knowledge that in itself or by combined with other knowledge elements can create value for the company; and thus (3) phenomena related to interpersonal knowledge sharing is more prevalent and easier to observe.

I.6 Research gaps and research questions

As knowledge-intensive sectors become more and more important in the global economy (Sass & Szalavetz, 2014; Szalavetz, 2022) and as we have progressively more data on how people connect to each other both in the physical and the virtual space (Jacobs & Watts, 2021; Licoppe & Smoreda, 2005), the study of knowledge sharing and knowledge networks grows increasingly popular. In this expanding stream of literature, it is not easy to define a single research gap for a paper-based doctoral dissertation as individual papers intend to tackle different research problems. Moreover, articles included in a paper-based dissertation are written and published in different years, while the focal points of this rapidly evolving research stream change several times through the completion of the doctoral program. In some cases what might have been an important research gap in the past, may well be satisfactorily dealt with by now.

In this section, I will present the research gaps and ensuing research questions of individual papers in the dissertation. In the following sections, I summarize the main concepts and introduce research methods used in each paper. Finally, in section I.9, the structure of the dissertation is elaborated, and a common contribution of the research program is proposed. Research findings will be summarized again in each paper and ultimately in Chapter VI.

Enterprise social media

In the second half of the 2010s, after the overwhelming success of social media sites Facebook and Twitter, attempts aiming at implementing similar solutions in the workplace rapidly gained traction (Kane et al., 2014). Enterprise social media and related technologies quickly climbed the "peak of inflated expectations" in Gartner's hype cycle just to plunge in the "trough of disillusionment" a few years later (Bughin, 2015). For the last five years, enterprise social media tools have been applied in most knowledge-intensive organizations, although they are rarely used, and the achieved corporate benefits fall short of previous expectations. The reason behind this is usually found in the lack of critical mass: if only a few employees actively use enterprise social media, the advantages of adoption are slim, while non-users may avoid the *fear of missing out*.

The features and internal mechanisms of enterprise social media tools are well documented and published by prominent authors of technology management (Kane et al., 2014a; Kane, 2015; Leonardi, 2015; Ellison & Boyd 2013) in leading journals of organizational IT, such as MIS Quarterly. Management and IT consultants also argued extensively for the implementation and use of enterprise social media, presenting significant profit gains for knowledge-intensive companies (Bughin 2015, simplysucceed, 2015). These profit gains result from a more efficient system of interpersonal knowledge sharing as employees can more quickly find necessary information which also expedites task-based collaboration and knowledge creation.

Even though previous research (Kane et al., 2014; Fulk & Yuan, 2013) established the effects of certain enterprise social media features on knowledge sharing and knowledge production, its interplay with real-life organizational social networks was still unclear. Moreover, while large-sample consultancy studies (Bughin, 2015) demonstrated an increase in profit margins due to the use of enterprise social media in knowledge-intensive organizations, its specific operation (such as common themes discussed, usage patterns, or co-workers' reactions to others' posts and comments) had yet to be documented. Our paper that appears as Chapter II of this dissertation sought to address these research gaps. First, we used netnography and follow-up interviews as methodological tools to discover actual user practices and associated attitudes and thus provide a richer description. Second, we uncovered new

mechanisms through which enterprise social media impacts real-life social network relations. We proposed and investigated the research questions as listed below.

RQ1 How does the use of enterprise social media affect the real-life organizational social network in a Hungarian knowledge-intensive company?

a) In what ways does it substitute for real-life interactions?
b) In what ways does it complement or generate real-life relationships?

RQ2 What are the specific advantages and disadvantages of enterprise social media use based on the case sample case study?

RQ3 How does enterprise social media influence knowledge sharing, advice-seeking and social learning in organizational settings?

While RQ1 and RQ2 are questions that are explicitly mentioned in the paper and that we purposefully integrated in our research design, RQ3 is formulated from an implicit research goal, i.e., to understand how enterprise social media specifically contributes to the efficient knowledge management and knowledge sharing practices of a knowledge-intensive organization. Research results concerning RQ3 seemed so significant for me that these brought my attention to the relational antecedents of advice-seeking and knowledge sharing and research questions proposed in subsequent papers that appear as Chapter IV and Chapter V of this dissertation.

Negative relationships and signed graph research

Conflict, strife, and discord are all very human. Wherever people interact, co-workers bond and friendships blossom, negative relationships appear, too. Workplaces are no exception, even if corporate culture makes open hostility taboo (Baksa, 2019). Negative relationships affect almost every feature of organizational life, from internal communication and knowledge sharing to employee retention, from decision-making to change management. Negative relationships often stay in the blind spot of managers and network researchers who analyze but positive dyadic phenomena (Halgin et al., 2020; Labianca, 2014). In the past few years, the inquiry on negative ties in organizational social networks developed into an individual stream that is lately called as “signed graph research” (Harrigan et al., 2020). Signed graphs refer to

networks in which relationships have a valance that could pe positive, neutral, or negative.

The examination of negative relationships may be crucial due to a phenomenon called "negative asymmetry" (Marineau & Labianca, 2021) that refers to the observation that even though there are usually fewer negative ties in a social network (5-10 percent) than positive ones, their influence is overproportionate. Negative ties can have numerous detrimental effects on an organization. For one, they can lead to increased conflict and decreased collaboration among individuals and teams (Lazega et al., 2016). This can in turn decrease productivity, increase turnover, and lower morale (Tai et al., 2012; Venkataramani et al., 2013). Negative ties can also lead to information being withheld or distorted (Halgin et al., 2020), which can make it more difficult for the organization to make informed decisions. Additionally, negative ties can impede the flow of new ideas and innovations, as individuals are less likely to share information or collaborate with those they view as rivals or adversaries (Lazega et al., 2016).

My paper that appears as Chapter III of this dissertation addresses a research objective that stemmed from a theoretical and a practical knowledge gap, namely, to give an up-to-date overview of an unfolding new research stream that also has direct implications for management practitioners. Though the theoretical foundations of negative tie research had already been established (Labianca & Brass, 2006; Labianca, 2014), as of fall 2018, the submission date of my paper, there were no published literature reviews that would summarize empirical research findings in the field. My paper sought to give an overview on extant research results, arrange them in a theoretical framework of different levels of organizational social networks, and propose directions for future research. The timeliness of this endeavor is corroborated by the fact that similar works (cf. Yang et al., 2019; Harrigan et al., 2020) were only published years later. I proposed and investigated the following research question:

> ***RQ4*** What are the individual, dyadic, group-level, and whole-network-level consequences of negative relationships based on extant empirical research?

The literature review identified various research papers that had consequential conclusions on the impact of negative relationships on knowledge sharing (Parker et al., 2016; Marineau et al., 2016) and collective learning (Lazega et al., 2016) in knowledge-intensive organizations. These findings proved to be insightful when formulating the research questions of subsequent papers (Chapter IV and Chapter V).

Knowledge networks in organizations

In the past decades, the revolutionary advancement of technology brought the attention of scholars and management practitioners to the challenge of improving the innovative capabilities of organizations (Csedő et al., 2019a). Companies in knowledge-intensive industries increasingly focus on their ability of self-renewal and adaptation (Csedő & Zavarkó, 2019). Other knowledge-based organizations, such as higher education institutions, try to ameliorate their knowledge-producing capabilities. Concurrently, learning-related organizational processes that support the amassment, management, sharing, and deployment of knowledge have grown in importance (Bencsik et al., 2020; Bencsik & Juhász, 2020).

Codification is an efficient way, although not always viable, to externalize knowledge and make it accessible to various employees (Grimand, 2006). Tacit or hidden knowledge, on the other hand, spreads through employee interactions, while it also plays an essential role in the knowledge production of most organizations (Argote & Miron-Spektor, 2011; Qureshi et al., 2018). Thus, the analysis of organizational social networks has become an increasingly important tool for understanding knowledge sharing and advice seeking in knowledge-intensive organizations.

Knowledge networks in organizations include formal and informal relationships that aim to share, combine, or recreate knowledge (Škerlavaj et al., 2010). Informal relationships that are not always visible for managers are often critical for dissemination of knowledge, as they can facilitate the transfer of information and ideas between individuals who may not be directly connected through formal channels. Furthermore, network analysis can help to identify key individuals and groups (Borgatti & Cross, 2003) who are essential for knowledge sharing and advice-seeking within an organization.

The analysis of knowledge networks can also provide insight into the patterns of communication and collaboration within an organization. By analyzing the flow of information and ideas within a knowledge network, it is possible to identify bottlenecks and barriers to knowledge sharing, as well as opportunities for improvement (Cross & Parker, 2004). This can be particularly valuable in knowledge-intensive organizations, where the ability to share and access information is critical for success (Alvesson, 2004).

The network perspective in the investigation of organizational knowledge sharing is beneficial because it offers a framework that combines the acquisition and creation of knowledge, along with the individual's role as both a source and recipient of knowledge. A knowledge network is generally understood as "a set of nodes—individuals or higher-level collectives that serve as heterogeneously distributed repositories of knowledge and agents that search for, transmit, and create knowledge—interconnected by social relationships that enable and constrain nodes' efforts to acquire, transfer, and create knowledge" (Phelps et al., 2012 p. 1117).

Previous research in the field of knowledge networks has primarily focused on the impact of organizational factors on network dynamics (Mendoza-Silva, 2021) or applied established social network theories (such as social status theory and social capital theory) (Agneessens & Wittek, 2012), but the underlying relationships that drive advice-seeking and knowledge sharing behavior have not been extensively studied. Hortoványi and Szabó (2006) as well as Mattar et al. (2022) have found that for effective knowledge transfer to happen, there must be a combination of structural, cognitive, and social factors. These factors include the opportunity, ability, and willingness to share knowledge. However, compared to structural and cognitive factors, the interpersonal relationships that are required for knowledge transfer are less visible to managers and are often misunderstood (Marineau et al., 2018; Marineau & Labianca, 2021), and as a result, are less frequently considered when planning actions.

Thus, in the papers that appear as Chapter IV and Chapter V of this dissertation, I investigated the relational antecedents of advice-seeking behavior and the interplay of individual layers of interpersonal relationships. First, in Chapter IV, we combined qualitative and quantitative methodological approaches to create a pilot study at a

Budapest-based management consulting company. We used survey data to identify and examine key players of knowledge transfer in the organization and analyzed their role in different layers of the social network. We also determined the impact of three relational layers (sympathy, trust, perceived expertise) on advice-seeking aptitude. Finally, we conducted interviews to uncover organizational (technological, strategic, and cultural) factors that shape organizational knowledge transfer besides the relational antecedents. Second, in Chapter V, we built on the results of the pilot study, and investigated a similar research problem on three large organizational samples. This time, we more purposefully examined the interplay between different layers of the multiplex organizational social network to identify those relational foundations that are best at predicting advice-seeking from a given network actor.

In these two papers, we proposed and investigated the following research questions:

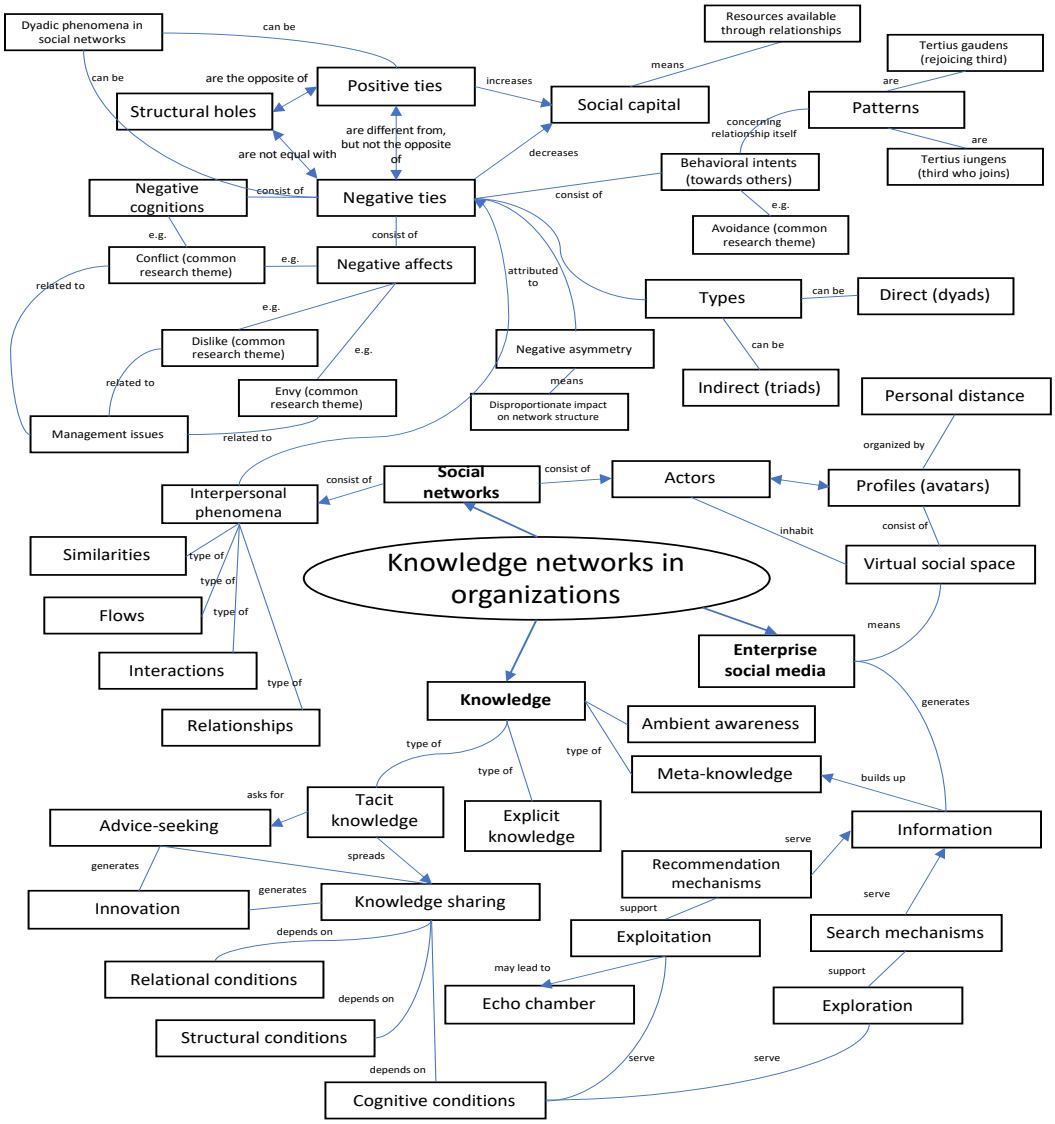
> ***RQ5*** What is the perceived impact of technological, strategic, and cultural factors influencing knowledge sharing in their organization according to the employees of a Budapest-based management consultancy?
>
> ***RQ6*** Are network actors who are key players in an organizational knowledge network also popular in other social dimensions (such as sympathy and trust)?
>
> ***RQ7*** What is the impact of different relational layers on the formation of advice-seeking ties in an organizational knowledge network?

As RQ5 yielded interesting but less transferable results in Chapter IV, it was omitted in the large-scale study presented in Chapter V which was in turn rather built on quantitative data. Investigating RQ6 in Chapter IV, we found several cases in which actors' positions differed between various dimensions of the multi-layered social network. This reinforced my conviction that a multiplex network approach would be beneficial to take in the large-scale study and corroborated the importance of RQ7 in both papers.

I.7 Main concepts

In this section of the dissertation, I present the most significant concepts that appear in either of the published research papers compiled in this study (see *Figure 4*). Most of these concepts are key components in the arguments of the papers. Consequently, many of them appear at multiple places in the text and are presented from various different perspectives.

Figure 4 Main concepts in my dissertation



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I.8 Research methods

Although relevant research methods are also presented in each paper that is included as a chapter of my dissertation, in this section, I give an overview of the specific methods I used during my doctoral research. From the methods listed below, literature review was used in the case of all four papers, while netnography was specifically selected for the investigation on enterprise social media, and social network analysis was used to explore knowledge networks in organizations.

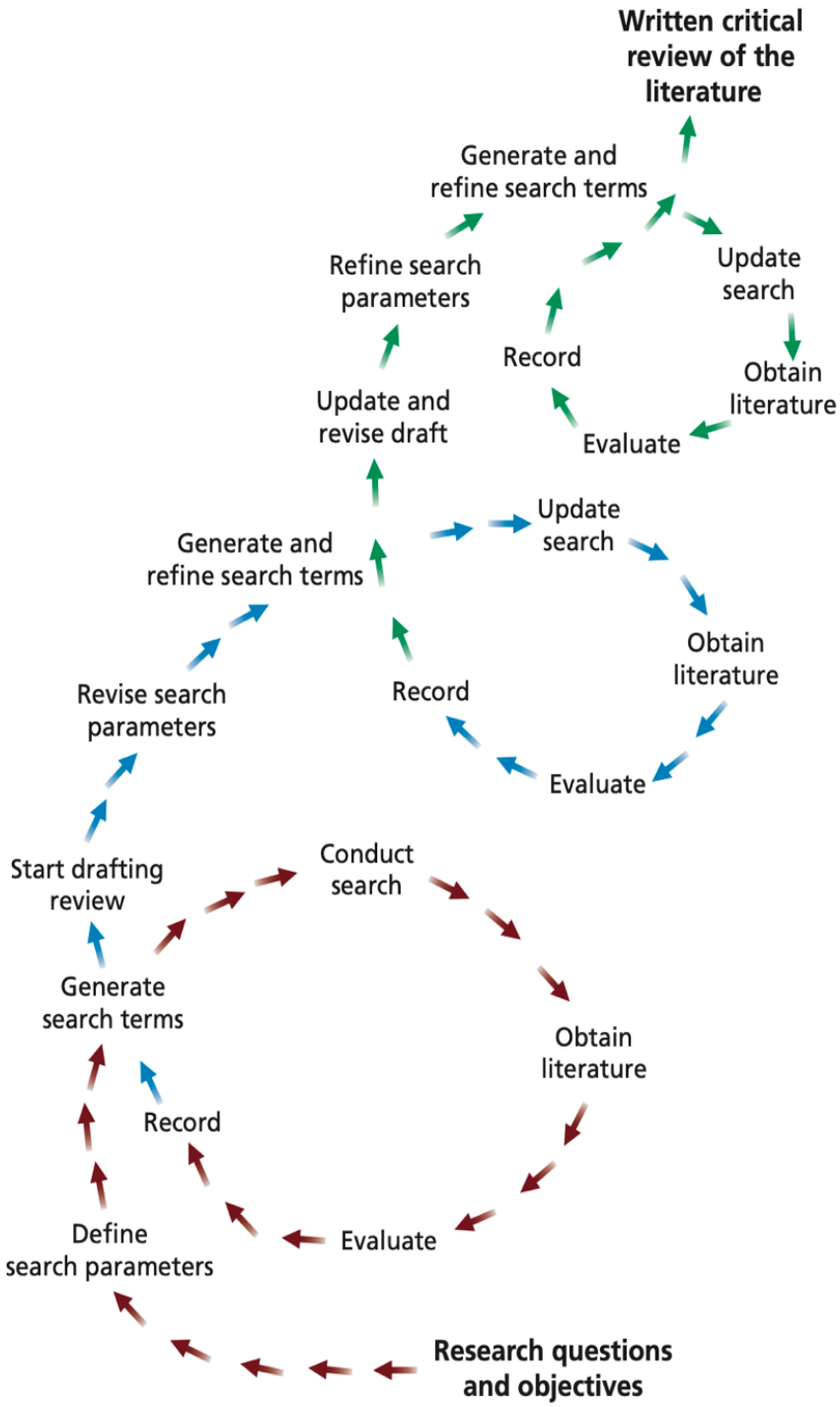
Literature review

A review of the scientific literature is used to identify, evaluate, and interpret relevant available findings related to a particular research question, area, or phenomenon (Bapuji & Crossan, 2004). As the significance of a doctoral research and its findings will eventually be judged based on previous research findings and the contribution to the extant scientific discourse, a literature review should be able to show the researcher's understanding of their field and its key theories, concepts, and ideas (Saunders et al., 2019). A literature review should also represent major issues and debates about the subject of the inquiry. This overview will enhance the researcher's subject knowledge and help clarify their research questions.

As my doctoral research process consisted of various projects stretching over five years. Instead of a systematic literature review, I collected, evaluated, and organized relevant literature through multiple iterations. Organizational network theory is a popular research stream, thus numerous new research pieces had been published during these years.

Despite the fact that reviewing the literature is usually an early activity in a research project, it is usually necessary to continue refining the review throughout the project's span. According to Saunders et al. (2019), this process is similar to an upward spiral, culminating in the finished product, a written review of the literature (see *Figure 5*). Once the researcher has a profound understanding available, they can start the process by planning their literature search and conducting their search. Potentially relevant publications are read and evaluated, those relevant being noted and referenced.

Figure 5 The working process of creating a literature review



Source: Saunders et al., 2019, p. 75

Netnography

Netnography is a qualitative research method that adapts ethnographic research techniques to examine the culture of online communities (see *Figure 6*). It considers technology as a tool of use, a tool of shaping society, and a social forum thus forging these three dimensions into an inseparable whole (Dörnyei & Mitev, 2010). As organizational phenomena related to enterprise social media appear in a virtual social space, I used netnography to assess them.

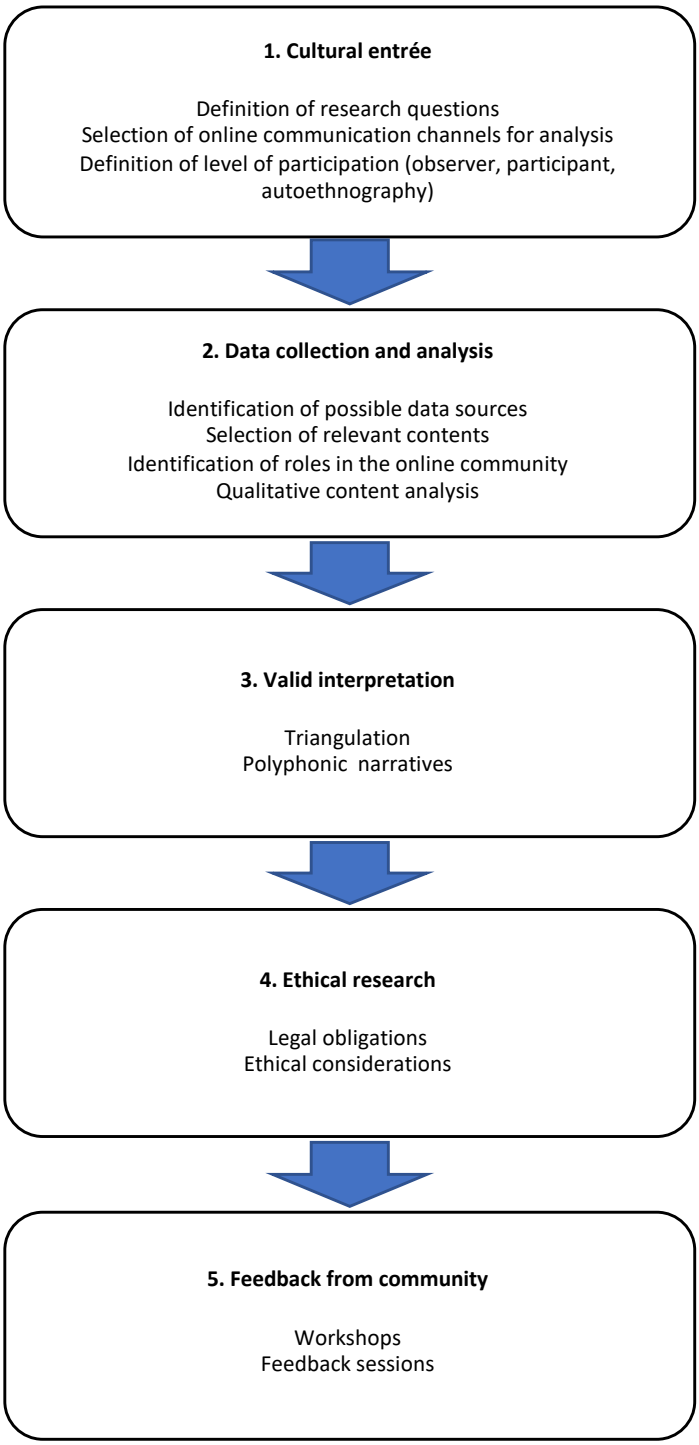
In preparation for a netnography, researchers should first formulate research questions, and then identify online communication channels and platforms that help answer these questions. The relationship between the researcher, the reader, and the subject under study is changing in ethnography. Likewise, the role of the researcher in netnography can be different, and *observer*, *participant* and *autoethnography* levels can be distinguished based on the degree of the researcher's involvement. My role was that of an observer as I was not associated with the organization in analysis.

After selecting the appropriate data source and method, and deciding on the type of participants and observers, begins data collection and analysis. According to Horváth and Mitev (2015), the most effective way is to use a search engine (e.g., search interface of an enterprise social media site) and the right keywords. In netnographic data collection, we can distinguish three types of data sources (Dörnyei & Mitev, 2010): (1) online communication of communities (e.g., the content published in Yammer groups); (2) the researcher's observations of community interactions, members, and their meaning (e.g., based on benchmarks reported by the processed literature); and (3) interviews with members of the online community. In my empirical research, I used data from all three sources.

The information, experiences, comments, and interview quotes found in ethnographies and case studies serve to represent the studied people or phenomena (Dörnyei & Mitev, 2010). Representations, whether in the form of metaphors, narratives, numbers, or graphic statements, should be structured by researchers to present research experiences and results appropriately and explicitly. Netnography is generally based on the observation of online discourses and descriptions, but it is not possible to directly observe the behavior of subjects unlike in ethnography. Therefore,

researchers intend to use multiple sources to provide a polyphonic description of social reality, thus increasing the validity of their study.

Figure 6 The steps of netnography research



Source: Dörnyei & Mitev, 2010, p. 57

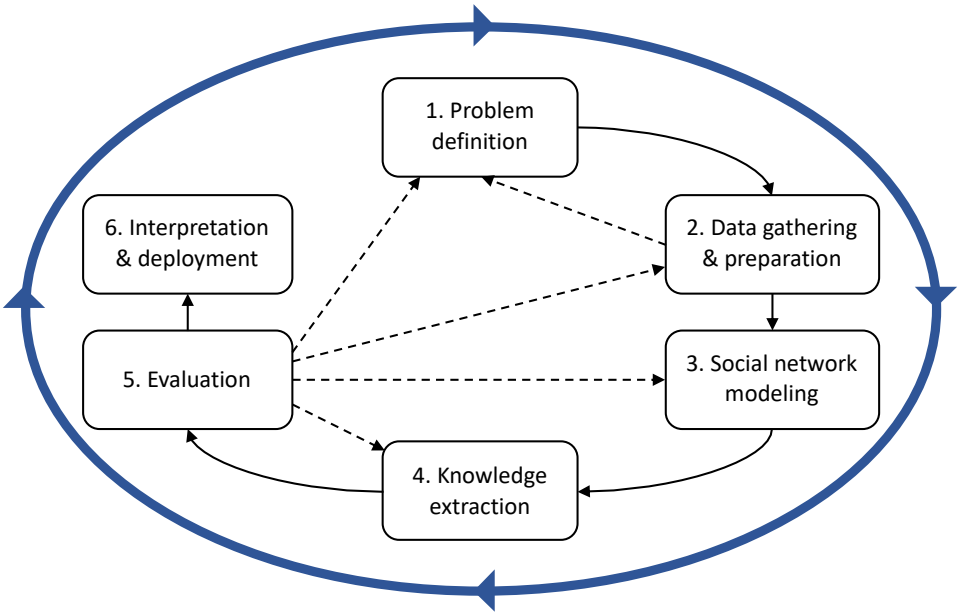
Social network analysis

Organizational network researchers usually collect data using self-administered questionnaires, although advanced technological solutions also open more opportunities to use observational data generated in various informational systems (Borgatti et al., 2009; Borgatti & Halgin, 2011). Since the emotional and relational foundations of advice-seeking and knowledge sharing relationships can rarely be deduced from generated data (i.e., "digital fingerprints"), I used self-reported survey data for my research on knowledge networks. I cooperated with two major Hungarian management consultancies that specialize in organizational network analysis.

Most items in social network analysis questionnaires are relational questions, i.e., the respondents must provide the name of one or more other actors as a response (Cross & Parker, 2004). Due to this feature of the questionnaire, it cannot be anonymous, as we need to know the identities of all network actors to make note of the connection (Robins, 2015). For network questionnaires, a high response rate, around 90-95 percent, is expected as the missing respondents can turn out to be high-interest actors in terms of the overall network structure (Borgatti et al., 2009). In this respect, not all respondents are equally essential, however, their relative significance is not known in advance. Consequently, instead of sampling it, social network analysis generally examines the entirety of a theoretically demarcated population (Robins, 2015). Network research aims to reveal and explain hidden patterns of human behavior that are supposed to be universal.

Research validity can be achieved by following the strict methodological rules of social network analysis. It is important to document the steps of the research, making it repeatable and transparent. In organizational networking research, it is particularly important to pay attention to compliance with ethical rules and requirements, as we work with particularly sensitive personal data. The steps in the process of social network analysis are summarized in *Figure 7*.

Figure 7 The steps of social network analysis



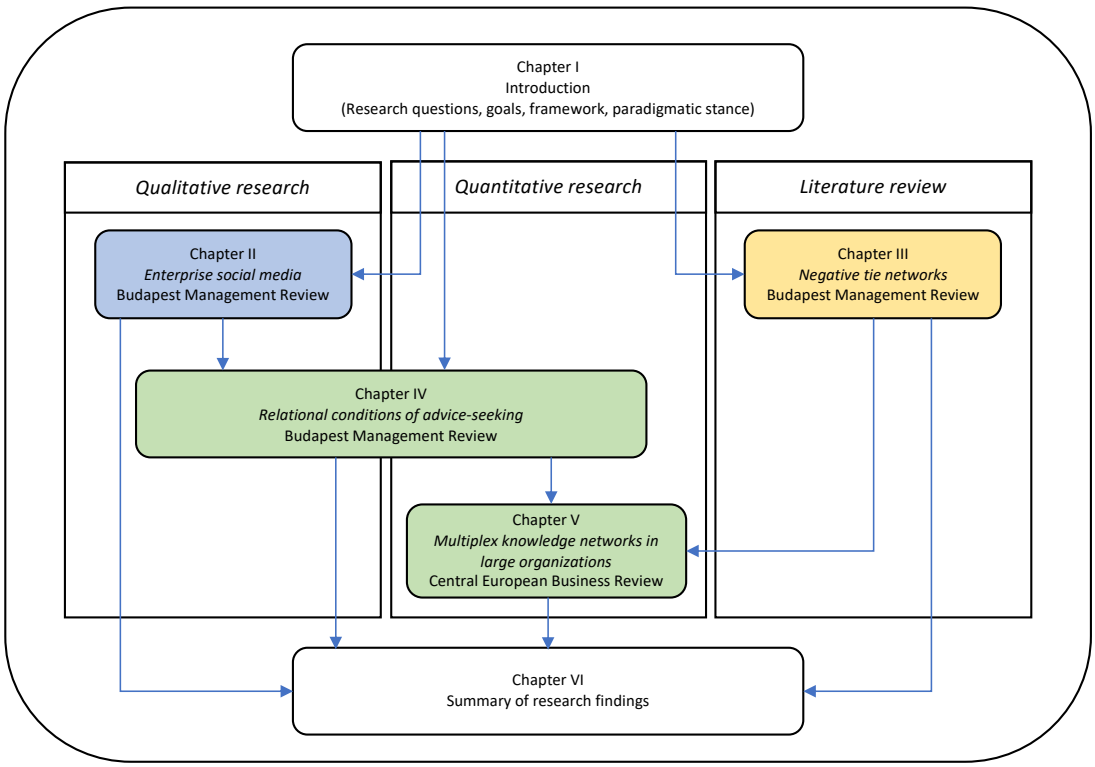
Source: Kazienko, 2018

I.9 Structure of the dissertation

In the introduction of my dissertation, I defined my field of research and presented the research questions and research goals. The paradigmatic stance and methods used in my doctoral research were also discussed. The subsequent chapters of my dissertation demonstrate my findings in four interconnected sub-topics of organizational network theory and are thus based on already published research papers. Chapter II discusses the potential impacts of the use of enterprise social media on real-life social networks, and particularly, knowledge sharing in organizations. Chapter III demonstrates the significance of negative relationships in social networks and describes their different dynamics on individual, dyadic, triadic, and whole-network levels. Chapter IV presents the mapping of an organizational knowledge network as well as the relational foundations of advice-seeking between employees. Chapter V capitalizes on these preliminary findings, repeats the pilot study on three large organizational samples and corroborates previous research results. Finally,

Chapter VI contains a brief outline of new scientific results. The structure of my doctoral dissertation is summarized in *Figure 8*.

Figure 8 Structure of my doctoral dissertation



Source: author

While *Figure 8* illustrates the methodological and thematic connections between chapters, it is worth considering how the research questions and findings of individual papers contribute to the thought process of the whole dissertation. Accordingly, *Figure 9* demonstrates the interconnections between research questions investigated in each paper and highlights how questions in previous papers informed and guided subsequent ones. Similarly, *Figure 10* shows the relationships between findings of the individual papers and how they contribute to the line of thought of the dissertation.

Figure 9 Interconnections between research questions

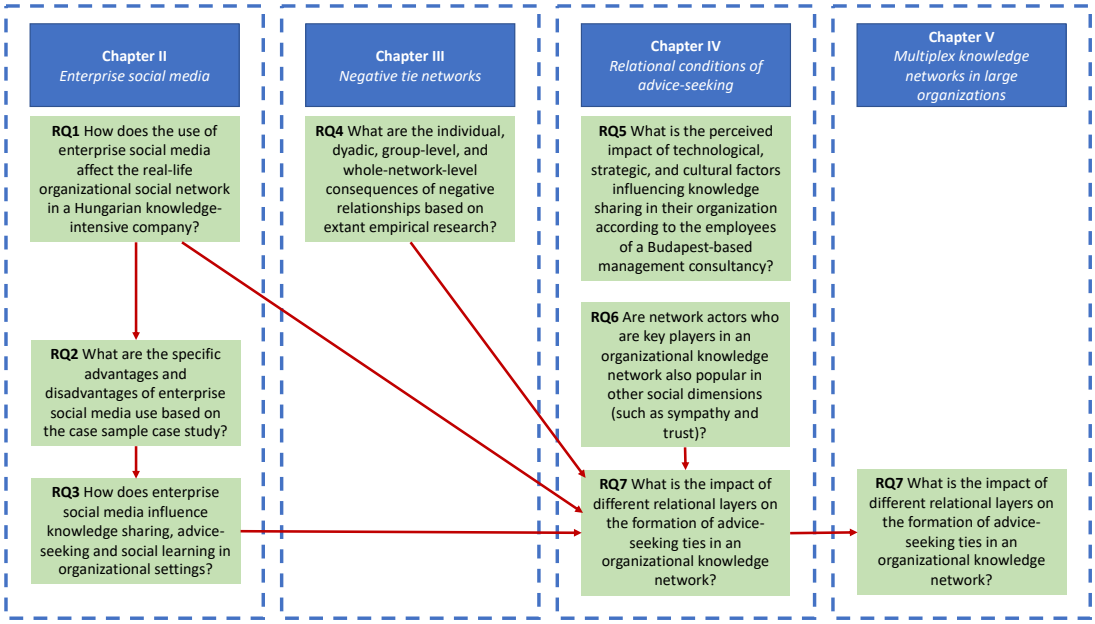


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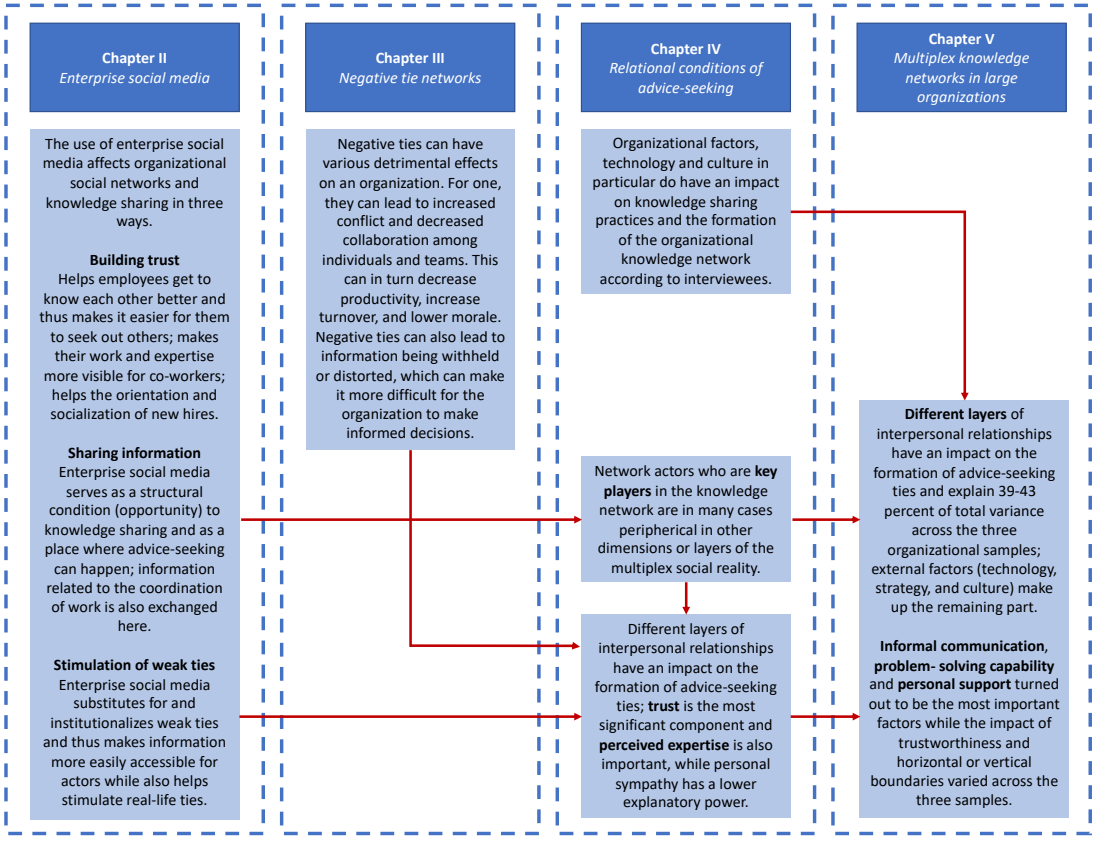
Figure 10 Interconnections between contributions and findings



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II. Enterprise social media networks

Abstract

The dynamics of interpersonal and interorganizational networks is one of the most popular topics in international management literature these days. Enterprise social media – a technology that promotes networking – quickly became popular in the corporate environment, even though its concepts vary, and little is known about its organizational effects. The authors present current definitions of enterprise social media and summarize the latest literature in the field. This paper interprets enterprise social media as the engine of interpersonal networks and compares its dynamics to that of offline networks. The authors introduce the most important organizational aspects of enterprise social media based on the findings of their qualitative research in a company operating in a knowledge-intensive industry in Hungary.

II.1 Introduction

The use of internal corporate social media platforms and the related organizational phenomena have come to managers' attention only in recent years, yet due to the managerial hopes placed in them, this field has been in the spotlight. Enterprise social media, often referred to as the "tie-on Facebook", is in the broadest sense an online network that connects individuals along business interests or activities. In this regard, it differs from other more widely used collaboration and groupware tools. Enterprise social networks involve software products such as Yammer or Workplace. Due to their rising popularity, it is worth examining the question of what is the relationship of enterprise social media to the informal networks ever present in organizations? Does it merely display and model, or even build and form these social networks?

The social network of the informal organization not only have a significant impact on day-to-day operations but can also play a key role in solving crucial managerial issues (cf. Kiss, 2005; Török, 2005). In these cases, some network actors often get a formal role and leadership authority: for example, so-called influencers who have easier access to employees in times of organizational change. Enterprise social media is both a *communication platform* and a *virtual location for networking* within the organization, which at the same time makes the patterns and dynamics of the informal organization more visible and understandable for managers and employees.

According to recent years' surveys, more than two-thirds of large companies have introduced internal social media sites (Bughin, 2015); the range of IT solutions providing similar functions has grown significantly; and numerous papers have been published on this topic in international journals of management information systems (Kane, Alavi, et al., 2014; cf. Kane, 2015; Leonardi, 2015). Yet so far, little attention has been paid to the organizational effects of enterprise social media in the general management literature. In our view, this is partly due to the fact that the topic has been misinterpreted as a purely technological issue, and partly because the dynamics of the informal organization has been out of focus for the conventional managerial approach.

However, with the growing significance of knowledge sharing and collaboration, more and more managers and organizations view *informal* initiatives as a reserve for further performance enhancement. Still, international surveys examining the penetration of the technology (cf. Bughin, 2015; simplysucceed, 2015) mostly conclude that the use of enterprise social media is still at a low maturity level in most organizations that miss exploiting much of the potential benefits.

The aim of our paper is twofold: on the one hand, we wish to place this topic in the Hungarian scientific discussion by presenting the relevant international literature, and on the other hand, we intend to get closer to understanding the organizational effects of enterprise social media through the case study of a Budapest-based company. In the course of our qualitative research, we used the methodological tools of *netnography* (Dörnyei & Mitev, 2010). By exploring the examined virtual corporate environment, we primarily sought answers to the question of how enterprise social media can be interpreted from a network approach and what novelties, changes and differences does it bring to organizational social networks.

In our paper, we first outline the concept of enterprise social media by comparing the definitions of several authors. Then we use the metaphor the “engine of interpersonal networks” to present one of the most essential organizational implications of this phenomenon. We then present the results of our own empirical research and propose research directions that require further investigation.

II.2 A conceptual definition of enterprise social media

Corporate IT solutions, with features similar to public social media sites that serve private contact and recreational purposes, are listed under various titles in the international scientific literature. The main reason for the uncertainty about naming is the novelty of the field: the definitions and keywords proposed by different authors are often not yet mature, thus newer and newer concepts are introduced to describe the phenomenon. Nonetheless, there are significant differences between the different concepts. *Table 1* describes the most common concepts and their definitions.

Table 1 Definitions of enterprise social media

Enterprise 2.0	Social Network Site	Enterprise Social Media
1. Use of this technology is optional	1. Allows users to create public or semi-public profiles in a closed system	1. Users have a profile that is constructed by themselves, other users, and the platform itself
2. Has a mechanism that can make the structure and pattern of user interactions visible	2. Allows users to modify their own relationships as well as view other users' relations	2. Users can view and modify their own contacts or those of other users on the platform
3. Creates equal user roles or roles that are different from the formal organizational hierarchy	3. Able to list users that are the focal user's contacts	3. Users can list the users they have a relationship with
4. Allows the flow and processing of various types of information	*(See Boyd & Ellison, 2007; Ellison & Boyd, 2013)*	4. Users can access or hide digital contents using the platform's search mechanisms
(See McAfee, 2006)		*(See Kane et al., 2014)*

Source: own compilation based on Boyd & Ellison, 2007; Ellison & Boyd, 2013; Kane, Alavi, et al., 2014; McAfee, 2006

The indisputable advantage of the concept *Enterprise 2.0* is that it reflects the increasingly blurred nature of internal and external organizational boundaries, however, it captures the phenomenon at a very high level of abstraction – thus covering various technological solutions and a wide range of functions. Compared to Enterprise 2.0, the concepts of *Social Software in the Workplace* or *Social Network Site* are already more specific but suggest a much more technological approach. In fact, both terms reflect an instrumental approach, and their definition is fundamentally based on the functions provided by each related software.

The use of the terms enterprise social media (ESM) or enterprise social networking (ESN) seems more appropriate for several reasons than the concepts already

described. The two concepts are very close to each other, and in some respects, synonymous. A difference is that while the former emphasizes the communication platform, the latter the networking capability of the organization members through it. In our study, we use the terms ESM and ESN in the same sense, and generally refer to the phenomenon as enterprise social media.

According to the Merriam-Webster Dictionary, the word medium means an intermediate position, as well as an intermediary (channel), and a condition or environment in which something may function or flourish. According to Kane et al. (2014), all three meanings of the word are very characteristic for enterprise social media:

- First, although most organizational events take place offline, and most displayed content is generated on other platforms, due to the intermediate position of ESM, it is able to display these contents to users.
- Second, the ESM platform transmits digital information between users, i.e., acts as a communication channel.
- Third, an ESM platform works as a virtual environment defined by specific technical rules and mechanisms as well as sociocultural norms that help the spread of some patterns of behavior while hindering others.

II.3 Interpersonal networks in virtual space

A central concept of the enterprise social media phenomenon is the *network* – that is, the virtual manifestation of the organizational social network. Why is it essential to analyze this aspect of enterprise social media use? Why is it worthwhile to revisit social networks already explored by organizational sociology? One of the frequently voiced goals of implementing different enterprise social media platforms is to support the networking of employees. The purposeful use of informal social networks can help meet challenges in change management, knowledge management, or engagement management (Cross & Parker, 2004). In addition, previous studies on the comparison of online and offline social networks (Kane, Alavi, et al., 2014) has concluded that some networks dynamics and mechanisms work differently in the virtual space.

In this part of our paper, we therefore present the interpretation of interpersonal networks, the types of dyadic phenomena, and the differences between online and offline networks. We then suggest various approaches to the analysis of enterprise social media platforms based on relevant academic literature.

From the perspective of network theory, organizations are networks of interpersonal relationships that connect different actors, thus creating a specific structure (Thompson, 2003). That is, the basic units of analysis are not the individual actors (nodes), but the relationships established between them (Borgatti & Halgin, 2011). From this, two statements follow: (1) organizations are in all cases multiplex (i.e., multi-layered, multi-relationship networks); and (2) the vertices that are the endpoints of relationships (ties) can be not only individuals but also groups, organizational units, or other objects (cf. “organizations are systems of people and objects” (Dobák & Antal, 2013, p. 29). A possible classification of dyadic phenomena is suggested by Borgatti et al. (2014) as presented in *Table 2*.

Table 2 Types of dyadic phenomena in networks

Dyadic phenomena (tie types) in networks			
State		**Event**	
Similarities	***Social relations***	***Interactions***	***Flows***
Shared location	Kinship	E.g., sends email to, talks to, eats lunch with etc.	E.g., information, money, emotions etc.
Shared group membership	Role-based		
Shared identity	Affective		
Shared attributes	Perceptual		

Source: Borgatti et al., 2014

Borgatti et al. (2014) distinguish between relationships that are enduring and therefore considered "states" and discretionary and therefore considered "event" like relationships. The former category includes similarities (proximities) between actors, such as a shared location of work, membership in the same groups, joint participation in certain activities or processes, and shared attributes (skills, expertise, organizational position, etc.). Social relations in the conventional sense, such as role-based relationships (manager-subordinate, co-worker, etc.), emotional relationships (likes, trusts, etc.), or acquaintances, are also considered as state-like ties. Interactions (discretionary events such as sending an email or having a business lunch) or flows (such as information, money, or emotions transmitted in relationships and through interactions) are also regarded as dyadic phenomena (Borgatti et al., 2014).

One of the most substantial differences between online and offline networks is the way these dyadic phenomena build on each other. In offline space, social phenomena shown in *Table 2* usually follow each other in the order indicated: similarities lead to social relationships, in which regular interactions take place, through which different things flow (Kane, Alavi, et al., 2014; Kane, Palmer, et al., 2014). While, of course, the expansion of relationships in a different direction is not unprecedented in the offline space (e.g., joining a new project team to work with a co-worker whom we like), it is still enterprise social media, a platform of social networking, that makes this inverse logic common. The newsfeed on enterprise social media sites shows the

activities of other users, which, as its name implies, means a flow-type phenomenon. Information shared by colleagues or other employees' reactions to them can be accessed without any interaction with them. By observing the flow of information (e.g., reading a news feed), we can learn about other people's opinions, personalities, and characteristic behavior, and thus form a perceptual or affective relationship with them. It is important to point out that these relationships will be generally one-way (directed) ties. They will become reciprocal only if the focal person is actively present in the online social space besides mere observation, and their behavior is perceived by other actors (Kane, Alavi, et al., 2014). This difference in dynamics of online and offline relationships is crucial for social learning: some users (e.g., new hires of the organization) can learn patterns of behavior and norms without having real, personal contact with other co-workers (Leonardi et al., 2013).

It is typical for enterprise social media platforms to uniformize user relationships. Most social media sites do not show differences between relationships based on, for instance, their direction (one-way or reciprocal), valence (positive or negative), or strength (strong or weak) (Kane, Alavi, et al., 2014). Instead, they usually support the designation of one type of contact (e.g., "acquaintance," "friend," or "follower"). Only in some cases do they allow users to group their contacts (e.g., by compiling inner and outer "circles" or different "lists") and associate different privacy settings for each group. Open (i.e., non-corporate) social media sites generally support either one-way (e.g., Twitter "followers") or reciprocal (e.g., Facebook "friends") relationships. This is a fundamental characteristic of the system that largely determines the behavior of users. Platforms where the user's approval is required to establish a connection and thereby track online activity, typically share more detailed and intimate information with other users than platforms where the connection can be declared unilaterally by one of the parties (Kane, 2015). While the former is more conducive for building reciprocal relationships based on regular interaction, the latter supports one-way mass communication (see, for instance, the role of U.S. presidential candidates' Twitter pages in the election campaign).

Another significant difference stems from a unique feature of enterprise social media solutions that they allow users to list all their connections (Kane, 2015). This feature of social media sites is so fundamental that it is also a key component of the definitions described earlier. Previous research (Borgatti et al., 2014; Cross & Parker, 2004; Cross & Thomas, 2009) found that people generally have very little "network awareness," meaning that they are traditionally not good at listing, systematizing, or understanding the structure of their individual social network. Enterprise social media platforms thus fill an important gap in human capabilities. In addition to the representation of personal networks (ego networks), a complete, system-wide view of the online network allows the analysis of network structures, involving even those relationships that are multiple steps away from the focal actor.

II.4 Mechanisms of offline and online networks

An actor's position in the network structure can be a valuable resource in itself. One of the major classical approaches of network theory, the networks-as-resource perspective, does not examine the content of relationships but the structure of the focal person's relationships, and especially, the range of their personal network. It describes the extent of the ego-network using three factors: 1) the density of the personal network, i.e., the extent to which ego's ties are interconnected; (2) the size of the network, i.e., the number of ties; and (3) the diversity or heterogeneity of ties. According to the networks-as-resource approach, actors whose ego network is more extensive have easier access to scarce information and resources in different groups than those who have fewer relationships (Shipilov et al., 2014).

Another construct related to the networks-as-resource approach is social capital. The concept of social capital was introduced by the work of Granovetter (1973), Bourdieu (1986), and Coleman (1988) and refers to a set of resources that an individual can mobilize through enduring and more or less institutionalized relationships. Its extent depends on the personal network's range and the quantity of resources available through the connections. The concept of social capital is essentially related to the networking function of enterprise social media platforms.

From this aspect, the use of enterprise social media is primarily beneficial due to the following arguments.

- It facilitates the formation of new relationships and the management of existing ones.
- It enables more informed networking strategies via search and referral mechanisms.
- It helps users understand the amount of their existing social capital by the ability to list and overview their relationships.

In his work, Burt (2005) deals with social capital that is realized due to the network position of information brokers who play a bridging role in certain network structures. Interpersonal networks are usually clustered. Clusters are network substructures with greater internal cohesion and tie density. Based on previous research by Christakis and Fowler (2010), three factors are responsible for an increased similarity between cluster members. *Homophily* is best described by the phrase "birds of a feather flock together", i.e., it means that people who are similar in a certain regard are looking for each other's company. *Induction*, on the other hand, raises the possibility that the focus person imparts a certain trait (e.g., commitment to an organization) to the persons with whom they are in contact. *Confounding*, in turn, explains when a similar trait is caused by some external factor that affects all members of the cluster.

When investigating the organizational effects of enterprise social media, it is particularly important to examine network phenomena as the design of platforms greatly influences the extent to which network mechanisms that appear offline also work in the virtual space (Kane, 2015). Homophily (similar actors connect) and clustering (friends of a friend connect) are also characteristic of offline social networks, and result in clusters as defined above. However, the recommendation mechanisms of social media platforms can significantly amplify these effects.

These platforms usually suggest new relationships based on the number of *shared attributes* or *shared friends* ego and alter have (see "similarities" dyadic phenomenon). Thus, the "echo chamber" metaphor often used to characterize social media is very apt. It suggests that these mechanisms create homogenous social structures (clusters) based on shared beliefs, values, preferences, and users in these structures can only encounter echoes of their own thoughts, while divisive, conflicting content avoids them (Leonardi et al., 2013).

In the offline space, network actors have to rely on their own limited capability to assess and evaluate networks when forming new relationships. The mechanisms of enterprise social media platforms, on the other hand, could even balance these natural processes. That is, if the recommendation system focused on differences instead of similarities, both individual and network benefits could be realized. Recommendation systems may suggest new relationships, for instance, based on the below criteria (Kane, 2015):

- Users who by themselves or through their relationships possess a resource that is missing from the focal person or their personal network.
- Users who possess an organizational position or a certain knowledge that the focal person is likely to need in relation to their work.
- Users who bridge structural holes at critical points in the network or span the external or internal boundaries of the organization, thus increasing the centrality of the focal person and the cohesion of the entire network.

Thus, the design of the recommendation mechanisms can make serious difference. Not only can the – sometimes disadvantageous – dynamics that appear in social networks be mitigated, but conscious planning would also create an opportunity for implicit network features to serve organizational strategy. Most currently available systems do not exploit this opportunity.

II.5 Profile and avatar – presence in virtual networks

Another significant difference between offline and online social networks is that enterprise social media users are not physically present, but through their profile and virtual avatar. Consequently, the way in which these profiles are created and developed, and the extent to which they coincide with the offline personality of the symbolized person, in other words, their *authenticity*, cannot be neglected.

In most cases, not anybody can register to enterprise social media platforms: as the social network is owned by a particular organization, it is the management (or the administrators of the site designated by them) who determine who can access the interface (Kane, Alavi, et al., 2014). Access to an organizational network created on most corporate social media sites (e.g., Yammer, Workplace, Slack) requires that the user have an email address that proves their organizational affiliation, however, administrators may define other access criteria. Somewhat arguing with certain definitions describing the phenomenon (e.g., McAffee's Enterprise 2.0) that the use of ESM platforms is fundamentally optional, in reality, managers can make registration mandatory (more precisely, automated) by administrative means. (While there is no doubt that prescribing the actual use of the site, i.e., regular reading, content creation, or posting, is indeed unlikely.) Thus, a certain group of individuals may *automatically* have a profile in an enterprise social media application. Other persons (e.g., employees) can join at their own discretion, yet others (e.g., members of partner organizations, key customers) have to apply to the administrators to join.

The content of user profiles comes from three main sources (Kane, 2015): (1) components generated by the system, (2) components created by that user, (3) components added by other users. The first category includes the automatically set up part of the user profile (e.g., contact details, department, and position automatically extracted from the employee database based on the e-mail address) and the whole structure of the profile, to which the user can upload additional data. The second category includes information provided intentionally and voluntarily by the user (e.g., areas of interest, abilities and skills) and content unintentionally produced as a biproduct of the user's previous activities. Many enterprise social media software keeps track of the "digital footprints" left by users and even allows other users to track them (e.g., list all previous activities available from the user's profile, list interests,

group memberships). Thus, in proportion to usage frequency, the profile of users is increasingly built on actual past decisions, actions, and habits. The third category may include content that is placed on a profile by other users (contacts of the focal person) – if allowed by the system and the focus person's privacy settings (e.g., tags in image or text; content sharing or posts on that person's profile). It is worthy of note that the user profile is retained even after the employee leaves the organization, and its content may be available to others later.

"Personal distance" can also be interpreted in the cyberspace: users allow a particular content closer or further away depending on the extent to which they can and wish to identify with it, and if they are willing to make it part of their online identity. Liking a given content posted by someone else brings it much less close to one's own virtual identity than writing a comment or sharing the content on one's own profile page (Ujhelyi, 2014). In these cases, the user leaves a "digital footprint" which, through the mechanisms previously mentioned, becomes part of their online self-representation.

In summary, a substantial difference between online and offline social networks is that in a virtual network, interconnected vertices are not directly persons, but their user profiles (virtual selves) edited mainly by them. Therefore, behavior in the cyberspace is influenced by various other factors besides the users' personalities. The differences introduced in this part of our paper can thus be classified into four main categories: (1) the influence of the virtual environment, (2) the way content is disseminated, (3) the accessibility of social capital, and (4) the way of online self-representation and access to contents (Kane, Alavi, et al., 2014).

II.6 Network flows: the impact on knowledge sharing

After comparing the characteristics of online and offline networks, we present the effects of enterprise social media on *knowledge*, an important type of *flow* spreading in social networks. The investigation of knowledge sharing in enterprise social media is indispensable due to the socio-economic trends described in the introduction and its significance in knowledge-intensive organizations (such as the organization analyzed in our research). According to a 2014 KPMG survey, 35 percent of respondents considered the use of "intranet social networks" to be an existing organizational practice and technology supporting knowledge sharing (KPMG, 2014).

If we consider social capital generated from information resources, we can see that one of the key questions of enterprise social media is how it helps the flow of various pieces of information and knowledge within organizations. Does it help at all? What apparent differences can be observed between the functioning of enterprise social media platforms and other communication systems or networks in this regard? Previous research (Fulk & Yuan, 2013; Gibbs et al., 2013) and reports on corporate use (simplysucceed, 2015) suggest that the performance of organizations implementing enterprise social media has improved primarily due to more effective knowledge sharing. Thus, we introduce two essential phenomena related to knowledge sharing.

A unique feature of enterprise social media is that communication through this platform does not necessarily takes place at the same time: those who arrive later have the opportunity to "listen in" or "comment to" to an ongoing conversation. Enterprise social media platforms inherently serves as archives of communication, in which huge amounts of information are stored over time. For the future extraction of information recorded, it is particularly important to know the *way it is stored* and, even more so, what *options are available for searching*. For searchability, enterprise social media software typically allows users to create certain logical structures that can connect different contents based on their topic or the people or locations involved (e.g., using # and @ characters).

Another way to extract content recorded in enterprise social media is to use the system's internal search mechanisms. However, these mechanisms are in function not

only when users type into the search box, but also when the platform automatically compile the content of the "news feed" summarizing current news and user activities (see, for example, Workplace). When preselecting content for users, its logic is similar to mechanisms for recommending new acquaintances: the system is designed to find either familiar (sympathetic, popular, similar to what was previously searched for, etc.) or new content. That is, we find ourselves faced with the trade-off between *exploration* and *exploitation*. The latter reduces the short-term personal costs of search (time spent, attention) – but also the likelihood of accessing unknown, unusual, novel content, which in the long run results in a prison of thought ("echo chamber"). Discovery support mechanisms, on the other hand, more frequently offer novel content, which requires seemingly unnecessary personal effort to process in the short run yet can serve the development of innovative and creative solutions in the long run (Kane, 2015; Leonardi et al., 2013). Thus, the settings of enterprise social media software also largely determine how employees present in the virtual space will behave and perform. It is therefore essential that these settings are not random, but fit the company's activities, strategy, and possibly the job of each employee.

When assessing the effects of enterprise social media on knowledge sharing, it is also important to introduce the concept of *meta-knowledge*, i.e., the knowledge of who knows what and who knows whom (Leonardi, 2015). Knowledge sharing is moderated by (1) structural conditions (opportunity to share), (2) cognitive conditions (ability to share), and (3) relational conditions (motivation to share) according to Hortoványi and Szabó (2006). Successful knowledge transfer very often fails precisely because of the lack of meta-knowledge, which falls into the second of the previous categories: a certain knowledge may well be present in the organization but in vain if its location and way of extraction are unknown (Cross & Parker, 2004).

According to Leonardi (2015), enterprise social media develops the "ambient awareness" of employees, i.e., the transparency of the platform helps the creation of meta-knowledge. In his organizational research, employees who used an enterprise social media platform for six months significantly improved the validity of their meta-knowledge: they got a 31 percent more accurate image of who knows what, and an 88 percent more accurate image of who knows whom (Leonardi, 2015). Therefore, he concludes that the substantial changes brought about by enterprise social media are

due to the fact that employees communicate in a visible and traceable way rather than the content of communication per se.

At the same time, enterprise social media improves trust between employees, and through this, it also removes obstacles to the relational condition for knowledge sharing. According to a generally used interpretation of trust, it is the belief and confidence of related parties that the other party will not exploit their vulnerable position. Gelei and Dobos (2016) propose the separation of *trust* and *trustworthiness*: while the former is a feature of the relationship, the latter is a characteristic of the related parties, the perception of one party in relation to the other. In the context of enterprise social media, previous research has made two important findings regarding trust. On the one hand, trustworthiness is enhanced by the authentic nature of user profiles, i.e., the presence of a real name, a profile picture, and personal information shared (Kane, 2015). On the other hand, enterprise social media and weak ties appear to primarily support the transfer of explicit knowledge, while the sharing of confidential or tacit knowledge occurs through strong and personal ties (Kane, Alavi, et al., 2014; Kane, Palmer, et al., 2014)

We do not present the extensive literature on the topic of trust in detail, keeping in mind the limitations of our paper, however, we will refer to trust in connection to our findings.

II.7 Methods of empirical research

With our own empirical research, we aimed to get an exemplary overview of enterprise social media usage of a Hungarian organization and its organizational effects after having collected and processed the relevant literature. As individual opinions and experience were important in the understanding the communication on the enterprise social media platform, we chose a qualitative research method for our investigation. To learn about a *virtual* social space, we performed our research using *netnography* method (Dörnyei & Mitev, 2010). Netnographic observations were supplemented with additional interviews to increase validity.

With our research, we primarily sought to learn how the use of an online social network affected the relationships of the real social space in the case of a domestic company. To assess this, we analyzed the communication in the groups of its enterprise social media platform, Yammer. Our level of participation was that of the *observer*, as we examined a community unknown to us, and we did not participate in their social interactions. Available conversations were examined with the approval of the responsible managers and accessed through the account of an employee in the IT department. As the recorded conversations contained business critical and sensitive information, these are not cited, and the participants are not named: the emerging patterns are interpreted at a higher level of abstraction without individual data.

In netnographic data collection, we can distinguish three types of data sources (Horváth & Mitev, 2015), and in our empirical research we built on all of them: (1) online communication of communities (e.g., content and meta-content appearing in corporate Yammer groups); (2) the researcher's observations of community interactions, members, and their meaning (e.g., in this case based on benchmarks proposed by other researchers); (3) interview with members of the online community.

Prior to the interviews, we identified the user groups "active", "reactive" and "passive" among the approximately 100 users based on the content analysis of their communication in ESM groups. As the basis of classification, we considered their activity and attitudes towards the use of Yammer. The circle of interviewees was defined in a way that allowed us to learn the characteristic opinions, habits, and experiences of each user group. We conducted semi-structured interviews with eight

members of the organization. We wished to include the employees of several organizational units and representatives of as many hierarchical levels as possible: in addition to juniors who joined within two years, we also spoke with senior staff and managers of various business lines and competence centers.

The organization in analysis is located in Budapest and operates in a knowledge-intensive industry. They started using Microsoft's Yammer platform almost three years ago, making them rather early implementers in Hungary. Yammer is only available to internal staff of the examined company. The employees of the organization regularly work on projects, therefore, according to our preliminary expectations, enterprise social media can help their daily work due to its following characteristics: (1) it supports learning each other's expertise and areas of interest, thus building meta-knowledge and ambient awareness; (2) it supports the extra communication and personal coordination needs required for the execution of projects; (3) it facilitates communication and exchange of information between staff working on projects that span internal and external boundaries of the organization.

II.8 Findings of the case study

A general finding of our study is that most mechanisms proposed by the international literature and presented here earlier can also be observed in the examined organization. Based on the interviews and the interaction analysis on the enterprise social media site, we identified three key areas in which the virtual social network replaces and complements the communication networks of the physical space (see *Table 3*).

Table 3 The effects of enterprise social media on networks

Building trust	Sharing information	Stimulating weak ties
1. getting to know each other	1. structural condition of knowledge sharing	1. institutionalization of relationships
2. making work visible	2. place of advice-seeking	2. wider access
3. orientation of new hires	3. a tool of coordination of work	

Source: own compilation

Building trust: increasing the level of confidence between employees

In social networks, trust is particularly important, and a relational condition to knowledge sharing (Hortoványi & Szabó, 2006). According to our observations, enterprise social media helped to build trust relationships in the examined organization through three interrelated features: it helps (1) getting to know each other, (2) making work visible; (3) and allows orientation of new members of the organization.

Several interviewees emphasized that groups that are not related to work (in which relationship-oriented content spreads) help them to get to know their colleagues and start common activities. Two of them cited groups related to sport as examples. For instance, the author of a post calling for a common sport activity had the opportunity to form new informal relationships based on the responses. (We have already

introduced the multiplex properties of networks, the entrainment of relationships, and the resulting social capital earlier in our study.) Similar entries and common activities beyond working hours help to establish relationships of trust, which are later utilized in the course of work.

In several interviews, respondents referred to Yammer's feature of making work *visible*. For example, one interviewee felt that the competence center he led was less known in the past because they only collaborated with others on a few projects – and thus most colleagues didn't know what they were dealing with. He thought that Yammer had made a major breakthrough in this, as news on acquisitions and regular reports on their activities had increased their visibility within the organization.

"If, for example, we were presenting at a large company and that's where the acquisition activities started, it's great that colleagues who use Yammer regularly go back to the post they posted six months ago and say yes, we won, hooray! This is very important information. Many times, names are tagged who were involved in the acquisition. If you're very enthusiastic, you also know who to look for if you want to get involved in that project, for instance. That is very useful".

The presentation of the work done (or to be done) appears in most Yammer groups, but to various extents. *"We've reached a milestone in project XY, kudos to the team,"* one user writes, tagging the colleagues working on the project. *"[Name of institution] higher education institution nodded at our offer, work can start on Monday"* Or: *"On Friday, as part of a fantastic [name of competence center] event, we commemorated last year's successful business year and drew strength to the next one. I want to thank everyone".* Below the post, he also provided a picture of the event, in which he tagged the colleagues involved.

During the interviews, it became apparent that the visibility of the work of others, depending on the publicity it gets, is sometimes judged differently. This phenomenon was also reflected in the terms our interviewees used: while some saw it as "self-marketing" or "self-promotion," others see it as a healthy presentation of results and success. Overall, however, it seemed that getting to know the activities of colleagues helps to build a sense of familiarity, which together with the sharing of success strengthens the level of trust in relationships.

Yammer also helps build relationships outside of work: *"Hi! I'm looking for [company name] bikers. We have a couple of tasks waiting for us, where we can compare ourselves with IVSZ companies. ☺ Like if you care about the details"* – a cycling user addressed the others. There were three likes to register, and together, they began to organize their participation in the competition. It is clear from the wording of the entry that the posting user was not aware of who within the organization shared a common interest with him – or at least left the call open to anyone. This, in turn, benefited him the opportunity to form new informal relationships based on the reactions.

Two of our interviewees claimed that one of the possible benefits of Yammer is to support the socialization and orientation of new members of the organization. In their opinion, the platform offers a good opportunity for new hires to get an idea of the everyday life in the company. By reading previous conversations, they become aware what are the current topics and issues that concern the others. In addition, it can help new members of the organization learning names and faces as these are shown together on the platform. Getting to know your colleagues – and thereby building trust – is especially important for new hires, who are in dire need of help and information to integrate and learn.

Sharing information: reducing the importance of network brokers

The significance of information brokers presented previously in our study is greatly diminished by the fact that information becomes available to everyone, or at least, to many more. The power of actors possessing scarce resources in the physical networks dwindles in virtual space, while the power of particularly active users increases. In our research, we found that information sharing is one of the most important drivers of enterprise social media use in the examined organization. Information sharing is supported by three features of the platform: (1) an information storage independent from time and space, (2) a location of advice-seeking, and (3) a tool of coordinating work.

Our interviewees unanimously highlighted information sharing as the most important function of Yammer for them. By "information" they primarily meant professional news, curiosities, corporate events, and the achievements of their colleagues. Multiple interviewees emphasized that, in their view, Yammer could mainly substitute for certain corridor conversations and iquiries. According to our interviewees, the information obtained this way does not usually help them to carry out their daily tasks, but they consider it important "*because it provides awareness*" (see ambient awareness).

We can find examples for all types of information-sharing posts in the Yammer network. *"Open-Source data visualization, also used by Uber, is available to everyone. There are some exotic ones among the map-based visualizations,"* wrote a user in the group related to this topic and attached a link. "*Another interesting thing is that they were able to standardize some parts of the design for the international market and sell it as a module (Capex was presented at the webinar)".* He provides another useful news: *"Breaking news! Three surface parking lots have been vacated in the [XY] parking garage (3rd, 37th, 38th). We rented it, [company name] sign is out".*

There are fewer examples of advice-seeking in group communication – although we would not call it unprecedented. Requests made in groups usually relate to some non-urgent (not immediately necessary) information. In some cases, advice-seeking requests intend to exploit indirect relationships to people two steps away in the network. These features of the platform provide the structural and relational conditions for knowledge sharing as described earlier.

"There was a project that I was leading and in which I used Yammer a lot. It helped a lot in this. The trouble is that the e-mails are not so… If someone reads them, they have to reply, they have to properly format it. You can simply post something on Yammer, and it makes the work very efficient. I'm glad I used it, I had to. I couldn't have done that project otherwise. […] I made a group on Yammer that included project members and stakeholders. There went all the administration and all the new information. These were collected in a group. If we had collected and stored these in the cloud, in a common folder, no one would have ever read it. Here they immediately saw when an update came, they could even watch it from a mobile". This is how an

interviewee reports his experience. He previously made Yammer a tool for everyday communication and information exchange during a specific project. Thus, the information sharing functions of enterprise social media are also suitable for supporting everyday work and coordination.

Stimulating weak ties

Since Granovetter's popular experiments, the role of weak ties in obtaining hard-to-access information, such as in job search, has been widely known (Granovetter, 1973). However, the world has changed a lot in the past decades: in the age of ubiquitous information, weak ties have lost much of their significance. Nowadays, strong ties play a much bigger role, as these are the ones, we consider reliable enough to validate the information we achieve.

We found that enterprise social media ultimately plays an important role in stimulating weak ties by increasing the level of trust in relationships and making information more widely available within an organization. Thus, enterprise social media institutionalizes these relationships to some extent, and make the information and emotions that flow through them more widely available. Enterprise social media increases the visibility of weak ties through network awareness, which can play an important role in generating new ideas and organizational innovation in general.

Similar to Granovetter's cited experiments, enterprise social media users sometimes try to take advantage of their weak ties. "If you know a recent graduate who is above average in terms of accounting knowledge (who studied accounting at BCE or BGF or worked in an accounting firm) and is otherwise interested in consulting, please ping them to see if they are interested in our company," said someone in the HR group of the organization.

II.9 Summary

The use of enterprise social media has a history of but a few years and is therefore a relatively unexplored field, which is why this topic has recently received particular attention in international journals of management information systems. The characteristics of enterprise social media were presented through the comparison of the mechanisms of social networks online and offline. These lie primarily in (1) the influencing effect of the virtual environment, (2) the way content is disseminated, (3) the way social capital is made visible, and (4) the way content is accessed. In this paper, we sought to answer the question of what the relationship of enterprise social media is to the social networks that are present in all organizations. Does it merely display and model, or even build and form these social networks? In our empirical research, following a netnographic analysis of the enterprise social media platform of the organization we examined, we identified three key areas where the virtual social network replaces and complements the networks of the physical space: (1) trust building, (2) information transfer, and (3) the stimulation of weak ties.

It seems interesting to investigate how certain features of the cyberspace's design (e.g., referral mechanisms, supported connection types, profile structure, security settings, etc.) affect users' network awareness and behavior. The analysis of ESM platforms as "digital panopticons" seems particularly promising to see how transparency and mutual observation affect organizational behavior and trust. The examination of generational differences in enterprise social media use is also attractive. In this paper, we merely referred to the pitfalls and possible disadvantages of using enterprise social media, and their exploration also requires further research.

III. Negative ties in organizational social networks

Abstract

Over the past few years, exploration and analysis of organizational social networks have been attracting increasing attention in both organizational research and consulting practice. These inquiries, however, focused almost exclusively on positive social relationships, while they ignored the effects of negative relationships in these networks. Negative relationships (e.g., distrust, envy, or avoidance) are not equivalent to the absence of positive relationships, neither are their opposites. Negative relationships are generally defined as relatively enduring relationships including negative cognitions (judgements), negative affections (feelings) and behavioral intentions towards others. This paper aims to introduce the definitions and models of negative relationships, as well as to present previous research findings at (1) individual, (2) dyadic, (3) triadic, and (4) whole network levels of analysis. It articulates challenges posed by data collection and data analysis techniques during network research on negative relationships and offers possible solutions. The literature review is primarily based on research articles and concept articles published after 2010.

III.1 Introduction

An increasing number of research capture organizations as networks of interpersonal ties (Kiss, 2005; Kürtösi, 2007; Török, 2005) in which information and knowledge flow (Baksa & Drótos, 2018; Hortoványi & Szabó, 2006). Information that is necessary for their effective functioning and that is the basis of trust-based cooperation (Wijk et al., 2008). Organizational network research focuses primarily on the study of *ties* between individuals or groups in order to uncover patterns and mechanisms that often remain hidden from the eyes of members and managers (Cross & Parker, 2004). The topics and phenomena covered by earlier studies of this network approach are rather diverse, however, based on their methodological and philosophical consistency, these lines of research are increasingly regarded as an

original paradigm. Studies on organizational social networks generally consider the ties between actors as positive (Snow & Fjeldstad, 2015).

An important, although somewhat less popular line of organizational network research focuses on the study of *negative ties* in organizations. Negative ties are interpersonal relationships in a social network in which at least one of the parties have relatively enduring negative emotions or behavioral intentions towards the other (Labianca, 2014). Researchers of the topic primarily argue that negative ties *remain in the blind spot* of studies or consultancy diagnoses that only analyze positive (e.g., trust, respect) or neutral (e.g., cooperation, help, knowledge sharing) ties (Labianca & Brass, 2006). They reason that if the questions refer but to positive ties, the network graphs based on these will not explain whether or not missing ties cover existing conflicts and problems. It is easy to concede that we cannot see a complete picture without studying the rejection of identified opinion leaders, the restraining power of jealousy that appears in innovation networks, or conflicts that hinder cooperation – to name but a few examples.

This paper intends to present the most important definitions and concepts of negative ties based on the relevant international literature, and to place the topic among the focus areas of scientific research in Hungary. It also aims to inspire further research in the field that may support the development of organizational social network research and make diagnostic methods more accurate in consultancy practice.

This paper is based on an *exploratory* literature research (Adams et al., 2007). Its topic is relatively new and understudied in international literature, and thus the number of available research papers would not permit a systematic review. In the collection and processing of literature, I used a mixed method (Grant & Booth, 2009): first, a keyword-based search, then in the second round, a targeted search based on select reference lists and the snowball method. In the keyword-based search, I filtered for peer-reviewed journal articles in the EBSCO and Science Direct databases that were published after 2010 and that contained the words ‘negative tie’ or ‘negative relationship’ in their titles or abstracts. From the results, I excluded studies published in other scientific fields, and made further selections based on professional and content-based criteria: I was looking for articles that concerned different levels of analysis (individuals, dyads, triads, and whole networks) and multiple types of

relationships. As it became apparent that one of the key authors in the field is Giuseppe Labianca of the University of Kentucky LINKS Center for Social Network Analysis, I reviewed the works of his and his colleagues in particular.

III.2 Definitions of negative ties

Based on the traditions of organizational sociology and social psychology, the roots of organizational network analysis go back over a century: from Moreno's sociometry (Mérei, 2006) to today's sophisticated devices of diagnosis, it provided numerous theoretical and practical results. In these studies, researchers typically analyze ties of interpersonal trust, work-related flow of information and advice, as well as cooperation, shared learning, and problem-solving (Cross & Parker, 2004; Cross & Thomas, 2009). They aim to provide previously unknown information to the organization and its leaders by uncovering various network patterns. But what do we make of negative ties? Are they equal to the lack of positive ones? Alternatively, are they the opposites of positive ties? Previous research suggests that the right answer to both questions is 'no'.

Before providing an exact definition of negative ties, let us have a brief look at the historical precedents of organizational network research. Studies that analyzed both positive ties and conflicts as well as other negative relationships were already carried out by early scholars in sociology and organizational network research (Labianca, 2014). After Granovetter's (1973) pioneering paper on the strength of weak ties, however, this approach was marginalized, and came in the attention of the scientific community again only in the late 1990s (Brass & Labianca, 1999; Labianca et al., 1998). The works of Bourdieu (1986) and Coleman (1988) served as the basis of the systematic research of negative ties. These studies examined the concept of social capital and raised the question of what types of ties increased or decreased the social capital of network actors. The use of organizational network research in organization studies and consultancy became more and more prevalent in the first decade of the 21st century, and especially in the early 2010s. Due to this increasing popularity and based on the findings of research on social capital, various important conclusions have been drawn on the concept of negative ties.

III.2.1 Negative ties are not equal to the lack of positive ties

Burt (2005) calls the lack of positive ties *structural holes* and emphasizes their importance in a network. Structural holes represent a lack of ties between various definable parts (clusters) of a social network, i.e., they are 'empty spaces' in the social space that separate non-redundant sources of information. Burt (2005) also points out that brokers who bridge these holes may acquire a considerable surplus of social capital. Assuming that actors wish to maximize their individual gain, this rule makes maintaining and reproducing structural holes a rational behavior for brokers. Studying a network of positive relationships, one may identify structural holes, but cannot know whether there are underlying *negative* ties, as well. I will later present research results demonstrating that, similarly to structural holes, negative ties may also increase the social capital of specific network actors (*ego*), but only to the detriment of other actors (*alters*).

Social capital researchers generally exclude the content of network ties of a given actor from their investigation, and rather focus on network structure, and, especially, the *range* of personal networks. Shipilov et al. (2014) describe the range of *ego networks* using three factors: (1) the density of the personal network, i.e., the extent to which ego's ties are interconnected; (2) the size of the network, i.e., the number of ties; and (3) the diversity or heterogeneity of ties. In longitudinal research, the effect of various environmental factors (e.g., positive or negative management evaluations) on employees' behavior regarding their social capital has been demonstrated (Parker et al., 2016). Based on their results, they concluded that negative factors decrease, while positive factors increase the frequency of new relationship generation. Accordingly, negative effects decrease, while positive effects increase ego's social capital.

Although traditional social capital research has achieved considerable results, it did not take the effects of negative relationships in organizational networks into consideration. Brass and Labianca were the first to propose that a virtual *social ledger* that records social capital has not only a *credit* but a *debit* side, too (Brass & Labianca, 1999; Labianca & Brass, 2006). In other words, they believed that positive relationships increase the social capital of *ego*, while negative ones decrease it.

III.2.2 Negative ties are not the opposite of positive ties

Just as negative ties cannot be considered as the lack of positive ties, they cannot be simply considered their opposites, either. Studies carried out in primary and secondary schools have concluded that a network of negative ties is not the inverse of a network of positive ties (Boda & Néray, 2015; Csaba & Pál, 2010; Telegdy, 2013). Although central actors of the positive network have a better chance to be at the periphery of the negative network, and a smaller chance to be at its center, the inverse is not necessarily true: someone who has a peripheral role in the negative network may well be marginalized in the positive one, too (Telegdy, 2013).

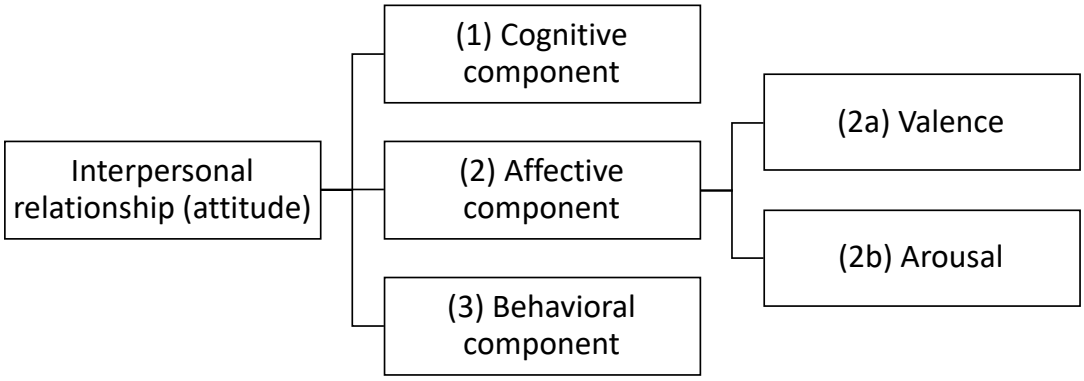
Earlier studies have found that negative ties have dynamics that are, in many respects, considerably different from those of positive ties (Labianca, 2014). One of the basic network mechanisms is that directed (asymmetric) ties strive for symmetry, i.e., sooner or later, they are expected to become reciprocal. For negative ties, however, this statement may be accepted less often, partially because of the considerably higher rate of tie latency (Szell & Thurner, 2010). This is especially true in organizational environments, where the behavioral norms of organizational culture often explicitly make open hostility taboo. Therefore, conflicts are realized in different forms, or stay latent. Latent conflicts may appear as directed negative ties: if a network member (*ego*) has a negative attitude towards another (*alter*), but the latter one does not learn about this, the negative tie will not be transparent, and likely will not be reciprocated, either.

It seems that the transitivity theorem observed in positive tie networks is not true of negative ties, either: although my friend's friend is often my friend as well, the same cannot be said of the friends of my enemies or the enemies of my friends (Marineau et al., 2016). Instead, new roles are defined alongside negative ties: other network members can attain extra power by supporting or mediating between antagonistic actors, or by creating negative ties. All in all, we may observe that in important points, negative ties operate on different underlying mechanisms than positive ties (Labianca, 2014). Therefore, we must define these as separate dyadic phenomena, and carry out further research to explore their dynamics in more detail.

III.2.3 Negative ties as interpersonal attitudes

According to the tripartite definition of Labianca and Brass (2006), negative ties are *relatively enduring* or *reoccurring* dyadic phenomena that induce (1) cognitive judgments, (2) negative affect (feelings), and (3) behavioral intentions towards others. Therefore, in their definition, they capture negative ties as negative interpersonal attitudes that persist for an extended time (cf. Bakacsi, 2004). To this tripartite definition, Labianca (2014) added the affective components of (2a) *valence* and (2b) *arousal*: while the first relates to the orientation of the emotion (positive-negative), the latter expresses the intensity of the emotion (calm-excited). This amendment is significant as it makes it easier to integrate the analysis of negative ties with other dyadic phenomena and compare them to these. On the valence axis, the pendants of positive ties may be found (e.g., trust-distrust, cooperation-avoidance, respect-envy), while the arousal axis may be used to demonstrate the differences between weak and strong ties (see *Figure 11*).

Figure 11 The tripartite definition of interpersonal relationships



Source: Labianca, 2014, p. 244

Labianca (2014) suggests that even though the definition above is complete in itself and therefore appropriate for theory building purposes, during practical research, it is not necessary to investigate all three components. Accordingly, most studies in the international literature demonstrate research results on one specific dimension of these relationships. For instance, previous studies examined avoidance as a behavioral component (Harrigan & Yap, 2017), distrust as a cognitive component (Marineau et

al., 2016), or aversion as an affective component (Fujimoto et al., 2017). It is easy to find complex relationships, however, that require a simultaneous examination of multiple components to uncover and understand their mechanisms. (At the same time, it is argued that questionnaire-based data collection, often used in network research, only permits the analysis of one component in each question.) These complex relationships include *jealousy*, which is the sum of the perception of a performance in comparison (cognition), a competitive or destructive emotional response (affection), and the resulting intents to act (behavior) (Sterling & Labianca, 2015).

III.2.4 Negative ties as interactions and flows

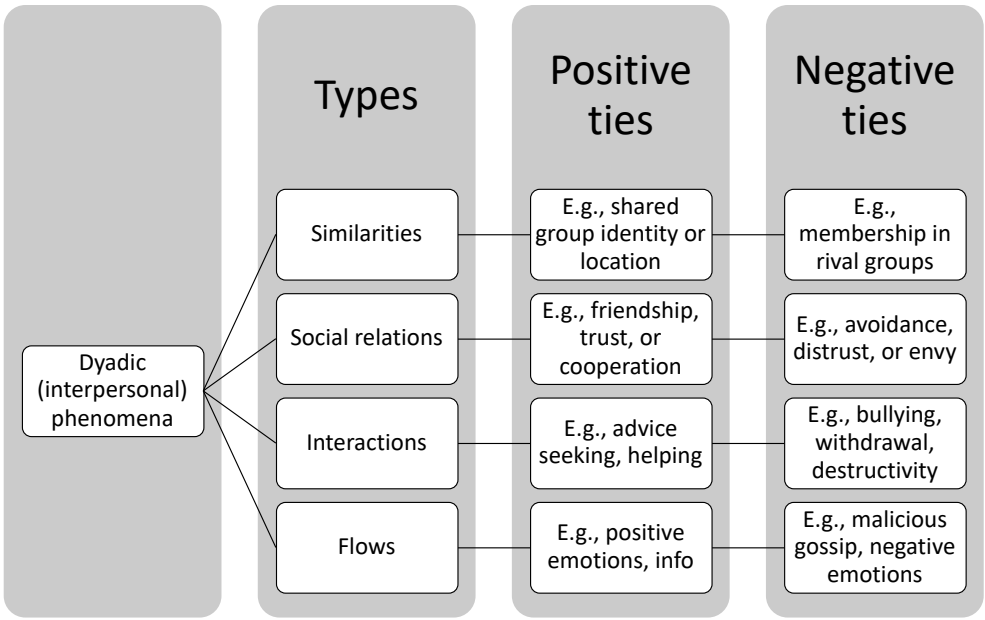
Organizational network research literature uses both the expressions 'tie' and 'node', as well as 'relationship' and 'actor' (Robins, 2015). In practical network research, these two concepts are often used interchangeably, yet it is important to see that the former is a mathematical-graph theory expression that may not only symbolize a tie (social relationship) in the narrow sense but an *interaction* or *flow*, as well (Borgatti et al., 2014; Borgatti & Halgin, 2011). If negative ties are understood as interactions and flows, a wider range of phenomena become researchable; at the same time, we necessarily diverge from the attitude-like definitions presented above, especially its "*relatively enduring"* element.

Borgatti *et al.*(2009) classified dyadic phenomena (i.e., ties between *ego* and *alter*) based on whether they represent a *state* or an *event*. State-like phenomena include similarities, i.e., attributes (e.g., shared location, group membership or identity) that may create a connection between two people, and relationships in the conventional sense (e.g., role-based, affective, friendship) that may be described with the tripartite definition presented above. We may consider interactions, i.e., discretional events between two actors, as event-like phenomena, which may be realized both in and outside of lasting relationships; as well as flows that depict, for instance, information, resources, and emotions transmitted in relationships and through interactions. *Figure 12* presents such extension in the definition of negative ties.

While interpreting the model, further explanation is necessary for the relationship between interactions and ties, and interactions and flows: whether these can be present in the networks separately from each other. As social relationships are relatively

enduring interpersonal phenomena, they are considered extant even if no interactions occur in them for a while. For example, one may not speak to a friend who works abroad for a couple of years (i.e., there is no interaction), yet the two people may mutually consider each other friends. In networks in the physical space, flows only rarely occur without interactions. However, such instances occur in social media networks that are becoming increasingly significant in corporate practice. In the "news feeds" of various online networks, there are flows that do not necessarily involve interactions: one can learn visual or textual information about friends without having a conversation with them or others (Kane, Alavi, et al., 2014).

Figure 12 The extended model of dyadic phenomena



Source: own compilation based on Borgatti et al., 2014; Labianca, 2014

The definition of negative ties in *Figure 12* lets us integrate and theoretically support the two important research directions of the topic. One of these is *gossip research*, which has a rich tradition and important achievements, both in Hungary (Galántai et al., 2018; Szvetelszky, 2017) and abroad (Ellwardt et al., 2012; Grosser et al., 2010). Papers in this stream claim that gossip – even malicious gossip – has an important role in the functioning of groups. On the one hand, it is a tool of punishing transgressions, and through this, protecting the group's integrity, while on the other hand, it can also help reinforce group identity. Previous research (Ellwardt et al.,

2012) found that persons with a high status in a group are less likely to become targets of negative gossip and that the distribution of gossip relationships is very uneven: often, a few ‘scapegoats’ become the target of gossip. In the above model classifying dyadic phenomena, gossip is considered as *flow*, as it represents informational content on a known other that is transmitted by actors during interactions or bounded in relationships.

Another important research stream investigates the phenomenon of bullying that appears in communities. Bullying, i.e., intimidation, mental or physical harassment inside a community is an *interaction*-type dyadic phenomenon, as it involves two network members (the bully and the bullied), yet there rarely exist an explicit or enduring relationship between them. Although most relevant research is carried out in school class communities due to the accessibility of data, this social phenomenon may also be observed in the world of work organizations. Based on studies carried out in Dutch school classes, 3.4 percent of all ties were bullying ties according to bullies, and 5.1 percent according to those bullied (compared to positive ties referring to popularity and friendship) (Tolsma et al., 2013). Although negative ties are generally hard to measure, it is clear that in this case, being directed ties, there is a considerable difference in the actors’ perception. We may understand the importance of bullying in social networks if we consider its role in intergroup conflicts and its effect on status (Huitsing et al., 2012): higher-status actors are bullied less often, while bullying may lead to a higher status.

III.2.5 The difficulties of defining negative ties

Regarding the previously presented interpretations and models, we may conclude that it is not easy to define negative ties as it requires the expansion of the somewhat simplistic models used for organizational network research. We step away from the mathematically analyzed world of graphs, but we do not reach the complex depth of psychological interpretations. Although the presentation or critique of the epistemological and ontological principles of organizational network research is outside the scope of this paper, I will now make a short detour to present the theory-shaping effects of negative tie research.

Network researchers treat interpersonal relationships in a standardizing way. Even if they differentiate between relationship types (e.g., friendship), in a specific social network, they do not differentiate between the individual ties that belong to the same type (e.g., the friendships of A and B or B and C), even though they may obviously be different in multiple respects. Many structuralists researchers go even further and question the significance of the *content* of relationships (ties) per se (Borgatti et al., 2014). Numerous content-based theories, such as Granovetter's (1973) theory of weak ties have their structuralist counterpart. For instance, from a structuralist approach, the strength of a relationship is a negligible aspect, as long as the increase of social capital can be explained by the difference in the connected structural position (Borgatti & Foster, 2003). Even if most researchers take the content and context of ties into account when interpreting results, it is clear that organizational network research uses a lot of simplification (in order to uncover high-level mechanisms and patterns) and capture interpersonal relationships in a uniform way.

The analysis and definition of negative ties complicate the basic assumptions of organizational network research in multiple respects. On the one hand, the attitude-like definition of negative ties (unlike the structuralist approach) aims to provide a complex, multi-component description of a tie, and this may raise similar expectations regarding the definition of positive ties, too. On the other hand, as negative ties are neither the *lack* nor the *opposite* of positive ties, they should not be handled together with positive ties without the interpretation of their content. Obviously, the various centrality measures used in positive tie networks should also be interpreted differently in case of negative ties. Moreover, due to the multiplex nature of social networks,

researchers should be able to handle situations in which positive and negative ties are present *simultaneously* between two actors.

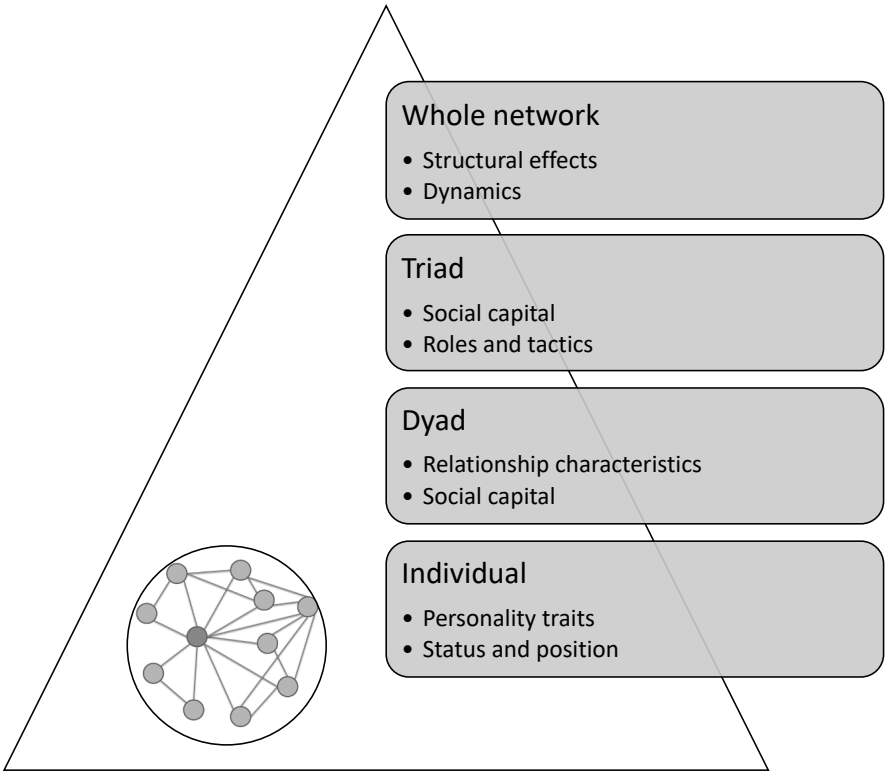
The various layers of multiplex networks capture various tie types between the network actors (Borgatti & Halgin, 2011). For instance, various ties (e.g., friendship, knowledge transfer, cooperation) between employees of the same department may be captured as different layers. For positive ties, the various layers frequently show similar patterns, and according to Coleman, the concept of *appropriability* of social capital is related to this phenomenon: i.e., if possible, one may prefer to choose their friend as their colleague and be more likely to share their knowledge with them. In reality, however, due to the complex nature of human relationships, positive and negative ties are often simultaneously present between two actors. For instance, *ego* and *alter* may distrust each other, yet should be able to study together, or one of them is jealous of the other professionally but looks up to them personally (Hortoványi & Szabó, 2006).

Because of the theoretical challenges that arise from the investigation of negative ties, it may be no accident that prominent authors in the field may be the most determined in the integration of the network approach and the psychological toolkit in organizational research (Casciaro et al., 2015; Venkataramani et al., 2013). I argue that despite the difficulties in the definition of negative ties, this integration may help make the findings of organizational network research more accurate, complete, and close to reality.

III.3 Previous research results and relationships

In the next part of this paper, I will present some of the most intriguing findings in the literature on negative ties. These findings will be presented in accordance with different levels of organizational network research: first, results related to individuals, individual network actors will be presented, then observations that relate to the dyadic, triadic, and whole-network levels. (Levels of analysis and the relevant subjects are summarized in *Figure 13*.) Due to the limitations and scope of this paper, I do not intend to give an in-depth presentation of the cited studies but wish to provide a comprehensive picture to experts interested in the field and inspire further research.

Figure 13 Levels of analysis in negative tie research



Source: own compilation

III.3.1 Negative ties at the individual (actor) level

Network research primarily investigates relationships and patterns between individuals, and not individuals themselves. Yet it may be interesting to learn how various attributes of network actors influence ties and their positions in network structure. The most important personal attributes are (1) personality traits and (2) status and formal position in the organization.

Although the exact content and enduring nature of *personality* is still disputed, as well as the number and definition of the traits that describe it, perhaps the most significant and generally accepted theoretical construct of personality psychology is the Big Five personality model (Carver & Scheier, 2006). It provides five factor groups that describe personality: (a) extraversion, (b) agreeableness, (c) conscientiousness, (d) neuroticism, and (e) openness to experience. Based on previous research, Labianca (2014) concludes that every personality trait that leads to a wider personal network (ego-network) also results in the actualization of more negative ties. This is to say, for instance, a more sociable person, who has a higher extroversion score, will have a larger network, but at the same time, more negative ties than their introvert peers.

Other researchers have found a strong positive correlation between low emotional stability, low friendliness and high openness values, and the number of negative interpersonal ties (Klein et al., 2004; Labianca, 2014). Although more ties (a larger ego-network) usually imply more negative ties, the ratio of negative ties or the *social network's negativity* is non-trivial. This distinction may be used to refine the effects of personality traits on the creation of negative ties. The organizational implications of these findings are reified by the fact that the increasing negativity of a social network leads to lower job satisfaction, lower engagement, and a higher tendency to quit (Venkataramani et al., 2013).

The status of network actors – either from formal sources of power or their position in the network structure – has multiple effects on the actors' exposure to, perception of, and reaction to negative ties. Marineau *et al.* (2018) studied the effect of formal and informal power on the accurate perception of network structure. Previous research (Kane, Alavi, et al., 2014) has pointed out that with the exception of the online social space, network actors are usually unsuccessful in recognizing their own position in

the network and correctly observing the entirety of the social net. In contrast, Marineau *et al.* (2018) found that high status had a positive effect on the accuracy of observation: (1) persons with formal or informal power have more accurate judgments on their own relationship networks, regarding both positive and negative ties; (2) actors with formal power are also more successful in evaluating the entire network structure; (3) incumbents of formal power positions are considerably more effective in detecting negative ties in the social network (Marineau et al., 2018). The latter observation may be explained by the fact that leaders have to detect negative ties that might endanger the completion of organizational goals, or that news on negative ties escalate faster and more frequently to people in formal power positions.

Researchers (Ellwardt et al., 2012) who studied the interrelationships of status and negative ties through workplace gossip found that low status increases the likelihood of becoming the target of negative gossip and thus becoming a scapegoat. Other researchers (Huitsing et al., 2012), who studied school class communities have drawn attention to the fact that while friendships are more likely to form between actors with similarly high status and a similarly high amount of incoming friendship ties, the same cannot be said about actors with an equivalently high number of negative ties. This latter statement is especially true in cases where negative ties are barely or not visible to other actors. In the case of open hostility (e.g., as victims of bullying), targets are more likely to seek social support.

III.3.2 Negative ties at the dyadic level

According to their previously presented definition, negative ties are generally interpreted as dyadic phenomena. In this chapter, I will focus on (i) the attributes of ties, and (ii) the connection of negative ties and social capital. In the analysis of negative ties, we must always consider their (a) *strength*, (b) *reciprocity*, (c) *recognition*, and (d) social *distance* (Huitsing et al., 2012). Analogous to positive ties, the strength of a negative tie may also be identified based on its emotional intensity (strong negative valence and arousal values) and behavior influencing effect. Identifying conflicts as negative ties, it is generally accepted that the emotional intensity of task-related conflicts is lower than that of personal conflicts, and this is also true for conflicts of interests and values (Labianca, 2014).

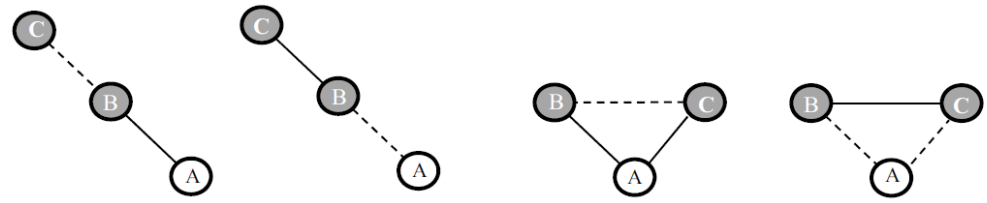
Just as with positive ties, some types of negative ties (e.g., bullying) are usually directional, but are often characterized by higher latency. As some aspects of organizational context – such as organizational culture or place in the formal hierarchy – often do not make the explicit expression of negative emotions and judgments possible, negative ties are usually less recognized (Harrigan & Yap, 2017). Accordingly, these ties are often non-reciprocated, at least as long as they stay latent. The hidden nature of negative ties and the fact that organizations often make them taboo and force them into symbolic spaces make research on this topic more difficult to carry out. The distance of negative ties in the social space describes whether a specific network actor is directly connected to another actor, or they have an indirect connection through a third actor. In other words, it is important whether someone is your enemy or a friend's enemy.

Labianca and Brass (2006) refer to negative ties as factors that decrease *ego's* social capital (i.e., resources that may be mobilized through ties in order to achieve goals). They believe that actors with negative ties towards ego may not only withhold valuable resources (for instance, in an organizational context, information, influence, or funds) but may also actively hinder reaching their goals (see the behavioral component of the previously provided definition). Consequently, they argue that characteristics like strength, reciprocity, and recognition increase, while the social distance decreases the negative ties' detrimental effect on social capital (Labianca & Brass, 2006). Researchers who study social networks from a resource-based approach believe this effect to be so crucial that they recommend defining negative ties as *ties that decrease social capital* instead of using complex and occasionally cumbersome definitions (Borgatti et al., 2014). Research in triadic settings proves that the case is not this simple – and this definition would be oversimplifying.

III.3.3 Negative ties at the triadic level

Triads are the smallest substructures of social networks above the tie level. As their name hints, they include three network actors and the ties between them. The advantage of triadic research is that instead of examining a single tie, it also investigates its immediate context, and as such, is especially suitable to capture organizational situations. Studying indirect relationships, i.e., exploring the effects of conflict, antipathy, or distrust two steps away from *ego* may also be interesting in the case of negative ties. Marineau *et al.* (2016) studied open and closed triads. The four main categories are summarized in *Figure 14*.

Figure 14 Direct and indirect negative ties in triads



1. Open triad (PN)	2. Open triad (NP)	3. Closed triad (PNP)	4. Closed triad (NPN)

Note: Ego's (A) relationships with other actors (B and C). Dashed lines between nodes represent negative ties while solid lines represent positive ones.

Source: Marineau et al., 2016, p. 241

Open triad refer to a setting where there are exactly two ties between the actors A, B, and C, while a closed triad captures a situation in which all three potential ties exist. In an open triad, we should distinguish cases where it is *ego*'s friend who is in a negative relationship with someone (PN) and cases in which it is *ego* who is opposed to someone supported by a friend (NP). In the first type of closed triads, *ego* faces a negative tie between two friends (PNP), while in the second type, *ego* fights a hostile alliance (NPN).

Although various pieces of research have confirmed that direct negative ties decrease the social capital and productivity of an affected actor, indirect negative ties may lead to more complex situations. Marineau *et al.* (2016) concluded that indirect negative

ties – even if they have negative consequences for the person directly targeted and the sum of other network actors – might be beneficial to certain actors.

A. In open PN triads, a dependent situation may be established between actors A and B, in which A supports actor B with emotional and other resources in its conflict with C. This may place A in the role of a *supporting confidante*, giving them a leverage to increase their informal power and moral capital against B, an eventually, their own performance.

B. In open NP triads, actor A is not necessarily more afflicted by the conflict against B, even if C supports B in it – i.e., an indirect positive tie that appears alongside a negative tie does not decrease the positions of actor A.

C. In closed NPN triads, on the other hand, actors B and C are capable of joining forces against actor A, and thus A's situation and prospects are considerably worsened – the alliance (indirect tie) between the opponents of the focal actor has a substantial effect on direct negative ties.

D. In closed PNP triads, actor A cannot exploit the supporting position also present in PN open triads "unpunished", as all friendly gestures towards B or C will result in the other's distrust of A. In these cases, the positive tie A has with actor B or C (often, with both) will decay in the long run, and their performance will be decreased in the short run as they have to maneuver in this unstable state.

Consequently, network actors may be able to profit from patterns developed alongside negative ties, primarily in PN open triads. A situation, known as *tertius gaudens* (i.e., the third who benefits), thus may lead to an increasement of social capital not only for people who bridge structural holes (Burt, 2005) but for those in the vicinity of negative ties, as well. *Tertius iungens* (i.e., the third who joins) is also a concept borrowed from the theory of structural holes. They are the actors who – opposed to the third who benefit – attain a higher social capital and informal power by connecting otherwise isolated actors or increase the number of interactions between them (Obstfeld, 2005). It is interesting to observe in the case of PNP closed triads that the *tertius iungens* tactic does not seem useful for negative ties; moreover, it can easily lead to an opposite result.

A crucial limitation of the above-presented research setting is that it captured but *snapshots* of social networks and did not reflected on the *dynamic* characteristics of negative ties. Future research into this direction seems lucrative and noteworthy to researchers interested in the field: a longitudinal investigation of negative ties could not only shed light on the mechanisms of tie formation but could also help uncover personal behavioral patterns and tactics concerning negative ties. Who are the actors who, obeying the command of *divide and conquer*, tend to generate indirect negative ties around them so that they can profit from them as a third who benefits? Who are the ones who, in ab opposite manner, attempt to be peacemakers, so that they can stabilize their networks in this way? Who are the ones who, for different reasons, look for conflict themselves? Who are the ones whom we see as the 'arm-bearers' of belligerent actors, again and again? The answers from network theory are not yet ready, albeit the questions are not new: even among the constantly fighting deities in the Greek mythology, we can find personifications of open conflict (Ares), hidden intrigue (Hades), sowing discord (Eris), and making peace (Eirene).

III.3.4 Negative ties at the whole-network level

In respect of negative ties, one of the most fundamental phenomena observed at the whole network level is *negative asymmetry*, i.e., the experience that despite their lower relative frequency, negative ties have a more substantial effect on the network's structure and functioning. Because of the considerable latency, it is difficult to accurately measure the exact number of negative ties in a social network, but their ratio compared to the positive ones may generally be considered between 5-10 percent (Labianca, 2014; Labianca & Brass, 2006). As they are more uncommon, they carry much more information regarding network structure than positive ties, and their effects are usually more widespread, as well.

Labianca and Brass (2006) used psychological factors to explain the phenomenon of negative asymmetry. Based on Taylor's (1991) ideas, they argue that human perception has generally developed in a way that we pay more attention to negative events, which results in more active psychological functions, leading to a higher level of arousal, as well as stronger cognitive, affective, and behavioral activity. This statement is partially supported by the results of evolutionary psychology (the better

survival chances of risk-aversive people), and partially by observations from developmental psychology (the educational effect of prohibition, punishment, and negative environmental factors). Previous studies have supported the effect of negative asymmetry in multiple topics (e.g., network perception, performance, status). Using examples from everyday corporate practice, we can observe that a positive tie between two strategically important organizational units or actors may be very beneficial, but a negative tie between them may paralyze, and in extreme cases, drive the entire organization in crisis.

In connection with the network level of negative ties, we should also mention the different mechanisms and dynamics of these. In the case of positive ties, tie formation may be traced back to one of six fundamental explanations (Harrigan & Yap, 2017):

i. ***Closure***: open triads strive to become closed – i.e., network actors have a better chance of developing a tie with someone they have a common friend.

ii. ***Reciprocity***: directional ties strive to become reciprocal – i.e., network members are more likely to become friends with someone who is friendly to them.

iii. ***Homophily***: friends who are similar in some respect are more likely to develop a tie – "birds of a feather flock together".

iv. ***Popularity***: actors who receive many directional ties are more likely to gain new ones – as described by the Matthew-effect or the "rich get richer" principle.

v. ***Activity***: actors who originate many directional ties are more likely to initiate further ones.

vi. ***Entrainment***: actors who already have some relationships between them are more likely to develop other types of ties as well.

It seems that while in positive tie networks, any of these six mechanisms may cause the formation of a new relationship, in the case of negative ties, the explanatory power of the first three mechanisms is limited (Harrigan & Yap, 2017). A lack of closure tendency can be explained by the previously presented dynamics of triads, while the limited role of reciprocity is due to the high latency of negative ties (because of the psychological costs or the external environment or the conflict, these are often directional, and stay hidden).

Harrigan and Yap (2017) found that instead of homophily, in negative ties, heterophobia, i.e., the tie-forming effect of *difference* only appears if the studied attribute is very divisive and emotionally loaded. They justify their findings by the notion that the behavioral component of *avoidance* often appears in negative ties (either in the form of physical avoidance or secrecy and taboo-making) that explains the lack of occurrence for the first three mechanisms. Csaba and Pál (2010) had similar results examining school classes: they found that in case of specific attributes (e.g., gender or being a 'teacher's pet'), heterophobia did not occur, but for other attributes (e.g., beauty), it was strongly present. Differences in relationship dynamics were also supported by others, for instance, from the side of relationship transitivity: it seems that our enemy's friend will not necessarily be our enemy, and our enemy's enemy will not necessarily be our friend (Csaba & Pál, 2010; Szell et al., 2010; Szell & Thurner, 2010).

III.4 Methods and measures in data collection and analysis

The empirical examination of negative ties generally requires even more prudence than surveying positive ones, and it is even more crucial to adhere to the criteria of research ethics. Some of the difficulties are related to data collection: (a) the data regarding negative ties is sensitive; (b) secrecy often comes up, so to minimize the chance of having to pay the psychological cost of making public a previously latent conflict, (c) the external environment, e.g., the organizational culture often makes these ties taboo. Other difficulties have to do with data analysis: (d) negative ties are mostly directional, operated by mechanisms different from positive ones – but in an analysis, they have to be interpreted together.

III.4.1 Data collection methods

Organizational network analysis is a useful diagnostic tool to explore certain organizational patterns, yet, because of its *modus operandi*, raises more ethical issues than other methods (Cross et al., 2013). Network data collection cannot be done anonymously, as we want to know the names of the connected employees, furthermore, through the answers of other participants, we may learn sensitive information about others who do not wish to participate in the research. The content of ties – especially for negative ones – may be particularly sensitive, as these often cross the boundary between professional and personal roles. As strategically significant ties missing from a study may lead to erroneous interpretations, it is indispensable for network researchers to receive the answers of as many members of the focal group or organization as possible (Borgatti & Molina, 2003). Due to the high sensitivity of data and the necessity of a full range data collection researchers may often face difficult issues. Therefore, they have to be particularly vigilant to find ethically acceptable solutions. In the case of negative tie research, it is even more essential to let responders know who can access data and research results and on which level of aggregation, as this may have a profound effect on the willingness to respond (Robins, 2015).

Besides the ethical issues, the wording of survey items on negative ties also affect applicability based on the organizational culture (Labianca, 2014). Expressions such as ‘enemy’, ‘hatred’, etc. are too strong and emotionally loaded. Therefore, their use may not only intimidate possible respondents but also draw the ire of managers of the organization in examination. These wordings also raise epistemological questions. For positive ties, it may be easier to argue that by asking a question on an interpersonal nexus, researchers do not considerably change the subject of their study. For negative ties, however, which generally cause a higher level of arousal, the listing of disliked colleagues may be more likely to reinforce said negative judgments and feelings.

Although for certain negative ties (e.g., bullying), we typically cannot avoid calling on them directly and explicitly, better results can usually be attained by refining the phrasing and separating questions into multiple parts. For instance, the *name interpreter* method first asks about the *existence* of the tie and investigate its *valence* only afterwards (Robins, 2015). For avoidance or work conflict relationships, for

example, we may first ask responders to list colleagues whom they regularly come into contact within their work. Then, in another item, we may ask them to rate how easy or difficult it is to cooperate with the listed people on a Likert scale, or how happy or unhappy they are to spend time with them. This method may even work for such complex relationship types as jealousy. Jealousy may be interpreted as the pain felt because of a lower perceived performance in comparison to others, and destructive feelings that ensue (Sterling & Labianca, 2015; Tai et al., 2012). Based on this, first, we can study whom the person compares their performance with (reference persons), then how deserved and just they feel about the perceived results, and finally, the personal and professional value judgments the person makes about them.

We may conclude that because of the limits of survey-based data collection techniques, complex interpersonal relationships such as negative ties may only be studied in an imperfect manner. A single question can grasp but a single component of the above-described tripartite definition, and researchers can only examine these relationships through their models, even if connecting multiple questions. Keeping all this in mind, it may be no coincidence that of all network researchers, authors interested in negative ties are the most motivated to draw upon the toolkit of psychology and social psychology (Casciaro et al., 2015) and attempt to widen the horizons of accepted organizational network theory and expand its methodology.

III.4.2 Data analysis methods

Analyzing negative ties data may prove challenging for network researchers equipped with methodological tools and measures developed for positive ties. The previously presented mechanisms of negative ties make most available analytic tools inapplicable. Most of the known network metrics have built on the transitivity of relationships (if A is B's friend, and B is C's friend, A is probably also a friend of C's), which is not true for negative ties. For multiple centrality measures, we posit that through ties, something is flowing in the network (Everett & Borgatti, 2014). While in negative ties, we may see that on the dyadic level flows may be observed, however, it is unrealistic to have multiple interconnected negative ties transmit the *same* flow (e.g., A dislikes B, therefore shares an inconvenient piece of information with him – regardless of B's dislike for C, they will not be likely to pass on the message from A).

In their significant work, Everett and Borgatti (2014) examined the applicability of known network measures and developed new ones. They found that of the concepts used to analyze positive ties, only the theorem of structural equivalence may be used without modification. This states that actors A and B are considered structurally equivalent if their negative ties go to and come from the same actors. Other concepts, such as the degree centrality measures may be used with some modification, but different conclusions must be drawn when interpreting them. For instance, with positive ties, the network density that comes from high degree centralities implies a more cohesive network. For negative ties, this is not necessarily true for the entire network, besides a fragmented periphery, there may also be a more cohesive center (Everett & Borgatti, 2014). Measures that build on the role of flows (such as betweenness-centrality, i.e., the measure of the mediating function of an actor) are not well suited for negative tie research.

However, the eigenvector centrality (Bonacich-centrality) that describes the relative network influence of the actors still seems useful. For positive ties, this is based on the notion that the position of an actor is stronger if they are connected to popular actors (central, with many ties), than if they were connected to peripheral alters.

As negative ties are often directional due to their higher latency, it seems convenient to use β-centrality (Bouyssou & Marchant, 2018) instead of eigenvector-centrality, but even this is only possible with some modifications. Everett and Borgatti (2014) argue that a negative β-centrality indicate that negative ties coming from popular actors (with many positive ties) are more detrimental to the focal actor than ones coming from less popular actors. They introduced the *h** centrality measure and the PN centrality measure to express this, which are capable of the *simultaneous* handling of positive and negative directional ties. For example, in a specific organizational situation, the PN measure makes it possible to study how avoidance or antipathy appears in an advice-seeking network, and how this affects the position of specific actors or the structure of the whole network.

III.5 Summary

In this paper, I have presented the role and significance of negative ties in organizational social networks based on recent international literature. I presented and compared generally used definitions, and presented consequences drawn from previous research findings according to the four levels of analysis. Finally, I briefly demonstrated the challenges in data collection and data analysis in negative ties research, while providing a few, available solutions.

In this literary review, I also draw attention to some attractive directions for future research. These include the dynamic mechanisms that may be examined through longitudinal studies of negative ties, and enduring roles and personal tactics that appear along with negative ties. The analysis of various negative tie types all represents potential research directions, and the further examination of the topic's methodological and scientific philosophical background also seems lucrative. While we can use the former to develop more accurate data collection and analysis tools inside current network theory, the latter may serve to widen the limits of the framework and open the way to research based on psychology or qualitative methodology.

With this paper, I would like to inspire further academic research and support the development of the network research consulting practice. Organizational network analysis is an efficient diagnostic tool that offers intelligible information to help solve

various managerial challenges and on which workable measures and solutions may be based. If we include negative ties in the scope of studied phenomena, we can avoid one of the significant blind spots of previous studies and arrive at more accurate answers to organizational challenges such as change management, the retention of talented employees, or managing intra-group conflicts.

IV. Relational antecedents of advice-seeking in knowledge networks

Abstract

As a growing number of organizations are engaged in the knowledge economy, innovation is becoming an essential success component. Innovation is almost always the product of collective thinking, cooperation, and co-creation. Thus, instead of examining exceptionally talented individuals, many researchers focus on analyzing networks of people possessing different knowledge, skills, and abilities. Knowledge networks are interconnected systems of actors who aim to share knowledge and generate new knowledge through a combination of knowledge elements. The authors argue for the advantages of a network perspective in the study of advice-seeking and knowledge sharing. Based on relevant literature, they introduce factors influencing advice seeking and knowledge-sharing behavior in organizations. The authors carried out their empirical research in a management consulting company based in Budapest, Hungary. This paper concludes that perceived expertise is the essential prerequisite of successful knowledge-sharing in the examined organization.

IV.1 Introduction

Increasing global competition has put companies' innovative capability in the center of managers' attention and academic inquiries. Companies in the knowledge-based economy should place particular emphasis on developing their ability to renew and adapt in order to remain competitive (Csedő et al., 2018; Sára et al., 2014). This necessity makes the issues of accumulating, managing, sharing, and applying organizational knowledge more significant than ever before (Bencsik & Juhász, 2018).

In the past decades, numerous studies have investigated the development of practical knowledge management systems (Anand et al., 2007; Natalicchio et al., 2017) as well as the requirements and success criteria for their effective functioning (Bencsik & Sólyom, 2012; Csedő et al., 2019a; Mas-Machuca & Martínez-Costa, 2012). Studies

in this field have also highlighted that innovation production conditions have changed considerably: new intellectual content is generated through the collective thinking and cooperation between people with different knowledge (Cheng et al., 2019; Faraj et al., 2015). All of this represents a significant shift from the images we preserve of the lonely polymath inventors of the Renaissance or the systematic but still solitary scientists of the Enlightenment and early modernity. Nowadays, our trust is in groups and networks that share their knowledge and collaborate (Csontos & Szabó, 2019, 2017).

Considerable volumes of research have analyzed learning, knowledge-sharing, and innovation networks both on the inter-organizational (Demeter & Losonci, 2016, 2019) and interpersonal (Phelps et al., 2012) levels of analysis. While research on inter-organizational networks primarily examines knowledge transfer within a company group, a supply chain, or a strategic alliance, interpersonal network researchers focus on knowledge sharing between employees of an organization. In this paper, we focus on interpersonal networks.

Effective interpersonal knowledge sharing is one of the most important domains of knowledge management systems. It ensures that the wide range of knowledge present in organizations is available in the right place and at the right time (Ergün & Avcı, 2018; Park & Kim, 2018) – especially for knowledge that, due to its nature, is difficult to codify. Therefore, successful knowledge sharing in high value-added, knowledge-intensive organizations is also a prerequisite of competitiveness (Anand et al., 2007; Vohra & Thomas, 2016).

Knowledge sharing is, in many ways, a unique organizational phenomenon. Although it can be influenced by structural incentives (e.g., prizes, cash rewards), people cannot be forced by order to share their knowledge (Bordia et al., 2006). However, in order to happen, several organizational conditions must be met that can motivate employees to share their knowledge (Mas-Machuca & Martínez-Costa, 2012). It is mostly unavoidable for one party to recognize their own lack of knowledge and seek advice from another. This requires not only the visibility of the knowledge of the other party, but also their availability, accessibility and the trust needed to address them.

In this paper, we explore the relational conditions of advice-seeking and sharing of knowledge transferable through personal interactions. To give a detailed review of the field, we present the most important models and the latest findings in the relevant domestic and international literature, and then report on the results of our own empirical research. In our research, we seek to answer the question what factors decide to whom members of a knowledge-based organization turn if they need advice. Do they turn to a colleague who has visible professional knowledge and whom they trust? Or someone who is personally close to them and easily accessible? Or perhaps the expertise recognized by the organization, and a formal leadership role in the specific field is decisive? To what extent is knowledge sharing supported by trust and personal sympathy?

We applied a network approach to answer our research questions. The examined organization (a twenty-three-person Budapest based consultancy) was interpreted as a knowledge network formed by its members. We asked employees to fill in a questionnaire about their advice-seeking and knowledge sharing relationships and attitudes. Collected data were organized and analyzed using the UCINET network analysis software (Borgatti et al., 2002). Based on the network data and maps, we conducted additional interviews with employees of outstanding significance so that we could form our conclusions and interpret these in the organizational context. The triangulation of qualitative and quantitative data increases the validity of our research while contributing to the expansion of the methodological range of the predominantly quantitative organizational network theory.

The purpose of this paper is twofold. On the one hand, by presenting the examined organizational example, we would like to draw the attention of researchers to the possibilities of network analysis in the examination of knowledge systems. On the other hand, with our findings we would like to support managerial decisions of other knowledge-intensive organizations and the preparation of measures aimed at creating supportive organizational conditions regarding knowledge sharing.

IV.2 Knowledge sharing and advice-seeking in organizations

In our paper, we first define knowledge and knowledge-intensive organizations, and then describe the benefits of a network approach to advice-seeking and knowledge sharing, primarily based on the international literature of the past few years. Finally, we present the organizational factors influencing advice-seeking and knowledge sharing.

IV.2.1 Basic concepts of knowledge and knowledge sharing

Knowledge is a resource of an organization that can be shaped and is constantly changing, making it difficult to define or measure at any given moment. It is important to distinguish it from mere data or information (Ajmal & Koskinen, 2008): the former refers to unprocessed facts and signs, and the latter to meaningful aggregates of data. However, in order for knowledge to emerge from these, an individual's personal qualities are needed: abilities, experience, and a unique approach that allow them to process and incorporate information into their own knowledge (Ajmal et al., 2010). According to Ajmal and Koskinen (2008), knowledge is ultimately noticeable through an individual's altered behavior. They argue that someone has only truly acquired a piece of knowledge if they use it, for instance, they make decisions based on it – as this is the real purpose of obtaining knowledge.

According to Argote and Miron-Spektor (2011), knowledge can be classified into several dimensions:

a) *Tacit or explicit knowledge*, depending on how and how easily it is articulated (explicit knowledge is easy to put into words, while tacit knowledge is more difficult).

b) *Declarative or procedural knowledge*, depending on the content of the knowledge (the former is factual knowledge, or know-what, whereas the latter is applicative knowledge, or know-how).

c) Based on the clarity of the causal relationship between the elements of knowledge (knowledge characterized by strong or weak causal relationships).

d) Based on the provability, verifiability and demonstrability of knowledge.

e) Based on the possibility of storing knowledge (knowledge that can be codified or not).

In this paper, we focus on non-codifiable tacit and explicit knowledge, which, as it is difficult to store, can only be shared in the organization through personal interactions. This hidden knowledge (Nonaka & Takeuchi, 1995) is also known as personal knowledge: the latter is apt because it also includes individual feelings, perceptions, and intuitions (Jamshed & Majeed, 2019). This knowledge is difficult to put into words (Argote & Miron-Spektor, 2011), so we often use other tools for easier expression: for example, figures, metaphors (Ajmal & Koskinen, 2008) or movements, as well as demonstration in practice. It is possible to learn, for example, through personal interactions: it requires individual skills, experience, practice, and reflection.

Thus, hidden knowledge is characterized by the fact that it is created dynamically through experience and is constantly evolving over time. Therefore, such knowledge is unique in each case and can rarely be found in a fixed or systematic form (Ajmal & Koskinen, 2008), and its transmission may be challenging (Esmaeelinezhad & Afrazeh, 2018). If an organization wishes to leverage the hidden knowledge of its employees, it must invest in developing systems that encourage and support the sharing of personal knowledge.

Knowledge sharing is a form of employee behavior increasing organizational efficiency, in which an individual shares their knowledge, expertise, or experience with their colleagues (Stenius et al., 2017). During knowledge sharing, employees can transfer both skills and expertise to each other (Tsai & Bagozzi, 2014), and due to its mutual nature, new knowledge may be generated, and the learning capacity of the organization may improve (Ergün & Avcı, 2018).

Knowledge sharing is a central element of knowledge management processes as it links the acquisition of knowledge to its utilization at the organizational level (Esmaeelinezhad & Afrazeh, 2018). In addition, it plays a particularly important role in making hidden knowledge applicable. Hidden knowledge can become available to the entire organization primarily through personal interactions and knowledge sharing (Stenius et al., 2017).

The primary means of production of knowledge-intensive or knowledge-based organizations, and thus the basis of their competitiveness, is the knowledge they possess. However, much of it is not codified, but is owned by organizational actors, and thus managers are able to mobilize it through them (Natalicchio et al., 2017). Knowledge-intensive organizations sell structured or transformed knowledge, possibly knowledge-based products, to the market. Their employees mostly have relevant professional expertise and experience as well as excellent intellectual skills. The company relies heavily on all of these in its operations. From knowledge-intensive organizations, we can distinguish two types: (1) professional service firms and (2) research and development firms (Alvesson, 2004). The first category includes, for instance, business service centers or various consulting companies, while the second category includes specialized analysts or organizations created specifically for innovation purposes.

It is organizational learning that makes companies able to create various innovations (Csedő et al., 2019b; Sára et al., 2014). Most definitions on organizational learning concur that it means changes in organizational knowledge that can be inferred from organizational experience (Argote & Miron-Spektor, 2011). Effective acquisition, sharing, and use of knowledge contribute to a company's ability to quickly adapt to its ever-changing environment (Hoe & McShane, 2010). This is particularly essential for companies that not only wish to gain a competitive edge, but also intend to be present in the market in the long run (Park & Kim, 2018).

In light of all this, it is reasonable that, in recent years, scholars have paid particular attention to examining the factors that support organizational learning. Interpersonal trust (Swift & Hwang, 2013), open communication (Hoe & McShane, 2010), knowledge sharing, organizational culture (Flores et al., 2012) and leadership style (Sattayaraksa & Boon-itt, 2016) all proved to be determining factors in the development of effective organizational learning. The listed factors are closely related to each other, but in this paper, we focus on knowledge sharing.

IV.2.2 A network approach to knowledge sharing – knowledge networks

Most papers in the literature divide the analysis of knowledge networks into three levels: (a) interpersonal knowledge networks, (b) intra-organizational (inter-unit) knowledge networks, and (c) inter-organizational knowledge networks (Csontos & Szabó, 2019; Phelps et al., 2012). In this paper, we focus our investigation to interpersonal knowledge networks, including the analysis of advice-seeking and knowledge sharing.

Managing the knowledge, they need for their functioning is equally important to all organizations. Many times, failure is due to the fact that although the knowledge necessary is present in the organization – at one of the employees – it is not available at the given moment. The concept of ambient awareness (Leonardi, 2015) refers to the knowledge of who knows what and who knows whom. The key to accessing knowledge and information is therefore this meta-knowledge: the less explicit and formalized an element of knowledge, the more likely ambient awareness is needed. A network approach to knowledge-sharing relationships is justified by the fact that these processes very often take place through channels other than formal relationships and thus remain in the blind spots of managerial attention (Phelps et al., 2012).

Knowledge sharing has (1) structural conditions (opportunity to share), (2) cognitive conditions (ability to share) and (3) emotional conditions (motivation to share) (Hortoványi & Szabó, 2006), and most of these are embedded in a network of relationships between employees. It is a structural condition that employees have a relationship: to know each other and to communicate with each other in connection with their work. It is a cognitive condition that they have knowledge worth sharing and have the ambient awareness already mentioned: that is, they should be aware of

whom they can turn to concerning a given issue. The emotional condition is determined by the characteristics of the nexus between the actors (strength, length, emotional valence). The existence of trust is also a condition for knowledge sharing, as knowledge sharing also carries risks for the party who requests and the party who provides knowledge. A generally accepted definition of trust is an individual's belief, that the other party will not exploit their vulnerability (Gelei & Dobos, 2016).

From a network perspective, the actors (nodes) of a knowledge and innovation network are the employees and other stakeholders of the organization, and the relationships (ties) between them represent advice-seeking and cooperation. In these directed or reciprocal (one-way or two-way) relationships, information and emotions flow (Borgatti et al., 2014).

Interpersonal networks also play an essential role in the diffusion of innovations within organizations, as the network structure predict related flows (Chan & Liebowitz, 2006). It matters, for example, how dense a knowledge network is (i.e., how many of all possible knowledge sharing relationships are actualized) or from how central an actor a content originates. Network experiments prove (Takács, 2010) that if we assume a reward for the transfer of innovation contents (i.e., material, emotional, power payments), due to the networked dissemination of knowledge, it is not the inventors but the most effective distributors (brokers) who will receive the largest share.

With the tools of organizational network analysis, we are able to study and compare patterns of interpersonal interactions in various social networks (Vohra & Thomas, 2016). A knowledge network is a system of interrelated actors whose primary purpose is to share the knowledge possessed by other actors and thereby create new knowledge (Škerlavaj et al., 2010; Tortoriello et al., 2012). In knowledge networks, actors may serve three functions. First, they might be repositories of knowledge (i.e., *knowledge owners*) possessing different knowledge elements. Second, they might be active contributors to the acquisition and transfer of knowledge (i.e., *knowledge brokers*). Third, might also be the creators of new knowledge elements (i.e., *inventors*). These functions emerge from the network of relationships between actors that facilitates as well as regulates the creation and flow of knowledge (Phelps et al., 2012).

Relationships in a knowledge network also serve three functions. First, they are channels through which information flows (Borgatti et al., 2009), and second, they are tools that help to combine knowledge (Škerlavaj et al., 2010). Third, they are filters: through them, do actors view, perceive, and evaluate each other's knowledge (Borgatti & Cross, 2003).

Central actors in the core of the network have a particularly significant role in knowledge networks. The more a person is considered a hub in the network, the more opportunities they have to gather and distribute a wide variety of information (Phelps et al., 2012). The central nature of an actor can be determined by numerous metrics (Robins, 2015). Degree centrality (or, in the case of directed relationships, indegree centrality) is a measure of how many people turn to a given actor and how many others pass on knowledge and information directly to them. Eigenvector centrality, on the other hand, also takes into account the extent to which those who turn to a given actor are in a central position themselves. In a knowledge network, this means that people who ask for knowledge from the focal actor themselves share knowledge with many – thus, they can reach more people with a given content. Betweenness centrality shows how many of the shortest paths between all actors pass through the focal actor. It signifies an actor's significance in the dissemination of knowledge elements.

Due to a high centrality, the hidden (i.e., tacit) knowledge possessed by an individual actor will be much more accessible to the organization than if it were located on the periphery (Phelps et al., 2012). Research has also shown that the number of connections (i.e., network density) is also related to the frequency of knowledge sharing. The denser the network, the more often employees transfer knowledge to each other (Tortoriello et al., 2012).

Strong interpersonal relationships also positively affect the sharing of hidden knowledge through building trust, mutual commitment, and shared norms between the two parties (Phelps et al., 2012). The strength of trust relationships (Granovetter, 1973) is reflected in their emotional valence, temporal endurance, and frequency of communication (Chan & Liebowitz, 2006). Individuals who talk more to each other and also like to spend time in each other's company, are more likely to share knowledge with each other than those who are emotionally further apart (Hortoványi & Szabó, 2006). Other researchers have found that the stronger the relationship between two actors, the easier it is for them to share hidden knowledge with each other (Tortoriello et al., 2012).

Finally, the physical distance between network actors also has an impact on knowledge sharing. According to a study by Christensen and Pedersen (2018), employees who are physically closer to each other are more likely to exchange knowledge than those who work farther away. However, this leads to the disadvantage that the resulting network clusters have relatively homogeneous knowledge: their members have more difficulty accessing the new knowledge elements needed to produce innovative content (Phelps et al., 2012).

IV.2.3 Advice-seeking networks, the motives of advice-seeking

The direction of the relationship between actors involved in knowledge sharing determines the way information flows. The recipient of knowledge is motivated by different factors to acquire knowledge than the source of knowledge to share it. James Nebus (2006) emphasizes the importance of advice-seeking and, in contrast with the conventional approach, investigates how an individual's decisions affect the characteristics of the knowledge network in which they are embedded. In Nebus's (2006) approach, the knowledge network is a social network in which actors are selected by the focal actor based on her intent to seek advice from them and their willingness to share. Consequently, her decision is based on whom the actor knows, on what basis she chooses from knowledge owners, and for what motives will she eventually seek out someone. For a focal actor to maintain her knowledge network, she should also sustain and preserve her relationships (Nebus, 2006).

The focal network actor can choose from members of two groups when it comes to asking for advice. On the one hand, they may seek out acquaintances within their existing personal network. On the other hand, they may turn to actors with whom they have neither personal nor professional relationship, but whose knowledge potential they recognized (Nebus, 2006). According to Borgatti and Cross (2003), the focal actor's perception of another person also influences whom they turn to for knowledge: their judgment is formed by direct conversations and observations and by other people's opinion.

The visibility of professional expertise strongly influences whom a focal actor turns to for advice (Leonardi, 2015). The actor seeking for advice should also be aware where knowledge is accumulating within the organization. It is also substantial to know which other actor can help them with a particular issue, that is, who knows what. Borgatti and Cross (2003) also emphasize the significance of knowledge related judgments. They argue that an advice seeker is more likely to turn to a co-worker for advice, if they consider their knowledge valuable.

With regard to interpersonal relationships, previous studies have shown that advice seekers often turn to people who are sympathetic to them rather than to actual knowledge owners. In their study, Casciaro and Lobo (2005) examined the work choice preference of employees: they wished to know if sympathy or competence is more important. Based their research findings, personal emotions play a more substantial role in the formation work-related relationships than the degree of competence. If an employee is disliked, others will be reluctant to work with them, regardless of their visible professional competence (Casciaro & Lobo, 2005).

The selection of the knowledge owner is also affected by the subject of the knowledge and the nature of the task to be solved. If the task is well-structured and clear to the information seeker, they can better assess the knowledge required for the solution, and this can narrow the range of potential knowledge owners (Nebus, 2006).

According to Cross et al. (2001), the advice seeking usually stems from one of the following five motivations:

a) ***Solutions***: request for information that helps solve a task, question, or problem, the content of which is usually factual or procedural knowledge (know what and know how).

b) ***Meta-knowledge***: information on the location or whereabouts of knowledge.

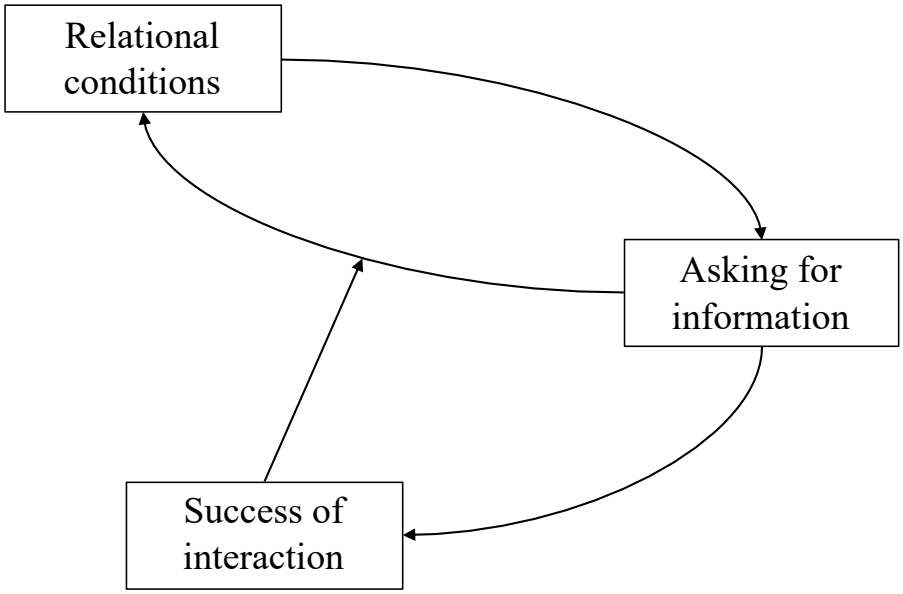
c) ***Problem reformulation***: the advice seeker gains a new of approach, creative framing, or an external point of view.

d) ***Validation***: the advice seeker wishes to confirm their knowledge – their self-confidence may increase through the interaction, so they will be able to share their knowledge more easily with other actors.

e) ***Legitimation***: here the focus is on the person of the knowledge owner; his expertise and personality can lend credibility to the knowledge seeker.

Borgatti and Cross's (2003) research on the formation of advice-seeking networks has shown that every time we reconnect with someone, we rewrite our previous image of the person (see *Figure 15*). At these times, the skills, attributes and knowledge identified with the person are also re-evaluated, and the assessment of the costs and benefits of seeking knowledge is recalculated. Consequently, the probability that the given person will be revisited by the knowledge seeker also changes (Borgatti & Cross, 2003).

Figure 15 The Dynamic model of advice-seeking and learning



Source: Borgatti & Cross, 2003, p. 442

IV.2.4 Factors influencing advice-seeking and knowledge sharing

The employees' attitudes and behavior related to knowledge sharing play a critical role in the actual knowledge transfer that takes place in an organization. Defining knowledge-sharing behavior as a function of the free will of employees raises the question of how this substantial behavioral pattern can be intentionally encouraged within the organization. Based on previous research, six factors influencing knowledge sharing are presented below.

1. ***Personal motivation***: a fundamental condition for effective knowledge sharing is that both the source and the recipient are motivated to interact (Quigley et al., 2007; Stenius et al., 2017).

2. ***Knowledge-sharing self-efficacy*** refers to an individual's self-confidence in their ability to share knowledge effectively (Hsu et al., 2007). In his research, Wang (2016) found that knowledge-sharing self-efficacy is positively correlated to an individual's knowledge-sharing behavior — that is, the more confident somebody is in their knowledge-sharing abilities, the more likely they are to share their knowledge with others.
3. ***Interpersonal trust***: employees are more likely to share knowledge with colleagues they trust (Hsu et al., 2007); this is especially true for sharing hidden knowledge (Park & Kim, 2018).
4. ***Supportive organizational culture***: the effect of a culture that supports knowledge sharing is that employees are aware of the value of knowledge, and thus place an emphasis on sharing it as while seeking out each other with greater confidence (Park & Kim, 2018).
5. ***Leadership***: recent research suggests that transformational leadership plays a significant role in stimulating knowledge sharing (Park & Kim, 2018); leaders have a key role in providing space for the free flow of knowledge within the organization by introducing measures to promote knowledge sharing, leading by example, open communication, and allowing for experimentation and continuous learning.
6. ***External incentives***: incentives provided by the organization have a positive effect on knowledge sharing if these are reinforced with cultural elements (Quigley et al., 2007); employees who are motivated by external incentives are less likely to share knowledge than those who are driven by internal motives (Nesheim et al., 2011).

Minbaeva (2007) claims that the factors influencing the success of knowledge sharing can be classified into four categories according to whether they affect the source of knowledge, the recipient of knowledge, the knowledge content itself, or the organizational environment. For example, one party's ability to share (disseminate) knowledge is highly dependent on motivation and self-efficacy presented above, while the other party's ability to receive (absorb) knowledge is influenced by, beside other factors, interpersonal trust (Minbaeva et al., 2003). The organizational environment has a strong influence on the development of both dissemination and

absorption skills (Yang & Chen, 2007), for instance, through supportive organizational culture, leadership styles, and external incentives. Based on previous research results (Szász et al., 2019), dissemination skills are mostly determined by knowledge-sharing-oriented organizational culture, feedback systems and structures that encourage knowledge sharing, and the intensity of interactions between departments.

IV.3 Research concept and methods

With our research, we wished to explore whom employees turn to in their knowledge network when they seek advice. As a context of the knowledge network, we also examined questions related to corporate knowledge management practice.

In our empirical research, we build considerably on models and previous research findings presented above. With our own results, we wish to contribute to the stream of literature discussing the dynamics of knowledge networks, while our goal is to gain a deeper understanding of why and how advice-seeking happens in organizations. Based on Hortoványi and Szabó (2006), we examine the structural conditions (availability, accessibility), cognitive conditions (perceived expertise) and relational conditions (sympathy, trust) of advice-seeking. Based on Nebus (2006) and Leonardi (2015), we also take into account the recognized and perceived competence of selected knowledge owners within the organization. In our research, we compare the position of actors in the formal hierarchy with their position in the networks of advice-seeking, trust, and sympathy relationships (Borgatti & Cross, 2003). We examine the correlations between these factors and the extent to which they contribute to the realization of advice-seeking.

The organization in analysis

The research was carried out at a Budapest based multinational company, where we invited the employees of the consultancy division to our sample pool. The company has been present in Hungary for almost two decades, during which it has shown a constant and dynamic development. As a consultancy, the company's core business is to produce and sell knowledge, thus it is a good example of the knowledge-intensive firm. In order for a company to maintain its competitive advantage in the market, it must constantly evolve. This is why the company's organizational-level strategic objectives encourage continuous renewal and innovation. Individuals involved in the study were consultants or staff members who support them. They all work on several projects of various sizes, in different team compositions.

Methods

Our investigation consisted of two parts. First, with the help of a questionnaire, we collected data related to the organization's knowledge-sharing practices, and we also surveyed the employees' opinions and satisfaction in this regard. We then conducted additional interviews with key actors of the emerging knowledge networks in order to get a more complex explanation and insight into network dynamics and the knowledge management processes of the company.

The questionnaire was completed by 21 of the 23 people working in the consultancy, indicating a 91 percent turnout. The survey included questions on the respondent's relationships with other employees, as well as six-point Likert-scale questions evaluating relationships and organizational knowledge management practices. Employee relationships were measured by (1) sympathy, (2) trust, (3) perceived expertise, and (4) self-reported actual advice-seeking using the following questions. Respondents could nominate up to four people for each question in order to limit their choices to the most significant relationships.

1. Whom do you like to meet after working hours?
2. Whom do you turn to if you need personal advice?
3. Which of your colleagues stand out with their professional knowledge?
4. Whom do you contact most often if you need knowledge related to your work?

In connection with the question on advice-seeking, we also asked in which subjects the respondents sought out a given actor and how satisfied they were with the information's quality. The Likert scales were set to six points to avoid centering and because the diagnostic tools used by the consultancy also included such scales – making this a familiar solution for respondents. We also asked the respondents to whom they would turn more often for knowledge if they had the opportunity. Here again, we were curious about the subject of the needed knowledge and the reason why the desired advice-seeking interaction had not realized.

Data collected by the questionnaire were studied using the network analysis software called UCINET (Borgatti et al., 2002). With this program, we calculated the centrality measures for the network and the individual actors, visualized various dimensions of the social network. The correlations between the variables and different centrality measures were analyzed with the SPSS 25 statistical program.

Based on the results of the questionnaire, we conducted semi-structured interviews with three key players of the network. These interviews served to provide insight into the knowledge management practices of the focal organization. In this process, we used the three-component model presented previously by Mas-Machuca and Martínez-Costa (2012): we examined the effects of technological, strategic, and cultural factors. The interviews were intended to explore the strategic and technological factors that support or hinder effective knowledge sharing among employees. In addition, our goal was to learn about the organizational culture of the company to better understand how it might influence knowledge sharing. Finally, we also wished to know how interviewees evaluate their role in the knowledge network.

The interviewees were selected so that their individual points of view would help understand these issues. Two of our three interviewees (A10 and A12) were managing senior consultants whose selection was also justified by their central role in the knowledge network. Interviewee A15 had been working as a junior consultant for a shorter period of time in the organization: we rely on their insights primarily to complement managerial perspective.

Research ethics

Organizational network analysis differs from other organizational diagnostic tools in many important respects, and because of these differences, it is particularly important to enforce considerations on research ethic. For example, in network analysis, the anonymity of respondents cannot be guaranteed, as in order for interpersonal relationships to be identified and analyzed, respondents should nominate other actors (Borgatti & Molina, 2003). It is also an inherent characteristic in network analysis that respondents could also nominate individuals who refused to participate in the research for some reason (Kadushin, 2005) – as was the case in our study.

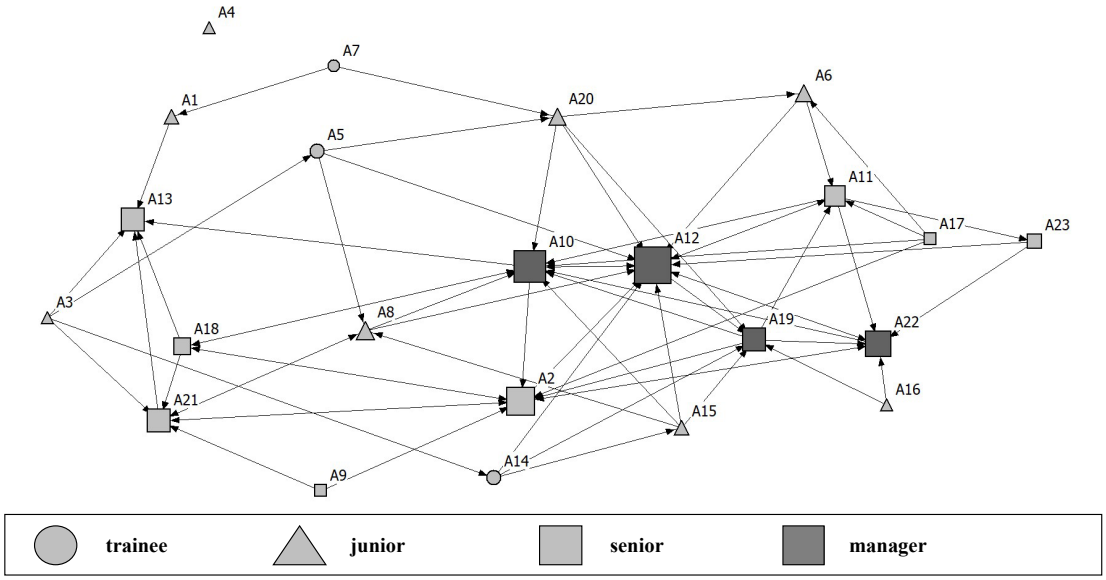
Network analysis also makes it necessary to ensure a high participation rate, for which it was substantial to reinforce respondents' trust by transparent communication. One of the crucial points in organizational network analysis is the handling of collected data (Kadushin, 2005). Respondents may have doubts about who can access their data and for what purposes they can be used – all of which can distort their answers. To avoid this, it was essential to keep participants properly informed throughout the process. On the one hand, we transparently communicated the objectives of our research as well as other information related to the completion. On the other hand, we indicated that participation was voluntary. Respondents were informed that the recorded data could only be accessed by the persons conducting the research.

IV.4 Results

IV.4.1 Analysis of the knowledge network

The knowledge network of the examined organization is depicted in *Figure 16*. The color and shape of the vertices represent the different ranks of network actors (trainee, junior, senior, manager), while the size of the nodes refers to the number of incoming connections (indegree centrality). Ties between nodes: the arrow expresses the direction of the relationship, in case of a back-and-forth arrow, the choice is reciprocal. (The graph is based on the answers to the question "*Whom do you contact most often if you need knowledge related to your work?*".)

Figure 16 Advice-seeking network in the organization of analysis



Source: own compilation

Examining the knowledge network, we found that everyone except one actor (A4) seeks advice from or provides knowledge to at least one other actor. The core and the periphery are clearly separated in the network. On the other hand, clustering — that is, the formation of cliques that have many internal and few external connections — is less common. Managers and senior consultants are generally more popular, with more people turning to them to acquire the knowledge they need for their work.

However, we also see a counterexample: actors A9 and A17 are seniors, yet no one seeks them out for knowledge. Trainees have apparently been successfully integrated into the knowledge network: two out of three do not only request but also provide knowledge to others.

In addition to indegree centrality, the calculation of two other centrality measures was essential. Beta-centrality is an indicator similar to eigenvector centrality presented earlier in our study, but applicable to directed networks. Beta-centrality gives a more accurate picture than indegree centrality as it takes into account not only the absolute number of relationships an actor has, but also the popularity of the actors with whom that actor is in connection. In a network of advice-seeking relationships, this means that actors with a high Beta-centrality are the knowledge sources of frequently sought out knowledge owners.

In order to identify employees who are key players in the flow of knowledge, we also calculated the betweenness centrality of the actors. Employees with a high betweenness centrality are important because knowledge contents flow through them most frequently.

Table 4 summarizes the measures of each actor in the knowledge network. (Further columns in the table refer to the networks indicated in *Figures 17* and *18*.) The values for Beta-centrality and betweenness centrality are normalized. In the advice-seeking network, the indegree, Beta, and betweenness centrality measures show a very strong and significant correlation: Spearman coefficient between indegree and Beta-centrality is 0.970, and between indegree and betweenness centrality is 0.847. This means that, apart from a few exceptional cases, the central actors who are sought out the most often, primarily build on each other's knowledge and they are also essential in the dissemination of knowledge.

A remarkable exception to this is actor A18, for instance, from whom only two other actors seek knowledge (A2 and A10), even though their Beta centrality is still above that of A21 and close to A13 (yet these actors have five incoming ties). This is because A2 and A10 are central actors, while those who seek out A13 and A21 are peripheral.

Table 4 Centrality measures in the analyzed networks

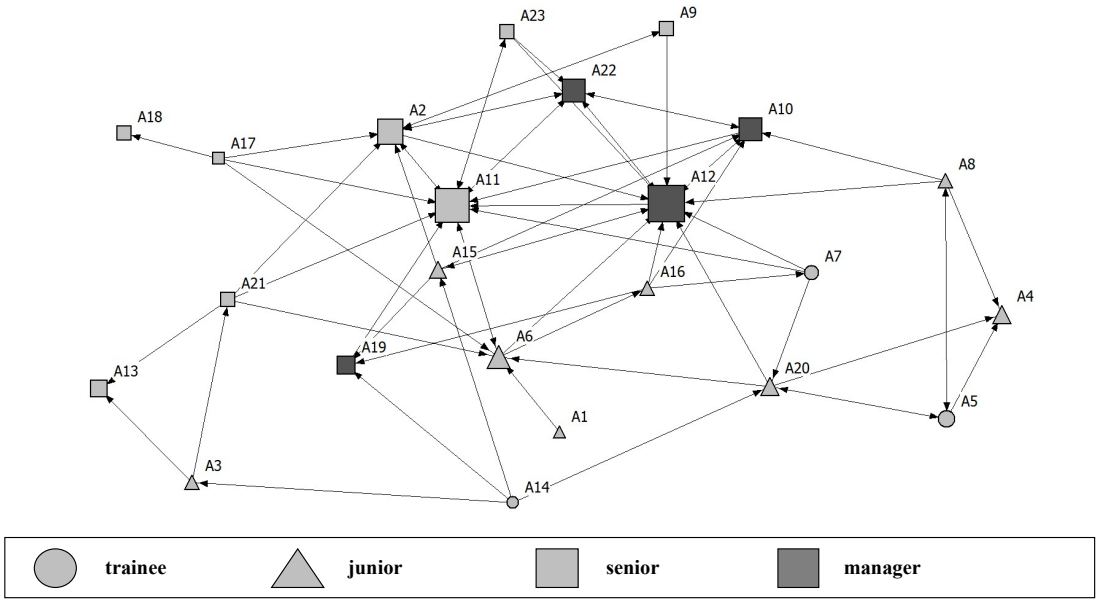
		Advice-seeking			Interpersonal trust			Sympathy		
ID	Position	Indegree	Beta	Betweenness	Indegree	Beta	Betweenness	Indegree	Beta	Betweenness
A1	junior	1	0.001	0.216	0	0.000	0.000	0	0.000	0.000
A2	senior	7	2.071	8.174	6	1.610	7.031	1	0.855	1.858
A3	junior	0	0.000	0.000	1	0.001	0.433	0	0.000	0.000
A4	junior	0	0.000	0.000	3	0.013	0.000	5	1.097	0.000
A5	trainee	1	0.001	0.941	2	0.009	4.329	4	0.857	6.843
A6	junior	2	0.003	0.397	5	0.701	23.432	5	1.300	15.934
A7	trainee	0	0.000	0.000	1	0.053	13.244	1	0.365	1.486
A8	junior	3	0.327	1.621	1	0.004	1.106	2	0.674	3.045
A9	senior	0	0.000	0.000	1	0.439	0.000	2	0.353	1.667
A10	manager	9	2.134	7.840	5	1.456	1.977	4	0.951	3.092
A11	senior	4	0.865	4.872	10	2.531	21.666	8	2.742	20.833
A12	manager	11	2.230	10.038	11	2.213	11.495	4	1.146	8.975
A13	senior	5	1.332	0.000	2	0.003	0.000	3	0.384	0.000
A14	trainee	1	0.001	1.031	0	0.000	0.000	2	0.530	2.749
A15	junior	1	0.001	0.554	2	0.604	3.369	3	0.526	6.151
A16	junior	0	0.000	0.000	1	0.192	17.843	4	1.143	7.100
A17	senior	0	0.000	0.000	0	0.000	0.000	0	0.000	0.000
A18	senior	2	1.250	1.116	1	0.001	0.000	0	0.000	0.000
A19	manager	5	0.669	4.004	3	0.220	1.117	1	0.427	0.000
A20	junior	2	0.002	3.213	3	0.021	13.807	5	1.168	9.170
A21	senior	5	1.008	4.337	1	0.002	3.463	2	0.270	3.359
A22	manager	6	1.814	2.730	5	2.318	2.252	2	1.367	5.195
A23	senior	1	0.258	0.000	1	0.690	0.216	4	1.642	3.193

Source: own compilation

Respondents of the questionnaire were asked to rate their colleagues whom they seek out for knowledge on a six-point Likert scale based on (1) their closeness and accessibility; (2) competence; and (3) recognition as a subject matter expert by the organization. Our preliminary expectation was that of these dimensions, perceived competence would be the most decisive in selecting the target of a knowledge request. This expectation was confirmed: in 88.1 percent of the cases, the respondents strongly agreed that the target of their request was competent, and in a further 11.9 percent they rather agreed with this statement. In contrast, only 59.7 percent of respondents agreed that they felt close to the knowledge owner and 64.2 percent claimed that the knowledge owner was a formally recognized expert on the topic.

We were curious to what extent this perceptual statement about their own selection was supported by further network data, so we examined the position of actors in two additional networks. *Figure 17* shows the relationships of trust between actors (based on the answers to the question “Whom do you turn to if you need personal advice?”) And *Figure 18* shows the sympathy relations of actors (“Whom do you like to meet after working hours?”).

Figure 17 The network of trust relationships in the examined organization



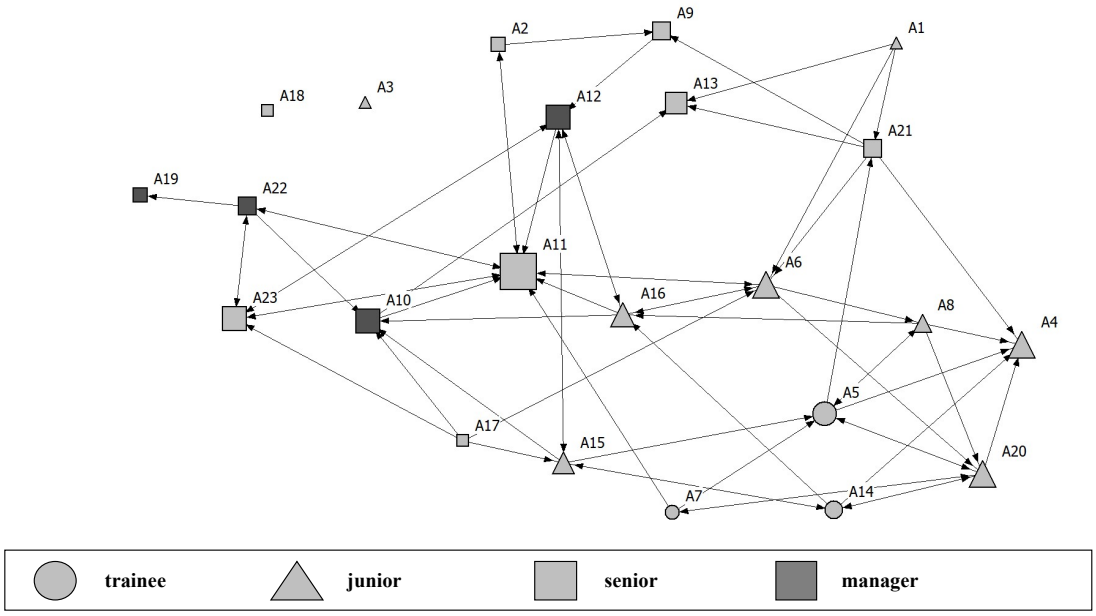
Source: own compilation

The dominance of senior employees is also evident in the network shown in *Figure 17*: it is them too, who form the center. The network of trust relationships is more clustered – primarily in the center, while smaller cliques can be observed on the periphery (e.g., A13-A21-A3 or A8-A4-A5-A20). Some actors, such as A11, gained more significance in the network of trust than in advice-seeking: they were chosen by ten others in the network shown in *Figure 16*, compared to only four in *Figure 17*. Overall, however, we can see that the network of confidential personal advice and work-related knowledge requests follows a similar pattern. The indegree values of advice-seeking and trust relationships show a significant, moderately strongly correlation (Spearman's $\rho = 0.654$).

The network of sympathy relationships shown in *Figure 18* is much more clustered, and it is clear that managers and seniors are segregated into two clusters from the clique of juniors and trainees. One reason for this may be the power and social distance between the groups. It is apparently still significant, even though the organization is flat and the age difference between the members is relatively small. Between the three clusters, actor A11 forms a bridge, and their resulting key role is important.

In this network, we see patterns considerably different from the previous two, so it is no surprise that there is no significant correlation between the values of indegree centrality in the advice-seeking and the sympathy networks. That is, even though it seems that some degree of trust is required to seek advice related to work, it no longer follows that a sympathy relationship extends beyond working hours.

Figure 18 The network of sympathy relationships in the examined organization



Source: own compilation

So, what decides whom the employees of the organization seek out for knowledge necessary for their work? To get an answer to this question, we compared the networks emerging along the four survey questions.

The elements in the adjacency matrices of graphs take values of 0 or 1 for all four networks, depending on whether or not a relationship described as $A_{i,j}$ exists. All four networks contain directed connections, so the adjacency matrices are not symmetric. The actors could not have selected themselves, so we can ignore the main diagonal of the matrices. Thus, in theory, a total of 506 connections are possible in each of the four networks, but since the actors could nominate up to four other people in each one, the maximum possible connection is 92, respectively.

The relationship data sets of the four networks were examined using binary logistic regression. In our model, we considered the actual (reported) advice-seeking as the dependent variable, while we set the sympathy, trust and perceived expertise relationships between the actors as independent variables. Our obtained model has significant explanatory power ($\chi^2 = 141{,}580$; $p = 0.000$; Nagelkerke $R^2 = 0.453$). The result of the Hosmer-Lemeshow test is not significant ($p = 0.454$), so we can state that our model fits properly with the measured data.

Table 5 Independent variables in the binary logistic regression model

	B	S.E.	Wald	df	Sig.	Exp(B)
Sympathy	-1.039	0.527	3.887	1	0.049	0.354
Trust	3.242	0.462	49.179	1	0.000	25.581
Perceived competence	2.452	0.353	48.332	1	0.000	11.615
Constant	-3.240	0.253	163.418	1	0.000	0.039

Source: own compilation

According to our model (see *Table 5*), sympathy ($p = 0.049$), interpersonal trust ($p = 0.000$) and perceived expertise ($p = 0.000$) also have an influencing force on the development of knowledge-seeking relationships. It is a surprising observation, however, that while trust and expertise have a positive effect on the dependent variable, as we expected, the sympathy relationships surveyed in the questionnaire make it less likely to seek professional help from a given actor. (This is indicated by the negative sign of the coefficient B in *Table 5* and a value less than 1 of the coefficient Exp (B).) Based on our model, the existence of interpersonal trust makes about 26 times more likely, and the perceived competence of the knowledge owner make about 12 times more likely the formation of an advice-seeking tie between two given actors.

IV.4.2 The organizational context of the knowledge network

We present the evaluation of the organizational knowledge management system based on the three factors defined by Mas-Machuca and Martínez-Costa (2012). According to them, the implementation of effective knowledge management is related to three conditions: (A) technological factors, (B) strategic factors and (C) cultural factors (Mas-Machuca & Martínez-Costa, 2012). In the following, we will evaluate the examined organization along these factors, building on the results of the questionnaire and the statements of our interviewees.

A) Technological factors

The interviews revealed that the organization has outdated technological capabilities in terms of knowledge management.

"We're not good at technology at all. There is a Facebook group where you can connect more directly with each other. We also share many articles here. There is also a global platform, but it's not at all exciting to sit in front of it. (...) The use of SharePoint sometimes catches up, and sometimes dies completely". (Interviewee A12)

The weakness of the technological conditions is due, on the one hand, to the shortcomings of the applied technological solutions. On the other hand, according to A10, the knowledge accumulated in the organization is growing so fast that such a large amount of information can only be well transferred in a suitable system, which they do not yet possess. Although all three interviewees claimed that they would see the potential benefits of technological improvements, they could not mention any specific plans in this direction.

B) Strategic factors

In knowledge-intensive industries, a company's competitiveness results from its innovative endeavors: it can build its knowledge quick and flexible in response to the changes in the environment (Hoe & McShane, 2010). In the case of the examined organization, goals related to innovation were prominent in their strategy. There is an explicit expectation for everyone to form the organization into one of the best consulting companies in the country with a constructive intention and conscious search for opportunities. Interviewee A12 also referred to this: *"We make a living from knowledge, so it is strategically important that we focus on it."*

Despite its strategic importance, the interviewees claimed that little external knowledge was built into the organization. In the company, most of the consultants are former trainees, so employees within the organization can usually learn from the same few people over the years, thus developing a similar mindset. It is also important to note that consultants can also learn from their clients and potential subcontractors — quasi-network actors outside the organization — which, however, were not covered in our research rather focusing on the internal knowledge network.

According to the interviewees, the management of the organization supports the development of knowledge management processes. To this end, a number of strategic actions have been identified that promote not only the integration of external knowledge but internal knowledge sharing as well. Among the performance indicators of the senior consultant responsible for knowledge management there are system development objectives. Acquisition of external knowledge is supported by the following activities: taking online courses, attending conferences, reading a book of choice related to work, collaboration with subcontractors, mentoring programs, sharing professional articles. Every week, a fifteen-minute event contributes to the internal knowledge sharing, during which colleagues share a current success story or a lesson learned.

C) Cultural factors

Our interviewees claimed that the organizational culture in the examined organization supports knowledge sharing. This was in line with the results of the questionnaire: according to this, employees eagerly turn to each other for knowledge, they do not have to fear rejection. 95 percent of respondents also agreed that it was up to them to acquire the necessary knowledge. That is, they believed that if an individual did his best, in most cases they were able to acquire the knowledge or information they wanted. The opinion of interviewee A12 also confirmed the supportive nature of the organizational culture:

"There will always be a way to find something you are interested in or that you want to deal. (...) Culturally, the more people have a role in paying attention to knowledge transfer, the bigger the chance to keep knowledge sharing alive in the culture".

Among the cultural factors, the interviewee A10 highlighted common values and norms as determining components. In their view, it is very important that the behavioral expectations everyone should follow are clearly stated and explicit. Cultural norms had been formulated together so that most can identify with them. These include trust, flexibility, reciprocity, regular feedback and community. According to A10, the pursuit of perfection and precision is an essential part of their organizational culture:

"A very important point of distinction for our team in terms of knowledge is that everyone's expectation is relatively hight towards themselves and their teammates. We are constantly thinking in an innovative and inventive mindset. (...) We never try to get comfortable in our current situation. We always want to invent something new".

The interviewees also proposed a novel idea: they argued that one condition of knowledge sharing is the passion for work. Interviewees A12 and A15 emphasized the significance of intrinsic motivation. They claimed that people prefer to ask for knowledge from others they perceive as having a passion for the given topic and are eager to talk about it.

"It's also visible from the outside who is inspired by what, which has a very strong impact on who you turn to. (...) In this profession, it really does matter what you are enthusiastic for. You can only be really good at what you do with heart and soul". (Interviewee A15)

According to interviewee A10, the goal is to have as many people as possible to possess the necessary knowledge in an easily understandable and transferable form. Everyone should have similar knowledge and ideas on a given topic, and each topic should have a designated subject matter expert who can be addressed by others if they have a relevant question.

This role of a subject matter expert, however, can have a detrimental effect on the work and schedule of those designated. According to the report of subjects A10 and A12, ad hoc inquiries, unexpected extra tasks all have a negative effect on work-life balance, and this can "fragment" people's life. Interviewee A10 told us that extra tasks often take time from exactly those significant improvements that could help reduce the workload.

Overall, we can conclude that organizational strategic factors and the organizational culture explicitly support the accumulation and sharing of knowledge among employees. It is remarkable, however, that knowledge sharing can also pose a danger to overload individuals who are often sought out with requests for knowledge. It is also emphasized that by developing the technological tools used by the organization, there could be a way to share the burden of advice-seeking on individual actors.

IV.5 Discussion

In this paper, we examined the conditions of the realization of advice-seeking and knowledge sharing, which are becoming increasingly important for the success of high value-added, knowledge-intensive organizations. As a basic assumption, we accepted that knowledge flows through relationships between the members of the organization, and is created, in part, by the combination of different knowledge elements in interactions among these actors. Consequently, in our paper, we argued for the usefulness of a network approach to examining advice-seeking and knowledge sharing phenomena.

In our empirical research, relying on the methodological tools of organizational network analysis, we wished to define on what factors depend on whom members of a knowledge-based organization seek out if they need professional advice. We found that in the organization of analysis, it is primarily interpersonal trust and the perceived competence of knowledge owners that decides from whom a person asks advice (knowledge or information) related to their work. On the other hand, personal sympathy among employees, as measured by a willingness to meet beyond working hours, reduced the likelihood of developing advice-seeking relationships in the examined organization.

This finding may be due to the fact that employees who are a pleasant company are not necessarily those who are regarded as competent and reliable sources of knowledge – and vice versa. Advice-seeking ties in the examined organization are largely directed at managers and senior consultants, who in turn are less popular in the sympathy network: perhaps they are less selected by junior employees because of differences in position and age. Another reason for this finding may be that asking for information from sympathetic and easily approachable colleagues is so natural and self-evident that these occasions are more difficult for respondents to recall when completing the questionnaire.

Casciaro and Lobo (2005) distinguish four types of employees based on whether their perceived level of competence and social acceptance is high or low. They conclude that while everyone is happy to connect with colleagues who achieve high values along both dimensions, competent but unpopular colleagues are mostly avoided. With

our findings, we have somewhat nuanced this picture. Our partially different results in knowledge-based organizations may be explained by the positive correlation between seniority and accumulated knowledge, as well as the negative correlation between seniority and accessibility and personal sympathy. However, we should point out a limitation of our research: we only examined positive relationships, so we did not take into account the effects of negative ties (Baksa, 2019; Labianca, 2014), which may significantly alter and influence advice-seeking relationships.

The generalizability of the results of our research is limited by the fact that we examined only one organization, whose size and other characteristics (such as the degree of fluctuation or the extent of the external, interorganizational network) may have influenced our results. Since, according to the dynamic model of knowledge request (Borgatti & Cross, 2003), the realized knowledge sharing interactions also change the level of trust between the actors and the perception of each other's competence, it would be worth enhancing our cross-sectional research with a longitudinal data collection. Further research into the drivers and conditions of knowledge sharing, for example by involving dissemination and absorption capabilities, also seems promising (cf. Szász et al., 2019).

This paper aimed to draw the attention of organizational scholars to the field of knowledge networks. Our own findings partly confirmed and partly further nuanced a number of previous research results. We conclude that management practitioners in knowledge-based organizations such as the one we examined, can increase the likelihood of knowledge sharing invaluable for their competitiveness, primarily by strengthening trust among employees and enhancing the visibility of their expertise.

V. A multiplex network approach to advice-seeking

Abstract

A revolutionary advancement of technology in the past decade brought the attention of academics and management practitioners on how to improve the innovative capabilities of organizations. Advice-seeking relationships have an essential role in the knowledge production of modern-day organizations as they enable actors to acquire information, professional support, and knowledge elements they can recombine to form new knowledge. This paper conceptualizes advice-seeking behaviour as part of an inherently complex social world that can best be captured by a multiplex approach to organizational network research. It investigates how different layers of interpersonal relationships in the workplace may contribute to the appearance of advice-seeking interactions. This study examines the cases of three knowledge-intensive organizations and applies binary logistic regression to shed light on the yet invisible relational foundations of workplace collaboration.

Implications for Central European audience: Central European countries attempt to improve their economic competitiveness by attracting knowledge-intensive companies as well as incentivizing innovation and digital transformation. Knowledge-intensive firms, such as business services centres or information and communication technology companies, are significant contributors to the economic output of countries like the Czech Republic, Hungary, and Poland. Recommendations derived from the results of this paper provide insights to the leadership of knowledge-intensive companies on how to create organizational environments that foster knowledge sharing and innovation. Measures that promote interpersonal trust, the visibility of expertise, and boundary-spanning behaviour are advised.

V.1 Introduction

Stimulating and fostering knowledge sharing and collaboration is often considered one of the primary challenges for managers in modern organizations, particularly in knowledge-intensive companies (Alvesson, 2004). According to the knowledge-based view of the firm (Pereira & Bamel, 2021) the role of an organization is to integrate the knowledge of its members. The relationship between its capacity to do so and its innovation capability is well documented (Mendoza-Silva, 2021; Odei & Stejskal, 2018; Škudienė et al., 2020) and understood by management scholars to contribute to the firm's competitive advantage. Some factors that support the innovation capability of an organization such as management support (Minbaeva, 2007), organizational culture (Ajmal & Koskinen, 2008), organizational structure (Ajmal et al., 2010), absorptive and disseminative capabilities (Szász et al., 2019; Whitehead et al., 2016), external relations (Csedő & Zavarkó, 2020), and the use of technology, have been extensively researched. Ultimately, however, it is individual employees who decide to ask for advice, share their knowledge, or collaborate. As all the above phenomena depend on actual and factual individual behaviours, it is reasonable to investigate and analyse the individual-level behavioural patterns behind the actual outcomes.

Knowledge within the organization is rarely enough in itself: it should be transferred between actors to be present at the right place, at the right time. Although knowledge-intensive organizations use a multitude of technologies to externalize, store, and share knowledge, in most cases, knowledge transfer still occurs in the process of one employee seeking advice from another (Bessenyei, 2005; Mirc & Parker, 2020). In recent years, there has been increasing academic interest (Brennecke & Rank, 2016; Lazega et al., 2016; Treglown & Furnham, 2020) in studying organizational knowledge networks, that is, a set of interrelated actors whose purpose is to share knowledge possessed by other actors and create new knowledge (Škerlavaj et al., 2010). Most research efforts in the field focused on organizational factors influencing the dynamics of knowledge networks (Mendoza-Silva, 2021) or tested already established social network mechanisms (such as social status theory and social capital theory) (Agneessens & Wittek, 2012), while the relational antecedents of advice-seeking remain understudied.

As Hortoványi et al. (2006) and Mattar et al. (2022) established, for knowledge transfer to occur, *structural*, *cognitive*, and *social* conditions must be met. That is, there should be an opportunity, an ability, and an intention to share. In contrast to structural and cognitive factors, preconditional interpersonal relationships are less visible to managers and are more often misunderstood (Marineau et al., 2018; Marineau & Labianca, 2021) and, therefore, less considered when planning actions. Thus, this study seeks to shed light on the relational foundations of advice-seeking behaviour by investigating the multidimensional social relationships of actors in a knowledge network. Furthermore, the study examines how positional distances in the hierarchy and across departments impact the willingness of employees to ask for knowledge. This approach is achieved by analyzing the social network data of three knowledge-intensive organizations (a business services centre, a higher education institution, and an ICT company) in Hungary and the United States. Binary logistic regression was used to identify the most significant relational factors. This study concludes that perceived trustworthiness, expertise, and helpfulness, as well as regular interactions of informal communication, are all substantial for the occurrence of advice-seeking behaviour – but with a notable difference between the relative explanatory power of variables across samples.

Consequently, this paper makes two contributions to the management, innovation, and behavioural sciences literature. First, it corroborates previous research by empirically demonstrating that informal relationships support the transfer of knowledge. It argues that relational preconditions of knowledge sharing are equally important as structural and cognitive factors. Regular communication between actors is proven to be crucial for making expertise visible and creating closure as well as an opportunity to share knowledge. Second, it extends existing knowledge by unfolding the individual impact of different relational dimensions in a multiplex social network on the generation of advice-seeking ties among actors. By employing a dyadic approach to knowledge networks, this study also contributes to the stream of organizational social network research where actor-based and structuralist approaches are predominant (Borgatti et al., 2014).

The structure of this paper proceeds as follows. After the introduction, Section 1 provides a review of necessary concepts of knowledge networks and advice-seeking behaviour in organizations to lay out the theoretical framework for empirical analysis.

In Section 2, information on data samples and research methods is presented. Section 3 includes the results and interpretations of the data analysis. Finally, in Section 4, connections and contributions to the existing literature are provided. Limitations and directions for future research are proposed as well as theoretical and practical implications.

V.2 Theoretical framework

Despite recent advances in information and communication technology, people continue to prefer to converse with other people in person or through virtual platforms as the primary means of obtaining substantial knowledge for their work (Causholli et al., 2021). One reason online or offline discussions are more popular than reading documents is that knowledge is often tacit, complex, or system-dependent and thus not easily codified (Nebus, 2006). In Cross et al.'s (2001) study of a consulting company, 85 per cent of the managers interviewed reported contacting fellow managers or employees for knowledge that was critical to their work. More recent studies also corroborated these findings, particularly in knowledge-intensive organizations (Lazega et al., 2016; Mattar et al., 2022; Mirc & Parker, 2020). This makes advice-seeking a promising area in research on intra-organizational knowledge sharing. Moreover, since advice-seeking usually occurs embedded in a rich context of diverse interpersonal relationships (Nebus, 2006), a multiplex social network approach is to be taken.

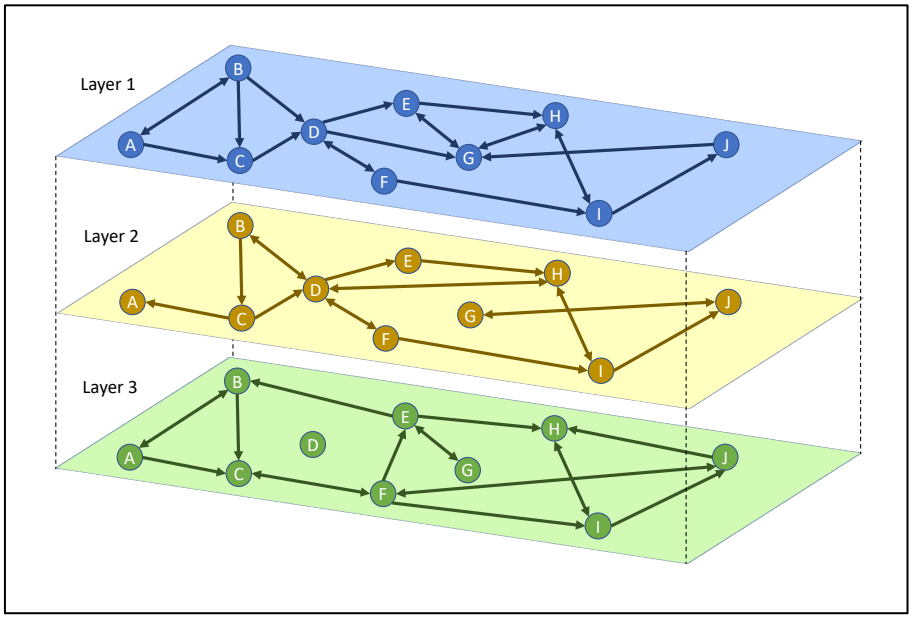
V.2.1 Multiplex approach to intra-organizational knowledge networks

Network theory has been an increasingly powerful paradigm in organizational research (Borgatti et al., 2009). In knowledge sharing, the network perspective is particularly advantageous, as it provides a convenient framework that integrates knowledge acquisition and knowledge creation, as well as the individual's roles as a primary source and a destination of knowledge. A knowledge network is generally understood as "a set of nodes—individuals or higher-level collectives that serve as heterogeneously distributed repositories of knowledge and agents that search for, transmit, and create knowledge—interconnected by social relationships that enable and constrain nodes' efforts to acquire, transfer, and create knowledge" (Phelps et al., 2012, p. 1117).

From this definition, multiple roles of network actors and functions of relationships unfold. First, actors may appear in three distinct positions. They might be repositories of knowledge (*knowledge owners*), possessing a variety of knowledge elements; they might facilitate knowledge acquisition and transfer (*knowledge brokers*); or they might as well create new knowledge elements (*inventors*) through combination or discovery (Phelps et al., 2012). Second, relationships between actors are both *channels* through which information flows (Borgatti et al., 2014) and *filters* through which actors view, perceive, and evaluate each other's knowledge (Borgatti & Cross, 2003). Relationships are also tools that help combine existing knowledge in order to create new ones (Škerlavaj et al., 2010).

Despite its many advantages, the network perspective also has some shortcomings. As Nebus (2006) points out, the network literature has a bias towards examining whole-network structures and characteristics when predicting outcomes, while it often overlooks individual or dyad-level dynamics. Moreover, network researchers' notion of people as *nodes* or *actors* and relationships as *ties*, while convenient for capturing "big picture" patterns, seriously oversimplifies the complexity and differences of individuals (Leinhardt, 1977). In fact, single-network studies usually examine but one aspect of interpersonal relationships, such as trust, sympathy, communication, or collaboration (Snow & Fjeldstad, 2015). As real-world relationships are complex, sometimes even controversial, this approach can only effectively capture one *layer* of social reality. That is a flaw in the theory that multidimensional (or multiplex) network studies, which examine multiple social layers simultaneously (see *Figure 19*) and signed graph studies, which combine the analysis of positive and negative relationships, seek to rectify (Harrigan et al., 2020).

Figure 19 Multiple layers of interpersonal relationships in a social network



Source: own compilation

As *Figure 19* demonstrates, actors who are connected in one layer of social space might not be in another. Moreover, actors may occupy a central position in one case and remain on the periphery in another. *Actor D*, for instance, can leverage brokerage positions in *layer 1* and *layer 2* that represent advice-seeking and collaboration networks, respectively, while missing any ties in the friendship network that is depicted in *layer 3*. He might be a senior expert who is professionally admired but perceived as aloof by his co-workers. *Actor G* also seems to be a hub in *layer 1,* while not so popular in the others: she may be a fountain of knowledge when it comes to seeking advice crucial for work but less invested in collaboration or fraternizing in the workplace. Human relationships are not only complex but also controversial. One might recognize a colleague's expertise while disagreeing with their values or avoiding direct collaboration due to their notorious lateness.

A multiplex approach in knowledge network research seems particularly lucrative as it may help identify layers of interpersonal relationships that impact knowledge flows. Furthermore, it serves as the theoretical foundation for the analysis of interplay (*i.e.*, correlation and regression) between different types of relationships (Gondal, 2022).

In recent years, various studies investigated the influence of specific relationship types on interactions related to knowledge sharing, such as advice-seeking. These demonstrated the importance and positive effects of trust (Bencsik & Juhász, 2020; Cross, Rice, et al., 2001; Swift & Hwang, 2013), friendship (Mendoza-Silva, 2021), emotional and fluid intelligence homophily (Treglown & Furnham, 2020), formal (Brennecke & Rank, 2016) and informal status (Agneessens & Wittek, 2012), and even competition (Lazega et al., 2016). However, a more comprehensive model of relevant relational antecedents of advice-seeking behaviour is yet to be established.

V.2.2 The significance and formation of advice-seeking ties

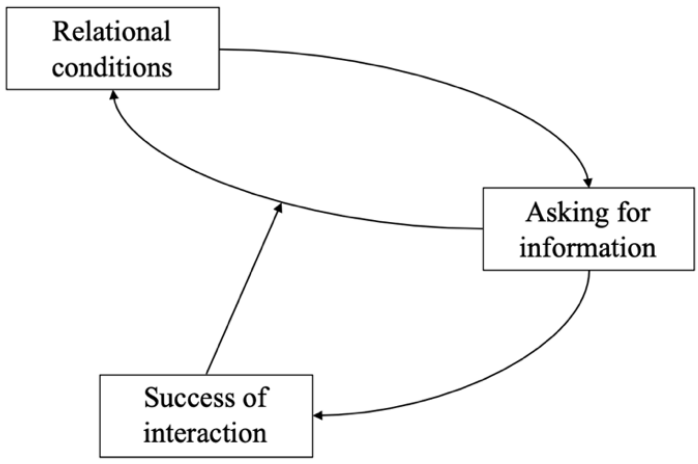
To better understand intra-organizational knowledge transfer from a network perspective, a more systematic approach is needed to distinguish between different types of dyadic phenomena. According to Borgatti et al. (2014), four kinds of dyadic phenomena are evidenced in network research. *Similarities* and *social relations* are state-like phenomena as these are relatively enduring and considered given at a specific moment. *Interactions* and *flows*, on the other hand, are dynamic occurrences and thus regarded as event-like. Similarities consist of shared identities and values, joint group memberships, or shared work locations. Although often used as a proxy, similarities are not, in fact, social ties but rather the context that provides opportunities and conditions for relationships to form (Borgatti et al., 2009). Actual social relations are relatively stable mental images of other actors that are occasionally recalled and sometimes rewritten. Alternatively, Labianca (2014) suggests that relationships are relatively enduring combinations of feelings (affects), judgments (cognitions), and behavioural intents to others. Social relations are sometimes products of kinship or social/organizational roles (Borgatti et al., 2014).

In contrast, interactions are transactions or exchanges between network actors. For instance, these exchanges include talking with, sending emails to, asking for information from, or collaborating on a task with others. As opposed to social relations, interactions are discrete events that happen once or more over time. Frequently occurring interactions may signal the existence of a relationship between two actors, as prior studies established that the regularity of interactions and the amount of time spent together increase the probability of relationship formation (King, 2021). On the other hand, a lack of interactions does not necessarily mean the

end of a relationship. You can imagine two friends who did not speak for two years after one of them moved to another town but still considered themselves friends and could pick up the conversation anytime where it ended. Finally, flows are elements transferred through interactions (Borgatti et al., 2014). Flows include emotions, money, and even germs in times of a pandemic, but more importantly, in a knowledge network, knowledge and information.

Within a knowledge network, advice seeking and knowledge sharing in this sense are not relationships but rather interactions that occur. Social relations are either judgments of others (e.g., perceived expertise, trustworthiness), behavioural intentions towards them (e.g., the willingness to ask for or provide information), or determined by formal roles (e.g., supervisor, subordinate, team member). Throughout the process of knowledge transfer, information flows between the actors: when one reveals their inability to solve a problem independently (an act that requires trust) and when the other provides the information necessary for the solution. Similarities provide the context for the interactions to happen (e.g., comembership in a project or working in the same office). According to Borgatti and Cross (2003), advice-seeking interactions should be conceptualized as part of a dynamic learning model (see *Figure 20*) in which asking for information, and especially the success of this interaction, has repercussions on its relational conditions. For instance, if actor *A* perceives actor *B* as knowledgeable and helpful and thus seeks them out to solve a problem, but they fail to do so either due to incompetence or negligence, actor *A* will probably adjust their perception. Consistently, if *B* does prove knowledgeable and helpful, *A'*s impressions will be reinforced.

Figure 20 The dynamic model of advice-seeking and learning



Source: Borgatti and Cross, 2003, p. 442

Information needs for problem-solving are not the only reason why network actors choose to seek advice from each other. In their study, Cross et al. (2001) found that based on 120 reported advice-seeking interactions among managers in a global company, only 57 per cent of these served the purpose of *solution generation* for problems. Forty-five per cent of interactions yielded *meta-knowledge*, that is, a knowledge of who knows whom and who knows what (Leonardi, 2015) required for effective advice-seeking in the future. *Problem-reformulation* that enables the actor to broaden their understanding of the problem and give more accurate solutions also made up 45 per cent of all interactions. Furthermore, advice-seeking was reported as a means of *validation* (49 per cent) and *legitimation* (36 per cent). While the affirmation that comes from validation is used to bolster the advice seeker's confidence, legitimation gives credibility to the solution based on the social status of respected sources endorsing the solution (Cross, Borgatti, et al., 2001). Given these points, an ideal target of advice-seeking interactions is either an actor who is *a renowned expert* (solution generation, problem-reformulation, and validation), is *well informed* and has profound local knowledge (meta-knowledge) or *has high formal or informal status* (legitimation). This is also in line with the findings of Agneessens and Wittek (2012) and Mattar et al. (2022).

In the sense of Borgatti et al. (2014), *perceived* expertise or local knowledge are directed (not inherently mutual) social relations where an *ij* tie means actor *i* considers actor *j* an expert of a subject. These social relationships that foster advice-seeking develop through several network mechanisms and together form the multi-layered social foundations of the knowledge network presented in section 2.1. According to Harrigan and Yap (2017), six mechanisms are primarily responsible for tie formation in networks. (1) *Closure* is a tendency of tie's partners to form a tie. That is, in an *ABC* open triad where *A* and *B* are friends, *A* and *C* also tend to become friends over time. (2) *Reciprocity* is the tendency of the recipient to return the given tie (also documented as the norm of reciprocity by social psychologists). For instance, if *A* shares a juicy piece of gossip with *B*, *B* might feel compelled to return the favour with another piece (Szvetelszky & Bodor-Eranus, 2020). (3) *Homophily* is a tendency of actors to develop relationships with those with whom they share similarities (essential attributes). In a knowledge network, it may be more probable that somebody who works in a specific department will develop relationships with others in the same department. (4) *Popularity*, in turn, means that actors with many (incoming) relationships are more likely to form new ones—a mechanism responsible for the so-called Matthew-effect ("the rich get rich") of natural networks. An already renowned expert in the organization is likely to be discovered by other colleagues. (5) *Activity* refers to a tendency of those who initiate ties to send additional ties. Differences in activity are rooted in internal traits such as introversion versus extroversion. (6) *Entrainment* is the tendency of ties in a particular social layer to predict ties in another layer. For instance, colleagues who have been collaborating on a project task become friends. The study of entrainment is noticeably limited in the social network literature as it requires multiplex data on different types of ties (Harrigan & Yap, 2017).

V.2.3 Conclusions for the empirical analysis

Based on the presented theoretical framework, it is posited that reported advice-seeking interactions are suitable markers for actual knowledge transfer processes occurring in a knowledge network. This is in line with recent findings showing that individuals tend to respond positively to direct requests for help (Flynn & Lake, 2008). Advice-seeking may happen for a variety of reasons, but in all cases, it seems reasonable that its targets are perceived to have substantial expertise, be well-informed, or possess high formal or informal status in the organization. The works of both Swift and Hwang (2013) and Cross et al. (2001) verified the significance of interpersonal trust (a perception of trustworthiness and helpfulness) in asking for help or information and sharing knowledge. Thus, in this study, it is posited that social relations, including perceived expertise, local knowledge, helpfulness, and trustworthiness, will have a positive effect on the initiation of reported advice-seeking interactions. It is hypothesized that the receiver's higher position in the hierarchy (*i.e.,* higher formal status) will result in more incoming requests for advice. Based on research results corroborating the homophily and closure mechanisms, it is posited that advice-seeking is more likely to occur within members of the same organizational unit. Finally, based on the entrainment effect, all relational conditions of advice-seeking are supposed to have a medium to high correlation with other layers of the multiplex social network.

V.3 Data and methods

Network data of three knowledge-intensive organizations were analysed to test the above-detailed assumptions. Sample organizations included a business services centre (390 employees), a higher education institution (583 employees), and an ICT company (1970 employees). The first two sample organizations are located in Hungary, while the ICT company operates in the United States (see *Table 1*). Data was collected by Maven Seven Network Research, Inc., a Budapest-based management consultancy specializing in organizational network analysis. Respondents filled in a self-administered survey questionnaire through a purposefully designed online platform entitled OrgMapper®, developed by Maven Seven. The questionnaire included 18 relational questions of which 8 items were used for this study (see *Table 2*). OrgMapper® questionnaire had been previously validated by Maven Seven through expert judgment, tested for internal and cross-sample consistency and has been used for years in consultancy practice. Data was collected in 2017 as part of three different consultation assignments, anonymized, and later provided for research purposes. The use of public or private datasets issue from previous corporate data collections is in line with the general practice of organizational researchers in the network paradigm as pointed out by Borgatti and Halgin (2011) and Robins (2015). Due to the leadership support at the sample organizations, the response rate was over 90 per cent in all cases—a threshold generally accepted as a validity requirement in social network research (Borgatti et al., 2014).

Table 6 Description of the sample datasets

	Sample Organization 1	**Sample Organization 2**	**Sample Organization 3**
Industry	Business Services	Higher Education	Telecommunications
Location	Hungary	Hungary	United States
N of employees	390	583	1970
N of hierarchy levels	3	4	5
N of departments	13	12	10

Source: own compilation

Datasets from the sample organizations included demographic data of the network actors (i.e., hierarchy level, departmental affiliation) and relational data reflecting the existence of ties between actors in different layers of interpersonal relationships (see *Table 6*). In line with Labianca's (2014) tripartite model of social relations, some questions measured relationships as behavioural intents (questions 1, 2, and 3), while others focused on judgments (questions 4, 5, 6, and 7), or affections (question 8). Survey questions analysed in the study were selected from all 18 questionnaire items based on previous research findings as presented in the theoretical framework.

For the purpose of this study, dyads were chosen as units of the analysis. All possible (*n*(n-1)*) directed dyads were investigated in the 9 selected dimensions. In this approach, an observation is an *ij* directed dyad, and variables indicate whether actor *i* chose actor *j* in a specific relational layer (dimension). As suggested by Robins (2015), respondents were limited to four answers per question to avoid the collection of potentially weak, less significant ties. Thus, even though the theoretical maximum of ties was *n*(n-1)* in all dimensions, the actual maximum was *4n*. *Table 7* demonstrates the number, density, and reciprocity of ties in all relational dimensions. Density (*d)* refers to the fraction of reported ties (*e)* over all possible ties (4*n*), while reciprocity (*r*) indicates the fraction of cases in which an *ij* dyad (A_{ij}) was matched by a *ji* dyad (A_{ji}) over all reported ties (*e*).

$$(1) \quad d = \frac{e}{4n} \qquad (2) \quad r = \frac{\sum_{i \neq j} A_{ij} A_{ji}}{e}$$

As expected, relational dimensions that presume symmetry (e.g., informal communication, trustworthiness, and personal support) were generally more reciprocal than those that presume asymmetry of power, knowledge, or ability (e.g., formal communication, informedness, problem-solving). Networks of all relational dimensions could be analysed to identify key players, examine structure, and compute meaningful measures (e.g., average path length, modularity, clustering). Of these indicators, density and reciprocity are listed in *Table 7*. As the primary contribution of this paper is not the analysis of specific networks (i.e., layers of the social reality) but rather the examination of their interplay, it is only the dependant variable, advice-seeking, that is depicted in a graph form. *Figure 21* demonstrates the differences of structure and composition across the three sample organizations.

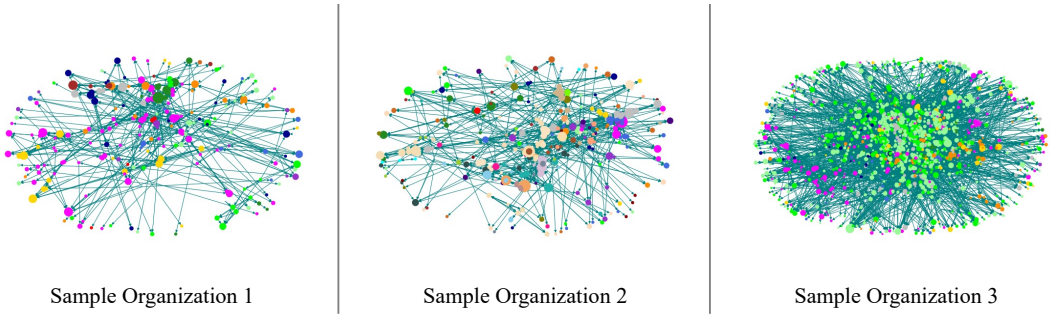
Table 7 Social relation types with corresponding survey questions

1.Advice-seeking	Whom do you feel comfortable asking for help if you find your work difficult?
2. Formal communication	Whom do you formally receive information and messages from in relation to changes in the organization and processes?
3. Informal communication	With whom do you have informal conversations about changes in the organization and processes?
4. Trustworthiness	Which of your colleagues do you consider trustworthy and dependable?
5. Helpfulness	Which of your colleagues is always ready or willing to help others?
6. Informedness	Whom do you consider to be well-informed with access to the latest news and updates?
7. Problem-solving	Which of your colleagues is good at solving problems in critical situations?
8. Personal support	Whom do you turn to if you need to discuss personal problems?

Source: own compilation

Demographic data on network actors were recoded into the dyadic level to indicate whether actors *i* and *j* are at the same level of hierarchy or in the same department. This way, all variables in the analysis were binary (0, 1) and represented the existence of ties in each relational dimension. To avoid misleading high correlations between variables due to a large number of non-existing ties in the networks, only those dyads were included in the analysis that had at least one existing tie in either layer. That is, an *ij* dyad was only included if actor *i* chose actor *j* in at least one of the nine relational dimensions demonstrated in *Table 7*. This is also in line with the purpose of this study to identify the relational antecedents of advice-seeking behaviour in existing relationships of knowledge networks.

Figure 21 Advice-seeking networks in the sample organizations



Sample Organization 1 | Sample Organization 2 | Sample Organization 3

Note: Colours represent different departments; node size depends on the number of incoming ties.

Source: own compilation

Binary logistic regression was used to investigate the individual explanatory power of each relational dimension (i.e., layers measured by the independent variables) on the presence of advice-seeking behaviour in these relationships. Binary logistic regression is a variation of linear regression that is used when the response variable is dichotomous and the independent variables are continuous, categorical, or both. Unlike linear regression, however, logistic regression does not assume that the relationship between the independent variables and the dependent variable is linear (Midi et al., 2010). Not only does it allow to assess of how well a set of variables predicts the categorical dependent variable and determines the goodness-of-fit of the model, but it also provides a summary of the accuracy of the classification of cases, which helps determine the per cent of predictions made from the model that will be correct. Instead of chance, binary logistic regression builds on the concept of odds, that is, it compares the probability that an event happens to the probability that it does not. It is generally considered a convenient tool for measuring how multiple variables affect the likelihood of a negative or positive outcome (Aldrich & Cunningham, 2016).

Table 8 Descriptive statistics of social relations in the samples

	Sample Organization 1	**Sample Organization 2**	**Sample Organization 3**
Advice-Seeking			
Number of ties	641	956	4,772
Density (practical)	0.411	0.410	0.606
Reciprocity	0.172	0.184	0.109
Formal communication			
Number of ties	753	1,088	5,176
Density (practical)	0.483	0.467	0.657
Reciprocity	0.093	0.081	0.102
Informal communication			
Number of ties	833	1,181	5,282
Density (practical)	0.534	0.506	0.670
Reciprocity	0.367	0.335	0.295
Trustworthiness			
Number of ties	902	1,236	5,809
Density (practical)	0.578	0.530	0.737
Reciprocity	0.266	0.261	0.202
Helpfulness			
Number of ties	893	1,300	5,580
Density (practical)	0.572	0.557	0.708
Reciprocity	0.206	0.229	0.164
Informedness			
Number of ties	600	936	4,044
Density (practical)	0.385	0.401	0.513
Reciprocity	0.070	0.028	0.029
Problemsolving			
Number of ties	503	777	4,370
Density (practical)	0.322	0.333	0.555
Reciprocity	0.095	0.067	0.088
Personal support			
Number of ties	517	797	3,625
Density (practical)	0.331	0.342	0.460
Reciprocity	0.236	0.163	0.243

Source: own compilation

V.4 Results

Binary logistic regression analyses were run in SPSS Statistics for all three sample organizations including *advice-seeking* as a dependent variable and all other relational dimensions in *Table 7* as independent variables. Two other categorical variables (same department and same hierarchy level) were also introduced to reflect the effect of the horizontal and vertical distance between actors on the willingness to ask for work-related help or advice. Binary logistic regression assumes that (1) the dependent variable is dichotomous; (2) there are no outliers in continuous variables; and (3) there is no multicollinearity (high correlations between independent variables) in the model. In this setting, the outcome was binary (advice-seeking behaviour is/not present), no continuous independent variables were included and all correlations between variables were low to moderate (Cramer's V coefficients for categorical correlations were lower than 0.40 in all cases). Thus, all basic assumptions of the regression model are met.

According to the omnibus tests of model coefficients, regression models in all three datasets proved to be statistically significant with χ^2=66.655, p<0.001, χ^2=115.364, p<0.001, χ^2=612.642, p<0.001 values in Sample Organization 1, 2, and 3, respectively. The p-values for the Hosmer and Lemeshow tests are higher than 0.05 (0.551, 0.674, and 0.562, respectively). The test's null hypothesis is thus rejected which signifies a good model-data fit. Binary logistic regression models use pseudo R^2 measures Nagelkerke R^2 and Cox & Snell R^2 which are both methods of calculating the explained variation. These measures usually have lower values than in multiple regression, however, they are interpreted in the same manner, but—with more caution—as an interval (Aldrich & Cunningham, 2016). In this case, Nagelkerke R^2 and Cox & Snell R^2 values were 0.267 and 0.393 in Sample Organization 1, meaning that the explained variation in the dependent variable based on the regression model ranges from 26.7 per cent to 39.3 per cent. Nagelkerke R^2 and Cox & Snell R^2 values ranged between 0.292 and 0.430 and 0.242 and 0.399 in Sample Organization 2 and 3, respectively. Classification tables of the regression models also suggest a strong explanatory power as overall percentages are higher than 80 per cent in all samples (82.6, 83.7, and 87.1) indicating generally correct predictions. Overall, these results suggest that relational antecedents explain a relatively large part of the variation in the formation of advice-seeking relationships. The remaining variation might be

explained by external factors such as accessibility, organizational structure, culture, leadership style, etc.

Based on the Wald test results, most independent variables turned out to be significant in the regression models. *Table 9* summarizes the explanatory values and significance of the included variables. Adjusted odds ratios (Exp(B) values) higher than 1.5 were emphasized in bold. According to the results, regular formal and informal communication between actors makes it 2 to 3 times more likely for advice-seeking to happen across all three samples. Remarkably, the perceived helpfulness of another actor does not contribute significantly to the odds of asking for their help. It seems that is the other actor's overall perception of being well-informed, good at problem-solving, and worthy of the trust that primarily explains one's willingness to seek them out. (Trustworthiness, in this sense, was measured as a general judgment of the other being dependable as well as one's readiness to ask for help in personal matters.) The horizontal or vertical distance of actors within dyads (as measured by differences in departments and hierarchy levels), in most cases, seems less significant or less impactful on the odds of advice-seeking happening. Although, in Sample Organization 3, belonging to the same level of hierarchy makes employees three times more likely to seek out their peers.

Table 9 Binary logistic regression model summaries for the sample organizations

	Sample Organization 1						
	B	S.E.	Wald	Sig.	Exp(B)	95% confidence interval	
Communication (formal)	0.9288	0.1246	55.5631	**0.0000**	**2.5314**	1.9829	3.2316
Communication (informal)	1.2394	0.1272	94.9870	**0.0000**	**3.4534**	2.6916	4.4309
Trustworthiness	0.3687	0.1314	7.8738	0.0050	1.4458	1.1176	1.8705
Helpfulness	-0.0423	0.1315	0.1036	0.7475	0.9586	0.7408	1.2403
Informedness	0.7554	0.1318	32.8687	**0.0000**	**2.1284**	1.6440	2.7556
Problemsolving	1.1724	0.1368	73.4648	**0.0000**	**3.2296**	2.4702	4.2226
Personal Support	0.9306	0.1358	46.9241	**0.0000**	**2.5359**	1.9431	3.3095
Same Department	0.3196	0.1230	6.7526	0.0094	1.3765	1.0817	1.7517
Same Hierarchy Level	0.0102	0.1332	0.0059	0.9387	1.0103	0.7781	1.3117
Constant	-3.1837	0.1644	375.1675	0.0000	0.0414		
	Sample Organization 2						
	B	S.E.	Wald	Sig.	Exp(B)	95% confidence interval	
Communication (formal)	0.6889	0.1070	41.4329	**0.0000**	**1.9916**	1.6147	2.4565
Communication (informal)	1.3813	0.1078	164.3110	**0.0000**	**3.9802**	3.2224	4.9162
Trustworthiness	0.4909	0.1098	19.9697	**0.0000**	**1.6338**	1.3173	2.0262
Helpfulness	-0.1185	0.1123	1.1148	0.2910	0.8882	0.7128	1.1068
Informedness	0.3519	0.1180	8.8980	0.0029	1.4218	1.1283	1.7916
Problemsolving	0.7820	0.1187	43.4099	**0.0000**	**2.1858**	1.7321	2.7582
Personal Support	1.5970	0.1084	217.2338	**0.0000**	**4.9383**	3.9934	6.1067
Same Department	0.6169	0.1089	32.0805	**0.0000**	**1.8531**	1.4969	2.2941
Same Hierarchy Level	-0.1816	0.1054	2.9712	0.0848	0.8339	0.6784	1.0252
Constant	-3.1499	0.1220	666.6543	0.0000	0.0429		
	Sample Organization 3						
	B	S.E.	Wald	Sig.	Exp(B)	95% confidence interval	
Communication (formal)	1.1002	0.0460	571.1494	**0.0000**	**3.0046**	2.7454	3.2883
Communication (informal)	1.2456	0.0489	648.6763	**0.0000**	**3.4750**	3.1574	3.8246
Trustworthiness	0.2939	0.0494	35.3407	0.0000	1.3417	1.2178	1.4782
Helpfulness	0.1201	0.0509	5.5696	0.0183	1.1276	1.0206	1.2459
Informedness	1.0242	0.0497	424.0719	**0.0000**	**2.7849**	2.5262	3.0700
Problemsolving	1.0988	0.0480	523.4755	**0.0000**	**3.0004**	2.7309	3.2966
Personal Support	0.5818	0.0515	127.6992	**0.0000**	**1.7893**	1.6175	1.9793
Same Department	-0.4471	0.0463	93.2291	0.0000	0.6395	0.5840	0.7002
Same Hierarchy Level	1.1111	0.0531	437.4226	**0.0000**	**3.0377**	2.7373	3.3711
Constant	-3.4431	0.0565	3710.7357	0.0000	0.0320		

Source: own compilation

V.5 Discussion and conclusions

Theorizing on advice-seeking behaviour in knowledge networks has tended to focus on either the effects of specific organizational factors (e.g., structure, culture, and leadership) or interpersonal dynamics based on one actor's individual judgments (e.g., expertise) and affections (e.g., sympathy and friendship) towards others. This paper proposes that there is merit in conceptualizing advice-seeking behaviour as a dyadic phenomenon embedded in an inherently complex social world that could only be comprehensively captured through a multiplex (multi-layered) approach. Multiplex analysis of organizational social networks may shed light on the relational foundations of advice-seeking and knowledge sharing, that is, the type of relationships that make these behaviours more likely to occur.

Although the odds ratios of specific variables in the model vary across datasets, there is a consistent pattern in their significance and relative explanatory power. Informal communication and perceived problem-solving ability were most substantial in all three samples. Differences in the odds ratios might be due to external organizational factors, such as culture, leadership style, or operational profile. In Sample Organization 2, for instance, a higher education institution, actors (many of whom are researchers and thus can be each other's competitors) seem more reluctant to ask for help without a conviction that the other is dependable and can even be trusted with personal matters. Sample Organizations 1 and 3, on the other hand, operate in the business sector where being well-informed and good at problem-solving outweighs trustworthiness. The role of belonging to the same level of hierarchy seems particularly significant in Sample Organization 3, although it is not self-evident if this difference is due to size, core activity, or culture (i.e., American versus Central-European).

In line with Borgatti et al. (2014) and Labianca (2014), this paper captured relationships as relatively enduring combinations of feelings (affects), judgments (cognitions), and behavioural intents to others. It examined the individual relational dimensions that are most commonly associated with advice-seeking behaviour (i.e., trustworthiness, helpfulness, perceived expertise) and created a more comprehensive model of these relational antecedents that explained 26.7 to 43.0 per cent of the total variance in the formation of advice-seeking ties. Results of this study corroborate

earlier findings such as Swift and Hwang (2013) and Cross et al. (2001) about the significance of interpersonal trust in workplace collaboration and learning. These results also provide support for Agneessens and Wittek's (2012) and Mattar et al.'s (2022) theory that actors with a higher formal or informal status are more likely to be sought out for help or advice.

Following Hortoványi et al.'s (2006) study, this paper also found that for knowledge transfer to occur, structural, cognitive, and relational conditions must be met. Regular formal and informal communication between actors were proven essential in all three sample datasets. Contrary to what has been reported by Cross et al. (2001), the perceived helpfulness of an actor was not a significant precursor of another's willingness to seek them out. Overall, data in this analysis shows that well-established formal and informal communication channels serve as structural means of advice-seeking; while judgments of other actors (such as perceived problem-solving abilities, trustworthiness, and informedness) make them a viable target. It seems that organizations and their managers should handle several layers of social dimensions beyond structural and procedural solutions if they want to foster knowledge-seeking behaviour and collaborative problem-solving.

The findings of this study are, in some respects, limited and need to be qualified in other ways. First, case-study methods or qualitative research tools may help to formulate a more comprehensive image of the sample organizations and thus explain individual differences due to organizational context. Second, as data in this study was collected pre-pandemic, it did not reflect the socio-technical changes in the past few years that partially altered how people interact and collaborate at the workplace. A repetition of this study on post-pandemic samples might also give an opportunity to better understand the impacts of social distancing on social network dynamics and the impact of those on advice-seeking behaviour and collaborative problem solving, and to compare the embeddedness of remote and on-site workers in organizational knowledge networks.

More recent papers investigating similar research questions have led, however, to congruent conclusions. Agneessens et al. (2022) found that expertise and psychological safety impact advice-seeking network formation both at the dyadic and the group level. They argue that expertise as a resource-related attribute makes those actors highly perceived as experts more attractive to advice-seekers and that actors with constructive attitudes have a higher propensity to build ties, while these same actors might be more inclined to build ties to similar actors with high constructive attitudes (Agneessens et al. 2022). Ajimati et al. (2022) investigated a sample of software developer professionals and reinforced that high connectedness in business and technical advice networks has a positive relationship with improving the problem-solving competence of software developers. Providing support to the results of this study, Wang et al. (2022) examined a post-pandemic online Q&A community and found that knowledge seeking quality and quantity positively affects social capital that, in turn, acts as mediator between knowledge seeking and knowledge contribution. In line of the results of this paper, Natu and Aparicio (2022) also corroborated that intrinsic motivation (that is generally due to interpersonal relationships between actors) is the most important driver in explaining knowledge-sharing intentions.

In addition to theoretical contributions, research findings in this paper also suggest for managers that by enhancing organizational communication, building interpersonal trust, and helping their employees to make their expertise more visible, they can effectively foster advice-seeking behaviour. Team building or merely creating opportunities for employees to bond over lunch or after work may strengthen their sense of trust. The use of enterprise social media or other tools that support ambient awareness (a knowledge of who knows what and who knows whom) may also help employees to make their expertise more visible to others. Rotation programs and cross-functional project assignments, on the other hand, can help advice-seeking ties cross horizontal and vertical organizational boundaries.

VI. Summary of research findings

In the 21st century, our prosperity depends more on other people than it did ever before. Neither a technological innovation from Silicon Valley nor a pandemic from China could have ever spread so fast and affect the lives of so many people than it does today. The social, economic and technological subsystems of our globalized world are increasingly complex, carrying more interdependencies than ever before. Value-creating relationships and inter-organizational networks have become critical for the competitiveness of business organizations: the position of individual actors in supply chains, strategic alliances, learning, and innovation networks substantially determines their opportunities. The lives, habits, beliefs, health, and even success of individuals can be predicted based on their positions in social networks. A data-driven revolution has brought about a network shift in almost all disciplines and fields of science. Moreover, the network metaphor has become popular in the public discourse and public speaking, as it provides a tool for modeling and understanding our complex world. In organizational studies, the network perspective is primarily used to investigate organizational change, organizational culture, and organizational learning.

Over the past decades, technological advancements have garnered significant attention from scholars and management practitioners for their potential to enhance organizational capabilities. Organizations within knowledge-intensive industries have placed particular emphasis on their ability to continuously renew and adapt. As a result, learning-related organizational processes, such as the acquisition, management, sharing, and implementation of knowledge, have become increasingly crucial. This has led managers and scholars to scrutinize and deliberately design organizational social networks, which facilitate the flow of knowledge and information and contribute to the generation of novel innovations.

In my doctoral dissertation, I presented four papers in three research areas of organizational network theory that are popular in the scientific discourse and relate to the analysis of organizational knowledge networks. By examining the functioning of enterprise social media in a case study, I presented the unique characteristics of virtual social networks as well as their similarities and differences with offline networks. With my literature review on negative ties in social networks, I included a phenomenon that had remained in the blind spot of previous research. Finally, by exploring the relational conditions of advice-seeking, I demonstrated what layers and characteristics of interpersonal relationships increase the chance of seeking out help and knowledge from co-workers. In the following sections, I summarize the contributions of each paper included in my dissertation.

Contributions of Chapter II, a paper on enterprise social media

The use of enterprise social media looks back on a history of just a few years, and its organizational effects had been relatively unexplored. In my doctoral dissertation, I presented the unique characteristics of enterprise social media through a comparison of the mechanisms of social networks in an online and an offline context. The differences lie primarily in (1) the influencing effect of the virtual environment, (2) the way content is disseminated, (3) the way social capital is made visible, and (4) the way content is made available and accessed. I sought to answer the question if the use of enterprise social media affects the real-life organizational social network in a Hungarian knowledge-intensive company. What are the specific advantages and disadvantages of enterprise social media use based on the case sample case study? How does enterprise social media influence knowledge sharing, advice-seeking and social learning in organizational settings?

The study aimed to understand the organizational effects of enterprise social media by conducting a case study of a Budapest-based company. Using the methodological tools of netnography, the study found that most of the mechanisms proposed by the international literature on enterprise social media were also observed in the examined organization. The study identified three key areas in which the virtual social network replaces and complements the communication networks of the physical space: building trust, sharing information, and stimulating weak ties.

The study found that enterprise social media helped to build trust relationships in the examined organization through three interrelated features: it helps (1) getting to know each other, (2) making work visible; (3) and allows orientation of new members of the organization. These findings align with the literature on trust building in social networks, which has shown that trust is particularly important and a relational condition to knowledge sharing (Hsu et al., 2007; Swift et al., 2013).

The study also found that enterprise social media helped with knowledge sharing in the organization. The platform's archiving function and searchability made it possible to extract information recorded over time and to find familiar or new content using the system's internal search mechanisms. This aligns with previous research that has found that enterprise social media can support knowledge sharing by providing access to information and by facilitating the discovery of new and unusual content (Fulk & Yuan, 2013; Gibbs et al., 2013).

In addition, the study also found that enterprise social media supports the development of meta-knowledge, which is the knowledge of who knows what and who knows whom (Leonardi, 2015). This aligns with the literature on enterprise social media and knowledge sharing, which has shown that the platform can support the development of meta-knowledge by providing access to information and by facilitating the discovery of new and unusual content (Kane, 2015; Leonardi et al., 2013).

Overall, this study contributes to the understanding of the organizational effects of enterprise social media by providing insights from a case study analysis. However, it is important to note that our study is based on a single case and therefore the findings may not be generalizable to other organizations. Further research is needed to replicate these findings and explore the effects of enterprise social media in different contexts. Additionally, more research is needed to understand the implications of the trade-off between exploration and exploitation in the context of enterprise social media and the impact of meta-knowledge on knowledge sharing.

Contributions of Chapter III, a paper on negative ties in social networks

Negative relationships affect almost every element of organizational life, from internal communication and knowledge sharing to employee retention, from decision-making to change management. Negative relationships often stay in the blind spot of managers and network researchers who generally analyze only positive interpersonal phenomena. In the past few years, the inquiry on negative ties in organizational social networks developed into an individual stream that is lately called “signed graph research”. Signed graphs refer to networks in which relationships have a valance that could be positive, neutral, or negative. The examination of negative relationships should not be ignored due to a phenomenon called “negative asymmetry” that refers to the observation that even though there are usually fewer negative ties in a social network than positive ones, their influence is overproportioned.

In this literature review, the role and significance of negative ties in organizational social networks are examined and discussed based on recent international research. The first aspect of the literature review is a presentation and comparison of the definitions of negative ties that are commonly used in the literature. This includes an examination of the different types of negative ties and how they are defined by prominent authors in the field. This is an important step in understanding the scope of the literature and the different ways that negative ties are conceptualized.

The second aspect of the literature review is a discussion of the consequences of negative ties as drawn from previous research findings. This includes an examination of the effects of negative ties at different levels of analysis, such as the individual, group, and organizational level. This can help to understand the ways in which negative ties can impact organizational outcomes and how they can be mitigated.

The third aspect of the literature review is a discussion of the challenges in data collection and analysis in negative tie research. This includes an examination of the difficulties in measuring negative ties and the limitations of current data collection and analysis techniques. This can help to identify areas where future research could improve the understanding of negative ties in organizational networks.

The final aspect of the literature review is a discussion of potential directions for future research. This includes an examination of the dynamic mechanisms that may be examined through longitudinal studies of negative ties, and enduring roles and personal tactics that appear along with negative ties. The analysis of various negative tie types all represents potential research directions, and the further examination of the topic's methodological and scientific philosophical background also seems lucrative. While we can use the former to develop more accurate data collection and analysis tools inside current network theory, the latter may serve to widen the limits of the framework and open the way to research based on psychology or qualitative methodology.

Overall, this literature review highlights the importance of taking negative ties into account in organizational network analysis. By including negative ties in the scope of studied phenomena, we can avoid one of the significant blind spots of previous studies and arrive at more accurate answers to organizational challenges such as change management, the retention of talented employees, or managing intra-group conflicts. The aim of this paper is to inspire further academic research and support the development of network research consulting practice, as organizational network analysis can provide valuable information for solving managerial challenges when negative ties are considered.

Contributions of Chapter IV, a paper on advice-seeking

Advice-seeking, that is, the request for professional knowledge and help from a colleague is the antecedent of knowledge sharing and ultimately, of innovation. In my doctoral dissertation, I explored the relational conditions of advice-seeking and knowledge sharing through personal interactions. To give a detailed review of the field, I presented the most important models and the latest findings in the relevant domestic and international literature, and then reported on the results of my own empirical research. I sought to answer the question of what factors decide to whom members of a knowledge-based organization turn if they need advice. Do they turn to a colleague who has visible professional knowledge and whom they trust? Or someone who is personally close to them and easily accessible? Or perhaps the expertise recognized by the organization, and a formal leadership role in the specific field is decisive? To what extent is knowledge sharing supported by trust and personal sympathy?

The study presented in this paper aimed to explore the dynamics of knowledge networks in organizations, with a focus on understanding the factors that influence employees' advice-seeking behavior. The research was conducted at a Budapest-based multinational consulting firm, and the results were based on a combination of survey data and interviews with key actors in the emerging knowledge networks.

The analysis of the knowledge network revealed that the majority of actors in the network had at least one incoming connection, indicating that knowledge sharing was prevalent within the organization. However, the network also exhibited a clear separation between the core and periphery, with managers and senior consultants being more popular as knowledge sources. Additionally, the calculation of centrality measures such as Beta-centrality and betweenness centrality helped to identify key players in the flow of knowledge within the network.

The results also highlighted the importance of perceived competence as a factor in employees' decision-making when seeking out advice. This finding is consistent with previous research that has emphasized the role of perceived expertise in knowledge sharing (Hsu et al., 2007; Wang, 2016). Additionally, the study found that the organizational culture in the consulting firm was supportive of knowledge sharing, which is in line with previous research that has identified a supportive culture as a key factor in encouraging knowledge sharing behavior (Park & Kim, 2018).

The results of our research indicate that personal motivation, knowledge-sharing self-efficacy, interpersonal trust, supportive organizational culture, transformational leadership, and external incentives all play a critical role in encouraging knowledge sharing within an organization. These findings align with previous research on the topic, such as Quigley et al. (2007) and Stenius et al. (2017), who also found that personal motivation is a fundamental condition for effective knowledge sharing. Additionally, our results support the findings of Hsu et al. (2007) and Wang (2016), who found that knowledge-sharing self-efficacy is positively correlated to an individual's knowledge-sharing behavior. Furthermore, our study supports the idea that trust, and a supportive organizational culture are crucial for knowledge sharing, as previously suggested by Park and Kim (2018).

However, the study also identified areas for improvement in the organization's knowledge management practices. In particular, the research revealed that the company had outdated technological capabilities for managing and sharing knowledge, which was a limitation for effective knowledge management. Additionally, the study found that the organization had limited integration of external knowledge into their processes, despite the strategic importance of innovation in knowledge-intensive industries (Hoe & McShane, 2010).

Overall, the study contributes to the literature on knowledge networks by providing a detailed examination of the factors that influence employees' advice-seeking behavior in a specific organizational context. The results provide insight into the dynamics of knowledge networks and the importance of different organizational factors in promoting effective knowledge management. However, the study also highlights the need for further research to explore the generalizability of these findings to other organizations and industries.

Contributions of Chapter V, a paper on the multiplex approach to advice-seeking in knowledge networks

Advice-seeking behavior within knowledge networks has traditionally been studied through the lens of specific organizational factors, such as structure, culture, and leadership, or through interpersonal dynamics based on one actor's individual judgments (e.g., expertise) and affections (e.g., sympathy and friendship) towards others. This paper proposes that there is merit in conceptualizing advice-seeking behavior as a dyadic phenomenon embedded in an inherently complex social world that could only be comprehensively captured through a multiplex (multi-layered) approach. Multiplex analysis of organizational social networks may shed light on the relational foundations of advice-seeking and knowledge sharing, that is, the type of relationships that make these behaviors more likely to occur.

This approach was achieved by analyzing the social network data of three knowledge-intensive organizations (a business services center, a higher education institution, and an ICT company) in Hungary and the United States. Binary logistic regression was used to identify the most significant relational factors.

The study found that informal communication and perceived problem-solving ability were the most substantial factors in all three organizational samples. However, the odds ratios of these variables varied across the different datasets, potentially due to external organizational factors, such as culture, leadership style, or operational profile. For example, in Sample Organization 2, a higher education institution, actors may be more hesitant to ask for help unless they believe the other person is dependable and trustworthy, while in Sample Organizations 1 and 3, which operate in the business sector, being well-informed and good at problem-solving may be considered more

important than trustworthiness. Additionally, the study found that belonging to the same level of hierarchy was particularly significant in Sample Organization 3, although it is unclear if this difference is due to size, core activity, or culture.

This study aimed to better understand the factors that influence advice-seeking behavior in relationships. Building on previous research by Borgatti et al. (2014) and Labianca (2014), the study focused on the combination of feelings, judgments, and behavioral intents that make up relationships. Specifically, the study examined the most frequently associated relational dimensions with advice-seeking behavior, such as trustworthiness, helpfulness, and perceived expertise. A comprehensive model of these relational antecedents was created and found to explain a significant amount of the variance in the formation of advice-seeking ties. The results of this study support earlier findings, such as those by Swift and Hwang (2013) and Cross et al. (2001b) which highlight the significance of interpersonal trust in workplace collaboration and learning. Furthermore, these findings align with the theory proposed by Agneessens and Wittek (2012) and Mattar et al. (2022) that individuals with higher formal or informal status are more likely to be sought out for help or advice. Overall, this study provides valuable insight into the complex dynamics of advice-seeking behavior in relationships.

Following Hortoványi and Szabó's (2006) results, this study also found that for knowledge transfer to occur, structural, cognitive, and relational conditions must be met. Regular formal and informal communication between actors proved to be essential in all three sample datasets. Contrary to what has been reported by Cross et al. (2001a), the perceived helpfulness of an actor was not a significant precursor of another's willingness to seek them out. Overall, data in this analysis shows that well-established formal and informal communication channels serve as structural means of advice-seeking; while judgments of other actors (such as perceived problem-solving abilities, trustworthiness, and informedness) make them a viable target. It seems that organizations and their managers should handle several layers of social dimensions beyond structural and procedural solutions if they want to foster knowledge-seeking behavior and collaborative problem-solving.

Despite these findings, it is important to note that the study's conclusions are limited in some respects and may need to be qualified in other ways. For example, case-study methods or qualitative research tools may provide additional insight into the complex nature of advice-seeking behavior within knowledge networks. Additionally, it would be beneficial to explore the impact of different organizational factors, such as culture, leadership style, or operational profile, on advice-seeking behavior in more detail.

Recent research papers investigating similar questions as this one have led to congruent conclusions. Agneessens et al. (2022) found that expertise and psychological safety have a significant impact on advice-seeking network formation at both the dyadic and group level. They argue that actors who are perceived as experts due to their resource-related attributes are more attractive to advice-seekers and that actors with constructive attitudes are more likely to build ties with similar actors who also have high constructive attitudes. Ajimati et al. (2022) studied a sample of software developer professionals and reinforced the idea that high connectedness in business and technical advice networks has a positive relationship with improving the problem-solving competence of software developers. Similarly, Wang et al. (2022) examined a post-pandemic online Q&A community and found that knowledge-seeking quality and quantity positively affect social capital, which in turn acts as a mediator between knowledge-seeking and knowledge contribution. Natu and Aparicio (2022) also found that intrinsic motivation, which is generally due to interpersonal relationships between actors, is the most important driver in explaining knowledge-sharing intentions. These recent studies provide support to the conclusion of this paper.

As for managerial implications, this study suggests that managers can play a crucial role in promoting advice-seeking behavior among employees. By improving organizational communication, building trust among employees, and helping employees make their expertise more visible, managers can create a culture of advice-seeking that can drive innovation and problem-solving. One way to build trust among employees is by promoting team-building activities or creating opportunities for employees to bond over lunch or after work. Managers can also use tools such as enterprise social media or other tools that support ambient awareness to help employees make their expertise more visible to others. Additionally, by implementing

rotation programs and cross-functional project assignments, managers can help advice-seeking ties to span across different levels and departments within the organization. By taking these steps, managers can create an environment where employees feel comfortable seeking and giving advice, which can lead to a more productive and innovative workforce.

Directions for future research

Based on my research findings, I have outlined promising directions for future research in all three subfields covered in my doctoral dissertation. *Table 10* summarizes these directions.

Table 10 Directions for future research based on own research findings

SUBFIELD	DIRECTIONS FOR FUTURE RESEARCH
ENTERPRISE SOCIAL MEDIA	• The effects of search and referral mechanisms on individual actor behavior in social media platforms. • The interpretation of enterprise social media as a "digital panopticon" and its inhibiting effect on norm violating behavior. • Generational and gender differences in enterprise social media use. • Ethical issues, security settings and privacy in enterprise social media and their effect on user behavior.

NEGATIVE TIE NETWORKS	• Enduring and reoccurring roles in the proximity of negative ties in organizational social networks: individual routines and tactics. • Longitudinal analysis of the dynamics of organizational social networks containing negative ties (signed graphs). • Investigation on mixed-mode networks containing ties with both positive and negative affections or behavioral intents. • The development of new network measures that can simultaneously handle positive and negative ties in a signed graph network.
ADVICE-SEEKING IN KNOWLEDGE NETWORKS	• The effects of disseminative and absorptive capabilities of organizations on the structure and dynamics of knowledge networks. • Longitudinal analysis of advice-seeking and knowledge sharing relationships based on the dynamic model of advice-seeking and learning. • Organizational factors affecting ambient awareness and social network accuracy of actors in a knowledge network.

Source: author

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